# EDUCATION AND NEW DEVELOPMENTS

## 2023

## VOLUME 2

Edited by
**Mafalda Carmo**

# Education and New Developments 2023

# Volume 2

**Edited by**

**Mafalda Carmo**

*Edited by* Mafalda Carmo, World Institute for Advanced Research and Science (WIARS), Portugal

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# BRIEF CONTENTS

# FOREWORD

This book contains the full text of papers and posters presented at the International Conference on Education and New Developments (END 2023), organized by the World Institute for Advanced Research and Science (WIARS).

Education is a fundamental right that accompanies us from the very beginning of our lives. It encompasses every experience we encounter, influencing and shaping our thoughts, emotions, and actions. Whether we engage in formal education within classrooms or learn from the world around us, the process of acquiring knowledge plays a vital role in our personal growth and development. It equips us with the tools to navigate the complexities of life, broadens our perspectives, and empowers us to make informed decisions. This International Conference seeks to provide some answers and explore the processes, actions, challenges and outcomes of learning, teaching and human development. Our goal is to offer a worldwide connection between teachers, students, researchers and lecturers, from a wide range of academic fields, interested in exploring and giving their contribution in educational issues.

We have brought together a diverse group of individuals with various backgrounds to contribute their unique perspectives and knowledge on Education. By including people from different nationalities and cultures, we aim to create a rich plethora of experiences that can broaden our understanding of human nature and behavior. The exchange of ideas and experiences among our participants helps to cultivate personal and academic development, providing a platform for the exploration of new insights and discoveries.

END 2023 received 758 submissions, from more than 45 different countries, reviewed by a double-blind process. Submissions were prepared to take form of Oral Presentations, Posters, Virtual Presentations and Workshops. The conference accepted for presentation 279 submissions (37% acceptance rate).

The conference also includes one Keynote presentation by Dr. Omid Noroozi, Associate Professor of Educational Technology, Wageningen University and Research (WUR), The Netherlands. We would like to express our gratitude to our invitee.

This conference addressed different categories inside the Education area and papers are expected to fit broadly into one of the named themes and sub-themes. To develop the conference program, we have chosen four main broad-ranging categories, which also covers different interest areas:

• In **TEACHERS AND STUDENTS**: Teachers and Staff training and education; Educational quality and standards; *Curriculum* and Pedagogy; Vocational education and Counselling; Ubiquitous and lifelong learning; Training programs and professional guidance; Teaching and learning relationship; Student affairs (learning, experiences and diversity; Extra-curricular activities; Assessment and measurements in Education.

• In **PROJECTS AND TRENDS**: Pedagogic innovations; Challenges and transformations in Education; Technology in teaching and learning; Distance Education and eLearning; Global and sustainable developments for Education; New learning and teaching models; Multicultural and (inter)cultural communications; Inclusive and Special Education; Rural and indigenous Education; Educational projects.

• In **TEACHING AND LEARNING**: Critical, Thinking; Educational foundations; Research and development methodologies; Early childhood and Primary Education; Secondary Education; Higher Education; Science and technology Education; Literacy, languages and Linguistics (TESL/TEFL); Health Education; Religious Education; Sports Education.

• In **ORGANIZATIONAL ISSUES**: Educational policy and leadership; Human Resources development; Educational environment; Business, Administration, and Management in Education; Economics in Education; Institutional accreditations and rankings; International Education and Exchange programs; Equity, social justice and social change; Ethics and values; Organizational learning and change, Corporate Education.

The contributions were published across two volumes, and this is the Volume 2 of the book titled *Education and New Developments 2023*, that showcases the outcomes of dedicated research and developments undertaken by authors who are driven by their passion to enhance research methods that directly relate to teaching, learning, and the practical applications of education in the present day. Within its pages, you will find a diverse array of contributors and presenters who expand our perspectives by delving into various educational matters.

This second volume focuses on the main areas of PROJECTS AND TRENDS and ORGANIZATIONAL ISSUES, being the contributions of the other two areas published in Volume 1.

We would like to express thanks to all the authors and participants, the members of the academic scientific committee, and of course, to our organizing and administration team for making and putting this conference together.

Hoping to continue the collaboration in the future.

Respectfully,

Mafalda Carmo
World Institute for Advanced Research and Science (WIARS), Portugal
*Conference and Program Chair*

Lisbon, Portugal, 24 - 26 June, 2023

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# KEYNOTE LECTURE

# "TOWARDS TRANSFORMATION OF EDUCATION IN THE DIGITAL AGE"

**Dr. Omid Noroozi**

*Associate Professor of Educational Technology, Wageningen University and Research (WUR)*
*(The Netherlands)*

## Abstract

The COVID-19 pandemic has forced transformation in educational settings within a short period of time. Such transformation has led to significant changes in our educational settings not only for students and teachers but also for institutions as such. This implies the need for constant innovations within educational programs to prepare our society for dealing with complex and global issues. In such transformation, digital technologies play a key role in today's classrooms and educational institutions are increasingly developing learning and teaching concepts that rely on the extensive use of such advanced digital technologies. This talk will focus on the key characteristics of transformation in our educational settings in the digital age. Then, the focus will shift towards how to integrate digital technologies in classrooms with particular emphasis on competencies that fit well with the digital age to enhance the process of teaching and learning. It will also focus on the key competencies that are crucial for students to acquire for dealing with complex issues and wicked problems in the digital age. This talk will also provide examples of active teaching methods and how they can be used in classrooms in line with the transformation of education in the digital age. Finally, the outlook of educational settings in the future will be discussed.

## Biography

Dr. Omid Noroozi is an Associate Professor of educational technology at Wageningen University and Research, the Netherlands. He explores relations among educational technology, learning, and students' transformative competence development. His Ph.D. (2013, Cum Laude) and research projects have been the subjects of various papers he has delivered at international conferences and various articles published in peer-reviewed journals. Omid has been a visiting scholar at the University of Michigan, USA, University of Oulu, Finland. He has received various research awards such as the most promising publication award at WUR, the best conference, and journal paper awards, nomination for Jan Hawkins award, and several junior research awards. Omid is now serving as an executive board member of the International Society for Technology, Education, and Science (ISTES), a committee member of the CSCL, Editor-in-Chief for the International Journal of Technology in Education (IJTE), and President and Scientific Chair of the International Conference on Studies in Education and Social Science (ICSES). He has co-edited a couple of collected books, served as an editorial board member of several scientific peer-review journals, and also guest-edited a couple of special issues in top-rank journals in the field of educational research. Omid is an active member of scientific associations e.g. AERA, ISLS, ICO, EARLI, and serves as an active reviewer for international peer-reviewed journals and conferences.

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# A SYSTEMATIC LITERATURE REVIEW:
# A PRAGMATIC MODEL OF ONLINE ENGAGEMENT AND AFFORDANCES TO SUPPORT ADOLESCENT LEARNERS

**Jia Li**

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## Abstract

Adolescent learners, who often have fewer self-regulatory and metacognitive skills than adult learners, require more support and higher quality interactions for online learning (Borup, Graham & Davies, 2013; Cavanaugh, Barbour & Clark 2009). Through a systematic literature review, this paper identified a pattern of student feedback that collectively addressed the wide range of support they required and received from multiple stakeholders when learning online. This work is inspired by the theoretical framework of adolescent community of engagement (ACE) involving members who play different critical roles in supporting adolescent students who are enrolled in online courses (Borup, West, Graham & Davies, 2014). To thoroughly capture who, what, and how elements within online learning environments supported or failed to support adolescent students and influenced either their positive or negative perception of their online learning experiences, five major types of support were identified, and the evidence was analyzed using thematic analysis across studies included in this review. The five types consist of 1) support by the formalized teacher-student relationships and interactions, 2) support via peer relationships and interactions, 3) support from a Proximal Community of Engagement (PCE, Oviatt, Graham, Borup & Davies, 2016, p. 223), including support from a broad yet immediate cycle, the school, familial and community members, 4) support through technological affordances that are unique to online learning environments, facilitating communication synchronously and asynchronously, and 5) support regarding structured and enriched curriculum development in online course shells/learning management systems (LMSs) for self-direct learning.

The shift to online learning due to the COVID 19 pandemic has greatly shaped adolescent students' perceptions of and experiences in distance learning, as well as their readiness for the future adoption of online learning. Therefore, it is important to enhance our understanding of "smart" designs and implementation of online courses, and the related teaching and learning strategies that can lend adolescents strong support to improve their learning experience and outcomes.

*Keywords: Systematic review, online engagement and support, adolescent students, learning community.*

## 1. Introduction

With the rapid development of internet technologies, there was already an upward trend pre-pandemic for secondary schools to integrate online education for adolescent students. The COVID-19 pandemic has changed the online education landscape and forced educators and learners to make a swift transition to online learning environments (Lockee, 2021); in turn, this has resulted in the widespread disruption of school systems for nearly 1.6 billion learners around the world (the United Nations, 2020). This shift represents the most extensive uprooting of educational delivery in human history (Pokhrel & Chhetri, 2021). Even with end of the school closures, online education has taken on a much more central role than before. For these and other reasons, many parents and students have indicated an unprecedentedly increased interest in taking online courses.

The adoption of online teaching and learning has been extremely challenging for adolescent students, who often have fewer self-regulatory and metacognitive skills than adult learners and face critical transitions from elementary school to middle school and from middle school to high school studies. With increasing academic demands on their learning, these students require more support and higher quality interactions throughout online courses (Borup, Graham & Davies, 2013; Cavanaugh, Barbour & Clark 2009). Therefore, a systematic literature review is needed to thoroughly examine research evidence prior to and during the pandemic from adolescent students' perspectives—the cumulative impact—of their experiences with online learning.

## 2. Objectives and research questions

Given the fact that one of the most often reported challenges online learning posed for adolescent learners was a lack of support and interaction, as well as decreased engagement, this paper specifically examined two research questions below.

1. What was the major form of support that adolescent students received from their school and social network, one that they valued, and which helped with their online engagement and learning?

2. What was the major form of support that adolescent students received via technological tools, one that they valued, and which helped with their online engagement and learning?

## 3. Methods

This systematic review was conducted according to the guideline of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA; Liberati et al., 2009). A systematic search was conducted for scholarly peer-reviewed articles in English published between 2000 and 2022. The search focused on studies of adolescent students' perceptions of the online learning experience, with student participants aged 13-17 years and in grades 7-12).

To conduct this systematic review, key terms listed in Table 1 were used to search for each database. The articles were further screened using the inclusion criteria, i.e., adolescent students from any geographical location who had at least one term of online learning experience that was enabled by any type of digital technology. The articles reported on empirical studies based on primary data collected using quantitative, qualitative, or mixed methods.

Fourteen databases were searched. These included the educational databases, i.e., Education Source (via EBSCO) and ERIC (via ProQuest), multidisciplinary databases with education coverage, i.e., Academic Search Premier (via EBSCO), Canadian Business and Current Affairs, i.e., Social Science, PsycARTICLES and PsycINFO (via ProQuest), JSTOR, and Web of Science. Further online learning research databases were searched, including I EEExplore and ACM Digital Library. Hand search was also conducted from the reference lists of the articles deemed relevant to the topic. A total of 17 articles were identified meeting the criterial for the review.

*Table 1. Search terms used for databases.*

| Category | Search terms |
|---|---|
| Population of interest | (teen* OR adolescent) AND ("high school" OR "secondary school") |
| Learning environment | ("online learning" OR online course*) |
| Learner perception | ("student experience*" OR perception OR perspective* OR engage* OR support* OR feedback) |

## 4. Thematic analysis and results

To thoroughly capture who, what, and how elements helped or failed to support adolescent students and greatly influenced their perceptions of their online learning experience, thematic analysis was conducted to identify the patterns of feedback. Open coding was applied to major results (Braun & Clarke, 2019), and ideas within the same theme were consolidated to provide an in-depth understanding of the adolescent students' collective perspectives, specifically regarding the support they received and appreciated as well as the support they required but did not receive during their online learning experience.

### 4.1. Major support for adolescent students' online learning and engagement: School and social network

To answer Research Question 1: What was the major form of support that adolescent students received from their school and social network, one that they valued, and which helped with their online engagement and learning? The results indicated that adolescent learners, who often had fewer self-regulatory and metacognitive skills than adult learners, required more support and higher quality interactions (Borup, Graham & Davies, 2013; Cavanaugh, Barbour & Clark, 2004). These included support

through interactions with their immediate circle online and onsite—teachers, peers, parents, and other community members—that were described as "a proximate community of engagement" (PCE) by Oviatt et al. (2016, p. 223). Based on the adolescent community of engagement (ACE) framework (Borup, Graham & Drysdale, 2014), a PCE involves members who play different critical roles in activities or interactions to support adolescent students enrolled in online courses. Greater engagement by PCE members in contributing to adolescent students' learning was more likely to increase the students' engagement (Borup et al., 2014), their positive perception of their online learning experience, and the likelihood of success (Oviatt, Graham & Davies, 2018).

Three major types of support from school and social network were reported in the reviewed studies. The first type of support was via formalized teacher-student relationships. Some research reported students' satisfaction with the amount of interaction they had with their online teachers (Harvey, Greer, Basham & Hu, 2014); some students expressed feelings of being cared about as a result of the different forms of teacher support that they received, e.g., pep talks and one-on-one interactions (Borup & Stevens, 2017). The students also expressed their appreciation toward online "shepherds," the supporting staff, who advised them with non-judgmental attitudes (Drysdale, Graham & Borup, 2016).

Second, support via peer relationships and interactions was critical to many students who believed that their social connections with and getting support from classmates helped them to stay motivated online (Dikkers, Whiteside & Lewis, 2013; Keaton & Gilbert, 2020). Evidently, students who completed their online course also perceived having more and higher quality interactions with their peers than those who did not (Hawkins, Graham, Sudweeks & Barbour, 2013). Their satisfaction levels with online learning were significantly correlated with peer interactions regarding the course content and procedures (Borup, Graham & Davis, 2013).

Third, regarding support from the PCE—a broader yet immediate cycle of school, family, and community members, some research reported that students got even more support from their parents than from teachers and peers, which also made important positive impact on their online learning engagement and outcomes (Oviatt et al., 2018).

## 4.2. Major support for adolescent students' online learning and engagement: Technological affordance

To answer Research Question 2: What was the major form of support that adolescent students received via technological tools, one that they valued, and which helped with their online engagement and learning? Two major aspects were identified by the students as being supportive of their online learning and engagement. The first was communicative support enabled by technological tools built into online course designs. With the recent speedy advancement in digital media technology, students felt that their interactions with teachers and peers were effectively supported through multiple means of communication in online learning environments, e.g., teachers' support using different avenues of open communication (web-conferencing, instant messaging, emails, chats, blogs) (Kumi-Yeboah, Dogbey & Yuam, 2018). The promptness and reliability of online communications, including reaching out to teachers by texting and meeting with teachers using video conferencing, made a great difference for students; in turn, they felt being cared by their teachers and this enabled them to collaborate effectively with their peers online during group learning activities.

The second aspect was in regard to structured and enriched curriculum development in online course shells/learning management systems (LMSs) that could lend strong support to students' independent learning of course content at their own pace. Students provided positive comments on the availability of well-planned materials. For example, a training unit on LMS that helped them understand course expectations and reduced dependency on online teachers and facilitators (Borup & Chambers, 2019) and weekly guides that teachers posted online helped them to stay on track (Borup & Stevens, 2017). To better support their self-directed learning more effectively, students also indicated the support they needed but was not available for their learning of course content. They made many suggestions to improve curriculum materials on course shells. These included posting course content in audio or video files and developing study aids, e.g., visual samples of problem-solving in math (Oliver, Kellogg & Patel, 2010), and various assessment and supplement materials that allow students to evaluate their understanding of course content (Oliver, Osbourne & Brandy, 2009; Oliver, Kellogg & Patel, 2012).

## 5. Discussions and conclusion

The adoption of online teaching and learning is an important yet complex undertaking, given that the challenges experienced by diverse students are often intertwined with socioeconomic factors (Kuhfeld, Soland, Tarasawa, Johnson, Ruzek & Liu, 2020). To effectively engage adolescent students in their online learning with adequate academic, personnel and technological support is key to their positive learning

experience and outcomes. With the uncertainty of the COVID-19 pandemic situation and its post-pandemic impact on instruction delivery mode, it is important to develop a pragmatic model of a supporting network and technological affordance for adolescent students' online learning.

Based on students' feedback on their online learning experience, this review also identified a wide range of supports that adolescent students felt they needed but which were not provided by multiple stakeholders. Some studies reported that students cited some constraints in online course designs, including restricted teacher-student interaction, which led to delayed, sparse teacher feedback and reduced learning opportunities (de la Varre, Irvin, Jordan, Hannum & Farmer, 2014; Oliver, Kellogg & Patel, 2012). Furthermore, students' negative perception of inadequate support was associated with their teachers' use of limited, inefficient communication tools, e.g., email (Oliver, Osbourne & Brandy, 2009). The dynamic, engaging educator-student relationship is critical to supporting students' online learning and should be fostered at the early stage of online instruction. Students also were concerned by feelings of isolation—the lack of social presence that comprised their online learning experience (Kumi-Yeboah, Dogbey & Yuam, 2018).

To conclude, based on students' shared experiences and perspectives on the support they received and needed through a network of relationships and interactions afforded by multimodal communications, a magnitude of support is required to ensure that students succeed in online learning environments. Further research is warranted to examine the variations of online support required by different subject matter. Also, the extent to which the perceived absence of social relationships and interactions led to adolescents' sense of inadequate support in online learning will be worthwhile to investigate.

*Acknowledgements*

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# WONDERING AND GRADING IN HIGHER EDUCATION – A TENSION RATIO?

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## Abstract

The topic of this paper is the possible tension between wondering and grading in Higher Education. By systematically discussing essential arguments, this question will be answered. Wondering means critical content questioning and a sharpened view. Things are seen differently and detached from their actual structures, which makes it elementary in Higher Education. However, there are structural elements, such as grading, that frame the learning process. On the one hand, this can contribute to a perception that students' ability to make their own judgments is low, but on the other hand, it can also lead to a focus on mere results and the usability of knowledge. Consequently, tension is created, and the effects of To-the-grade-learning and Learnification arise, which makes wondering secondary. There are examples of universities where gradeless assessment works and contributes to trying out new learning content, with less pressure to perform and focus on acquiring knowledge for its own sake. Noticing this positive development, de-grading might be a reasonable step to provide meaningful Education – and promote Wonder instead of emphasizing measurables.

*Keywords: Wondering, grading, higher education, to-the-grade-learning, learnification.*

## 1. Introduction

In Higher Education, numerous structural elements exist that organize learning. There is a great degree of standardization due to teaching hours, grading scales, division into distinct subjects, and admission procedures. This paper claims to focus on grading. However, what can also be mentioned as a crucial element of learning at the university is wondering. Through Wonder, the essential is to be grasped, which comes with questioning, curiosity, and assimilating—in short, capturing things that matter profoundly. As there is a great priority on grades, the case can occur that wondering is being pushed into the background. The question arises whether there is a tension between Wonder and grading in Education.

After Habermas (1967), especially within the 1968 movement, universities became a tool for social change and are fundamentally connected to social, political, and economic changes. Therefore, they have an impact but also interest. At the same time, many things changed progressively, such as the creation of the group of lecturers to partially reduce the power of professors, new bodies in academic self-administration, and basically a reduction of the elitist self-image. Nevertheless, problems like access, quality assurance of contents, and genuine possibility for involvement of the students remain partly unaddressed. Habermas (1967) emphasizes that critical questioning, self-reflection, and upheaval of internal structures are needed to ensure quality. For Higher Education to fit meaningfully into society, democratization is also essential. The principle of publicity is a mandatory requirement, which means every individual should have the potential possibility to participate in scientific progress and discussions. However, I would take the view that with grading it is restricted, as it excludes social backgrounds and rates different approaches to learning. Only when power relations become continuously more egalitarian can an equivalence of opinions and interests lead to a scientific discourse on an equal basis and a free-flowing accumulation of knowledge without the debatable classification into categories such as grades.

## 2. The role of wonder in education

Schinkel (2020) argues that there is a fundamental connection between good Education and Wonder. It is a crucial prerequisite that students should have a self-existing curiosity about the knowledge to be acquired. However, this alone is not enough. Educators must further support and enrich for a

successful continuation. Only in this way, relevant development can occur within the education context. Simultaneously, it is the task of the educators to make aware of potentially interesting things in the surrounding, but what makes it only successful is when "the penny drops" and when the to-be-educated see independently and experience an "opening up" (p. 103). Therefore, Education includes introducing new components of the world, which needs to be followed by the own processing of the learners. In this sense, "seeing and seeing are two: a lot of time, we see things without really seeing them" (p. 105). So meaningful Education includes initiating new perspectives on the world, questioning, processing, and not taking things for granted – which can be named as wondering. It implies having an intrinsic interest in something for its own sake and a genuine engagement, which lead to deeper understanding. The question arises whether grading can enable this described learning process or creates limits and will be examined in the following.

## 3. Grading in higher education

In most European universities, numerical grades or letter grades are used to assess student performance and, with their gradations, classify different areas of achievement. However, written feedback, using other scales, or destandardized forms of assessment are also reasonable. It should be considered that grades could serve the purpose of providing students with performance feedback and classifying their learning success. After Amaral & Magalhães (2007), due to the embedding of universities and schools in society and the fact that universities are also companies with economic interests, this original purpose can be pushed into the background. There have been numerous attempts to detach Higher Education from state regulation, creating a more neutral learning environment. This, in turn, has created market-like conditions with competition between universities and similar influences. It results that what can be seen as good from the evaluator's perspective, from society or in a competitive relationship, is often treated as good. There are undoubtedly well-thought-out rating scales that cannot be completely free of such influences, which appear more in understanding and interpreting humanities than in descriptive and explanatory natural science.

What should be considered is that there are different forms of measurement, and they cannot be classified as good or bad in principle. But as there are, referring to Curren (1995), "morally relevant differences between adults and children" (p. 426), assessment, in general, seems needed to help students receive higher forms of knowledge. Grades are therefore regarded as a "substituted judgment" (p. 430), for the time, people are seen as too young to interpret complex descriptions correctly and make reasonable decisions for themselves and society. Among other assessment forms, Curren argues that it is more feasible to make significant long-term decisions when the information is based on grades. For students to have an even more comprehensive range of suitable options after their educational training, this temporary restriction on the freedom to assess one's abilities is seen as beneficial. However, what is slightly more logical for school students, is questionable in Higher Education. Students' autonomy can be seen as neglected when they receive only substituted judgment instead of real feedback, which weakens the formation of decision-making and critical thinking. It is fair to assess to prevent decisions detrimental to personal development. Yet, it can cause "unwarranted interference" (p. 435) when the capability for own judgment is formed. This leads to the result that, especially in Higher Education, formulated performance appraisal and feedback are more useful and valuable.

While most people agree that in Education and society wondering is an essential prerequisite for sufficient learning and critical thinking, there is tension between wondering and grading. In what sense? Universities are designed to be places where knowledge is condensed, and the foundations of personal and societal future are laid. For this, free expression and exploration are indispensable. This can be at odds with grading from the point of view that students are less likely to take risks with trying new subjects, defending opinions, or adhering to individual forms of knowledge reflection, when poor grades might diminish chances for future jobs (McMorran et al. 2017). It cannot be said that standardized assessment patterns are not helpful per se. Comparability and measurability are valuable goods in Education, for example, when it comes to educational justice and the prevention of arbitrariness. However, it can still lead to a situation in which Education focuses mainly on the results at the end of the learning process instead of a deep learning process.

## 4. To-the-grade-learning and Learnification

Stolz (2017) argues that many standard testing and grading types "fail to capture human understanding of deeper learning" (p. 380). This includes primarily standardized tests and exams, as written proficiency leaves more room to present deep understanding. Still, the danger arises that a focus on grades is created and knowledge is shown in the desired sense. Davis (1998) uses the term "understood

knowledge" (p. 38), which is characterized as systemic, and interconnected. Therefore one-dimensional assessment as grades limitedly represents the complexity of knowledge.

With putting high importance on grades, after Stolz (2017), the effect of "teaching-to-the-test" (p. 380) occurs. From a student's perspective, finding out where one's interests lie and cultivating them in depth is neglected. At the same time, while it would be desirable to attach significance to the fundamental understanding of topics of interest, the focus shifts. In a system where paramount importance is attached to grades, it is a logical consequence that by focusing on these, other aspects are less prioritized. Next to this, "global competitiveness education" (p. 380) comes to the fore, as grading enables tangibility of successful Education and further comparability. Therefore the controversies of grading are not only to be seen on a personal basis, with individuals getting results, it is of a broader, even political context. Since universities are, in most cases, also companies in a society, whether students' achievements are highly valued depends on exploitability (p. 381). When it comes to the content of term papers or theses, and in which form knowledge is presented in exams, subjects must somehow fulfill the educational institution's purpose.

Here, Stolz (2017) argues that in Education - consciously or not - a difference between knowledge is made, as some get supported and are honored more than others. The risk is that "rational forms of knowledge" (p. 383) get less importance, as they can hardly be measured through grades. But "what can be tested are low-level skills and not student understanding and deep learning" (p. 387). This can be treated as curiosity and Wonder of more significant coherences, which have little justification of existence or revelation in scales. A tentative assumption can therefore be drawn on whether things that matter can be measured by grading. Grades can capture skills and learned facts. The more profound knowledge, however, is less suitable for standardized numerical assessment but needs individual and differentiated consideration.

Another perspective on Education is opened by Biesta (2010), who shapes the term "learnification" (p. 14), which is essential when unscrambling the tension ratio between wondering and grading. He argues that the focus in Education is being shifted more towards effective learning and measuring outcomes. Though it is necessary to cherish knowledge, the question comes up whether we are "valuing what we measure or measuring what we value" (p. 12). Accordingly, if only what fits into the measured scope is treated as good creates an entirely different learning process than a more open attitude to different results. To strengthen the exploratory part of Education, the fundamental question of what good Education needs to be answered first before letting scale numbers be interpreted to take over this decision and shape Education accordingly.

## 5. Elaboration of de-graded higher education

So far, the duality of learning and assessment often boils down to one thing: a grade. However, the fact that there are other ways besides this, which do not necessarily diminish learning progress, after McMorran et al. (2017), is often neglected. There are alternatives to standardized grading that achieve the same goals and do not suffer from the same problems as standardized testing and grading. Higher Education assessment without grading scales is the reality in some universities, as explained in the following. One way, besides regular grades, in Higher Education is that students receive pass/fail, credit/no credit, or purely qualitative assessment instead of grades (p. 362). By not having general categorization, students are not sorted into externally imposed assessment patterns which they can influence only up to a limited extent.

Nonetheless, they significantly shape their motivation to learn and self-perception. For example, the Nanyang Technological University of Singapore offers the pass/fail option in up to four courses. Any failed course in the first year can be repeated without repercussions (p. 364). Accordingly, it is easier for students to embark on a new subject and to try things out without the immediate concern of lessening their chances of getting a bad grade. In addition, Uppsala University uses Sweden's official grading system, which includes Pass with Distinction+/ Pass with Distinction/ Pass/Conditional Pass/ Fail (p. 364). On the other hand, the Evergreen State College of Stanford University School of Medicine does not use numerical grades but only formulated assessments, which take more time but allow the students differentiated feedback (p. 364). This can be seen as particularly important in the period of Higher Education since it is determinative and formative for the further personal and professional course of life.

Often, grades are used to exert pressure to create social conformity and enforce institutional measures, as Tannock (2017) points out. Therefore, they provide a pattern that sometimes leaves little room for students' design or interpretation of an assignment. Students who do not produce the expected content are sanctioned with poor (p. 1350). Moreover, grades undermine intrinsic motivations and thus conflict with critically engaged, self-directed learners who can wonder. While grades are a way to maintain standards, they are too one-perspective to be considered a significant measurement tool for

quality educational outcomes. It becomes evident that the focus is more on learning to get a good grade than on gaining knowledge for life or a particular topic. It is therefore essential to consider new, innovative approaches in Education - and grade-free Higher Education could be an alternative.

## 6. De-grading as a reasonable consequence to dissolve the tension ratio?

Beutel and Pant (2019) argue that upcoming patterns of differentiation and variety in youth biographies lead to individualization in the education environment and self-responsibility (p. 18). Nevertheless, they see a need to make achievement and performance results in Education visible, which is not necessarily given sufficiently by standardized grades but would be more reasonably justified by good performance diagnostics at all levels (p. 19). For Education without grades, a well-thought-out change is needed, which cannot happen suddenly and is unadjusted to the actual teaching. If grades are to be replaced by other forms of assessment, developmental-psychological insights into comprehension and learning, as well as moral and social judgment competence, are necessary. Changing the conditions of performance representation from the number to the word neither enlightens nor de-ideologizes. It is also continuously more important that the learners are involved in the evaluation, if only because group-oriented learning and self-assessment are becoming more crucial than simply accepting the assessment of others (p. 21).

Nevertheless, change is necessary, as Beck et al. (1991) found in a sizeable psychological study that Higher Education students who are very grade-oriented often report poorer overall academic performance. Reasons for this could be that they feel more pressure to compensate or that grades may be necessary to advance academically. In addition, very grade-oriented students learn differently than those less concerned about it. For example, when the former group learns firmly about test questions to be asked in a test, the latter focuses more on the larger context of the course material.

It comes to the fore after Vasudevan (2016) that written feedback transports more "holistic and meaningful information to adolescent learners" (p. 132), which numeric or letter grades cannot provide. Even more, they seem to show a "default to societal expectations rather than an intentional means of achieving […] educational goals" (p. 133). Accordingly, it becomes clear that in balancing personal and public interests, grades primarily serve the societal aspect. Trial and error in Education become less likely, as grades would entail a direct consequence. Hence "avoiding failure rather than seeking success" (p. 134) results. On the other hand, narrative feedback would include versatile components and is less ambiguous.

## 7. Conclusion

To circumvent the issues mentioned above, I propose de-grading Higher Education. Now another change to enable significant learning can be dared to make universities a place of critical questioning and wondering. Structures need to be adapted to contemporary demands, and utopias dared rather than remain in old patterns for fear of declining quality. De-grading could be the first obvious step to be followed by further changes. De-grading generates space for experimentation, free development, and Wonder, away from the curriculum and the socially desired. It becomes clear that grades in Education make sense primarily because they are a substitute for other assessment forms that are easier for many to understand. This includes, in particular, students who have not yet fully developed the ability to make meaningful decisions and assessments. Universities are increasingly becoming an instrument in favor of socially debatable developments rather than giving students a chance to find a suitable approach for themselves and the community through critical thinking and wondering.

Grading tends to focus intensely on outcomes and superficial, controversial knowledge. This can be seen as a contrast to wondering in Education. Here, learning that stimulates curiosity and considers the whole environment is intended. While grades impact self-concepts in basic Education and are related to socioeconomic backgrounds, they still can provide a decent performance assessment substitute when students are not conditionally able to self-assess and steer it in a helpful direction. This is less the case in Higher Education. There, an environment should be provided where students can develop freely, question knowledge, and work in a way that is not only oriented toward goals and social benefit. Grades don't make Wonder impossible per se, but they shift the focus on results and comparability, making wondering incidental. Therefore, thoughtful dismantling of the tension of grading and wondering in Education is vital for improving the structures of university and society in the medium term - to make visible what matters in the long term.

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# VULNERABILITIES OF MOBILE APPLICATIONS USED IN DISTANCE LEARNING ENVIRONMENT

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## Abstract

E-Learning means learning through electronic resources. This is usually done on the Internet, where students can access materials online at any time.

Nowadays, more and more students are enrolling in online courses to learn, due to the comfort of their homes and the desire to learn at their own pace, turning to various platforms that provide educational materials.

Thus, mobile learning platforms, used in the university environment, bring benefits to students, although they cannot fully replace traditional education. The Internet presents many opportunities and beneficial ways of learning.

In this material, we present the concept of distance education and how it is used. We present different software tools intended for mobile devices used in the education environment, and especially in the distance education process, and we analyze the vulnerabilities that have appeared for these mobile applications from the point of view of the data managed by these applications. The vulnerabilities are searched in CVE MITRE - Common Vulnerabilities and Exposures.

For each mobile application, we centralize the vulnerabilities identified and we will create a statistical analysis using Common Vulnerability Scoring System – CVSS. In this way, we will create a ranking of the most vulnerable mobile applications used in distance learning.

We believe that such an analysis is important for a growing technology because this technology development must be linked to certain security standards. Existing vulnerabilities already identified for the solutions used must be provided and analyzed so that there is no danger that these vulnerabilities are present in the solutions used.

*Keywords: Distance education, mobile applications, learning, vulnerabilities, data.*

## 1. Introduction

A system's vulnerability can be thought of as a weakness or flaw that permits white-hat hackers to alert the public or the system's owners to the exposure or black-hat hackers to breach the system's security to express their destructive intent. In order to provide countermeasures against them, it is crucial to analyze these vulnerabilities and take appropriate action.

Mobile learning applications can be exposed to malware, data breaches, and unauthorized access, among other security risks. Malware can be used to steal private data, including passwords and financial information (Willson, 2022). When an application is not properly secured, data breaches can happen, giving attackers access to private data. When an application is not properly secured, unauthorized access might happen, giving attackers access to private data. Additionally, phishing attacks, which are designed to steal passwords or personal information, may target mobile applications used in education.

In (Syvyi et. al, 2022) mobile applications are presented as a great tool for distance learning, as they allow students to access course materials and resources from anywhere. Mobile applications can help to create a more interactive learning experience, as they allow students to communicate with their instructors and peers in real-time.

The purpose of the paper is to give a broad overview of the significance of analyzing CVEs (common vulnerabilities and exposures) for mobile applications used in distance learning environments so that more people, including non-specialists, will be aware of the dangers associated with the rising trend in vulnerability disclosures and take appropriate precautions.

## 2. Distance education environment

E-Learning and web-based applications have been and are very popular allowing users to access information via the Internet directly from their personal computers. M-Learning or Mobile E-Learning allows accessing information via the Internet via mobile devices. Within M-Learning, courses and the platform are customized for each user (Al-Jarf, 2022).

The principal elements and advantages of Distance education environment are presented in Figure 1.

*Figure 1. Distance Education Environment.*
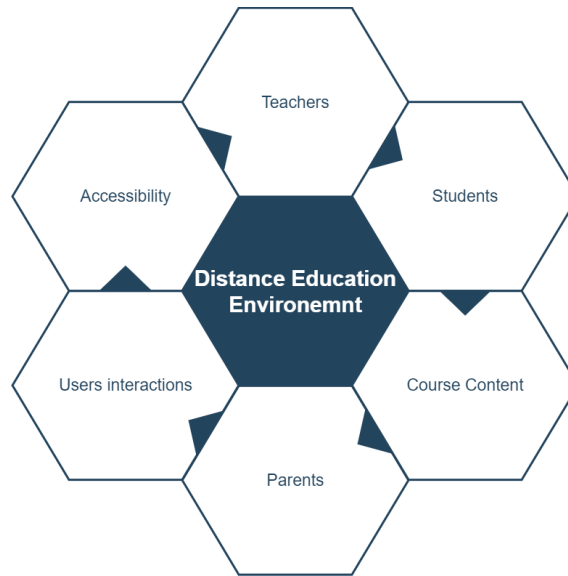


In (da Silva, et. al, 2022) distance learning environments is presented as an effective and beneficial instrument for students, as long as they are properly designed and well implemented. Distance learning can provide students with the opportunity to learn at their own pace, in their own environment, and with the support of their peers. Distance learning can help to bridge the gap between traditional and non-traditional students, allowing them to access educational opportunities that may not have been available to them otherwise.

Mobile devices are cheaper than personal computers and thus are bought by more people. Users take these devices with them all the time because they are small, portable and easy to carry. Learning is facilitated by combining different types of resources and different ways of developing knowledge and skills. The Mobile Learning mode provides users with both a physical and a virtual world. The information in the courses is put in the form of games.

The distance education environment offers students the opportunity to learn in any place and at any time. This allows them to adapt to their schedule and manage their time effectively. Also, this environment offers students access to online educational materials, such as interactive courses, educational videos and other resources.

Also, the distance education environment offers students the opportunity to interact with their teachers and colleagues through online platforms. This allows them to participate in discussions and collaborate with other students. Also, this environment offers students the opportunity to receive feedback and support from their teachers.

In addition, the distance education environment offers students the opportunity to learn in a more interactive and intuitive way. This allows them to better focus on the educational materials and better understand the concepts presented. Also, this environment offers students the opportunity to connect with other people from all over the world who share the same educational interests.

## 3. Mobile applications used in distance education

Mobile applications, like any other software product, to be accepted and used by users must meet the quality requirements imposed by them. Mobile apps represent investments made by the developer and after launch, he has to recover his investment. Failure to adapt the mobile application to user requirements leads to its non-use and automatic removal from the market, similar to removing a product from the

market. In our opinion the most used mobile applications in Mobile Learning are (Best Educational Apps, 2022):

    a. **Duolingo** is a free online language learning app. It is designed to help users learn a new language through interactive lessons, games, and quizzes. The app is available for mobile devices and computers and can be used to learn more than 30 different languages (Duolingo, 2023).

    b. **Teams** is a collaboration and communication application that provides a platform for work teams to connect and collaborate. The application offers communication tools, such as chats, video and audio calls, file sharing and other collaboration tools. It also offers integration with other Microsoft applications, such as SharePoint, OneDrive and Outlook (Teams, 2023).

    c. **MoodleMobile** is a mobile application that allows users to access the Moodle platform from mobile devices. This app gives users access to course content and activities, as well as received messages and notifications. It also gives users the ability to participate in discussions and upload files (Makruf, 2022), (Moodle Mobile, 2023).

    d. **Blackboard learn** is an online learning application that provides tools and resources to help teachers create and manage online courses. The app offers collaboration, communication and assessment tools, as well as course management tools such as the calendar, discussion list and material library. It also provides tools to create multimedia content such as videos and presentations. Blackboard Learn can be used to create complete online courses with all the resources you need to learn (Blackboard learn, 2023).

There are more mobile applications used in distance learning but for our analysis, we will use these four mobile applications.

## 4. Data vulnerabilities of mobile applications

For this study, we searched for the vulnerabilities reported on the platform (CVE, 2023) for these main solutions used in distance learning. Search results are shown in Table 1. For each solution, there is also a period in years in which these CVEs have been identified.

*Table 1. Identified CVEs for solutions used in distance learning.*

| No. | Solution | CVEs |
|-----|----------|------|
| 1 | Duolingo | CVE-2017-16905 |
| 2 | Teams | CVE-2022-21965, CVE-2021-24114 CVE-2020-17091, CVE-2020-10146 CVE-2019-5922 |
| 3 | MoodleMobile | CVE-2022-35652, CVE-2021-32477 CVE-2019-14830 |
| 4 | Blackboard learn | CVE-2022-39196, CVE-2021-36747 CVE-2021-36746, CVE-2020-9008 |

The identified vulnerabilities cover a period of 2017-2022. For most of the solutions, the latest vulnerabilities were identified in 2022. This information is shown in Figure 2.

*Figure 2. CVEs per years.*
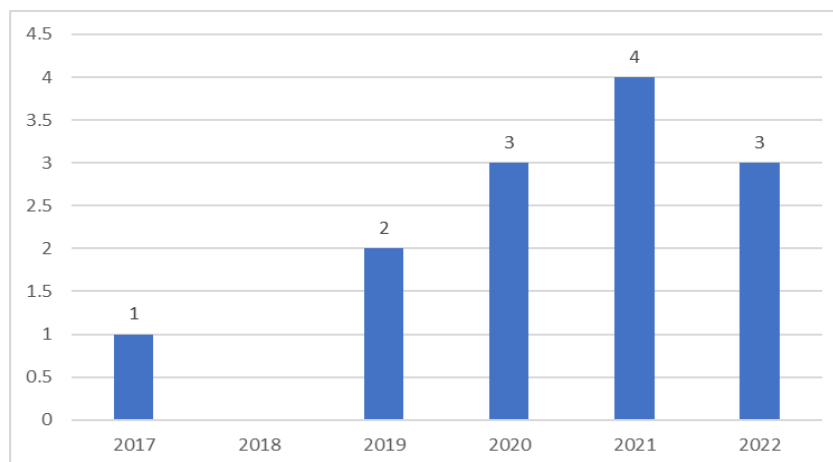
The Common Vulnerability Scoring System (CVSS calculator, 2023) is very used to calculate the score for each common vulnerability. The current version, and also the used version for our analysis is v3.1. We used this calculator to calculate the scores for the identified vulnerabilities. The results are presented in Table 2.

*Table 2. Scores for identified vulnerabilities.*

| CVE | Overall | Impact subscore | Exploitability subscore |
|-----|---------|-----------------|-------------------------|
| CVE-2017-16905 | 8.1 | 5.9 | 2.2 |
| CVE-2022-21965 | 7.5 | 3.6 | 3.9 |
| CVE-2021-24114 | 5.7 | 3.6 | 2.1 |
| CVE-2020-17091 | 7.8 | 5.9 | 1.8 |
| CVE-2020-10146 | 5.4 | 2.7 | 2.3 |
| CVE-2019-5922 | 7.8 | 5.9 | 1.8 |
| CVE-2022-35652 | 6.1 | 2.7 | 2.8 |
| CVE-2021-32477 | 4.3 | 1.4 | 2.8 |
| CVE-2019-14830 | 6.1 | 2.7 | 2.8 |
| CVE-2022-39196 | 6.5 | 3.6 | 2.8 |
| CVE-2021-36747 | 5.4 | 2.7 | 2.3 |
| CVE-2021-36746 | 5.4 | 2.7 | 2.3 |
| CVE-2020-9008 | 5.4 | 2.7 | 2.3 |

Also, we have calculated the averages for each mobile solution. The averages are presented in Table 3.

*Table 3. Average scores for mobile applications used in distance learning.*

|  | Overall | Impact subscore | Exploitability subscore |
|-----|---------|-----------------|-------------------------|
| **Duolingo** | 8.1 | 5.9 | 2.2 |
| **Teams** | 6.6 | 4.34 | 2.38 |
| **Moodle Mobile** | 5.5 | 2.26 | 2.8 |
| **Blackboard learn** | 5.67 | 2.92 | 2.42 |

These data are represented in the Figure 3 for a better interpretation.

*Figure 3. Average scores for mobile applications used in distance learning.*
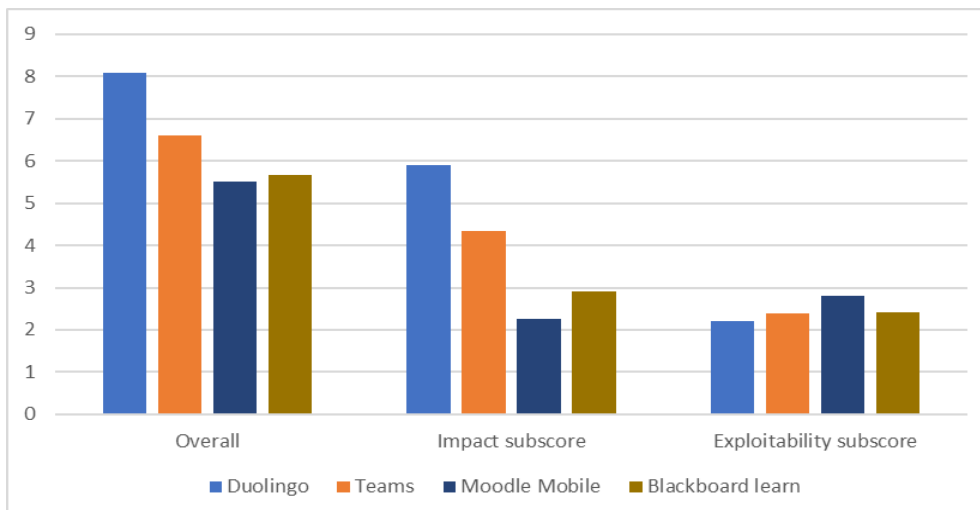
For Duolingo solution the average represents actually the score obtained by the single CVE identified for this solution. For the rest three solutions, we can see that the maximum overall score is obtained by the Teams solution.

## 5. Conclusions

In this paper, we analyze the identified vulnerabilities for the mobile applications used in the Distance Learning Environment and the impact of the number of identified vulnerabilities per year for these solutions.

Our future work will concentrate to identify new vulnerabilities and to make again the calculation of the new scores with the new data. Also, we want to create an automated tool that will identify automatically the number of common vulnerabilities and the overall score CVSS and to present reports monthly regarding to impact of each solution or other new solution that will be analyzed.

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# ASSESSMENT OF THE DIFFERENT SUBJECT AREAS
# IN AN INTERDISCIPLINARY PROJECT

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## Abstract

The explored component of this work investigates the influence of formative assessment, interim assessment, participation grading, self and peer assessment, as well as summative assessment on the final results of Project Based Learning (PBL). The samples were 120 students at an American-type of high school divided into two groups of 60. The aim of the study is to check whether the use of these specific assessment methods is applicable for an interdisciplinary project. The effect of having feedback from multiple teachers responsible for different disciplines on the end-result will also be tested. The end-goal is to determine whether the students have control over their projects and method of studying, to an extent where their finished products are created in their own vision. The instruments used to measure the course objectives were checklists corresponding to them. The research is made by observations on project activities: Checks throughout a set period of time, Questions and goals, Peer feedback, Final project report. A comparative analysis of students' academic results, with a sole focus on Mathematics and a multidisciplinary project, was done, to make a more extensive conclusion as to the effectiveness of said methods and their application in an educational setting.

*Keywords:*  *PBL, formative, interim and summative assessment, participation grade, peer feedback.*

## 1. Introduction

These days, it's almost impossible to have a conversation about education without hearing phrases like "student-centered," "deeper learning," or "project-based." Everywhere, districts, school leaders, and curriculum developers are launching new initiatives to promote instruction that gets students creating, investigating, performing, and experimenting, rather than taking notes and tests (Grossman et al., 2019). Science education is currently going through a process of change globally, which is related to the integration called STEM (Science - Technology - Engineering - Mathematics) (Tihbaut, 2018). It is not a separate program, nor does it replace educational standards, but a didactic approach that removes the traditional barriers between the four disciplines and integrates them into real, serious and relevant learning activities. The tasks of integral learning are best addressed when learning is implemented through the path of discovery, i.e., using the inquiry method. This method is an important part of inquiry-based learning through which new knowledge is constructed. The application of the project method and its variant, PBL, have the potential for conducting integrated learning (Raykova, 2019). Today, however, this approach results in most of the teachers being virtually untrained in how to make interdisciplinary connections. The results of Nikolova et al.'s (2018) study on teacher competencies indicate the need to focus on STEM curricula and teacher training methods, to raise awareness of the role of different stakeholders in the development of teacher competencies, and the role of teacher competencies in the development of the new generation of Bulgarian youth. The lack of tradition and experience in the collaborative implementation of STEM learning logically leads to questions about subsequent evaluation. Not only knowledge should be assessed in project work, because the aim is also to create key skills that should be adequately assessed. The latter implies the careful development of objective criteria and scales on which to base the assessment in question. In this regard, Raykova (2019) recommends the following methods for assessing students' knowledge and skills: testing to measure academic achievement; oral and written questionnaires; diagnostic interview; informal feedback from all groups; personal conversations with each student, etc.

Preparing our students for the future is an unpredictable task. But, with PBL, we can at least prepare our students to be adaptive to any situation they may face. This method doesn't have a particular definition, but for short let's say that PBL is a teaching method in which students are taught through tasks to model real-world situations in what they see as meaningful projects. Students are engaged in exploring

and solving a real-life problem, developing the skills needed to do so. It is meant to help prepare youth for the challenges of the 21st century, in addition to what the traditional curriculum is able to do. *The main goal of developing this approach is to create effective learning opportunities where learners can help each other by working in a group to answer a question, solve a problem, or tackle a challenge that will lead them to create a final product (Bell, 2010).*

Due to the Course syllabus of the American College of Sofia (ASC), the phases of creating an interdisciplinary project include:

*Table 1. Syllabus for an interdisciplinary PBL.*

| WEEK | TOPIC | OUTCOMES | TEACHING METHOD | ASSIGNMENTS |
|---|---|---|---|---|
| 1-4 | Interdisciplinary PBL start up | -Introduce the goals and work timeline for the PBL<br>-Understand the complexity of the research process<br>-Know what knowledge and skills related to each subject could be included in the project | Videos Discussion Lecture Discussion | Class Work (CW), Participation grade, Mind map (subject teachers Math and Physics)/ Formative Assessment (FA) |
| 5 | Creating the project goal | -Initial research on possible topics/questions<br>-Identify, learn, and value interdisciplinary connections in science research. | Students Discussion Teacher feedback (Formative Assessment) | Group work, CW/ Participation grade /Interim Assessment (IA) |
| 6-7 | Build a project RoadMap | -Create Project Plan with milestones and timeline.<br>-Reflect and review the project proposal to incorporate teachers' suggestions | Students Discussion Teacher feedback | Group work Project Proposal/ Subject teachers Math/Physics (IA) IT/Informatics/ Entrepreneurship (FA) |
| 8 | Analyzing Project requirements | -Students list functional and nonfunctional requirements | Students Discussion Teacher feedback | Submit Requirements/FA |
| 9 | Design/ Implementation Phase | Apply and improve all skills of the experimental research | Students driven learning, Teacher using effective questioning techniques | Group and Teacher Communication Group or Peer Evaluation/ FA |
| 10-22 | Iterative Implementation Phase | Build/Create/Develop, Test, Evaluate, Revise | Teacher facilitating and supporting enquiries | Video Reflections/ IA (Subject teachers IT and Informatics) |
| 23 | High Fidelity prototype (Interim Submission) | Submit Prototype<br>- Self Evaluate Project | Group Work | Prototype and Evaluation result Submission/ IA |
| 24-27 | Iterative Implementation Phase | - Improve/Extend/Complete Project Requirements | Self-directed Learning | Group and Teacher Communication/ Participation grade |
| 28-30 | Final Project Report, Project Presentation | Final Project Report<br>- Group Presentation Skills<br>- Individual Reflection | Group Presentation Skills | Presentation and project report / Final grade |

Not only are the learning method and the intent of its outcomes important, but also the evaluation of their achievement (Friedman, 2000). Such assessment must be an integral part of the teaching-learning process; it should be continuous and not just take part at the end of it, and it should be both summative and formative. Formative assessment is a part of the developmental or ongoing teaching-learning process. It includes delivery of feedback to the student, with the aim of improving teaching, learning and the curriculum. Summative assessment occurs at the end of a term or course and is used primarily to provide information about how much the student has learned and how well the course was taught (Wojtczak, 2002).

## 2. Materials and methods

PBL is difficult to introduce into classrooms at first, as it requires teachers to find what is interesting to students and work off that. It also requires a completely different way of grading, as it is impossible for an interdisciplinary project to be evaluated the same as a test or quiz, exactly because of the reasons PBL is looked at as better preparing for students – there is never one right answer, but rather numerous ways to solve a problem. Real problems are rarely solved by using knowledge from only a single subject or sphere. In order to construct efficient, working products, or even to reach a beneficial solution, students have to learn to intertwine the different lessons that they learn from the many subjects that they get taught at school. Achieving an objective summative assessment in this case requires very clearly formulated standards in rubrics for the different levels of grading in each subject. As mentioned, PBL projects do not have a single correct answer. In fact, many times they do not have a correct answer at all. For this reason, rubrics are so difficult to create, as they cannot constitute a simple checklist of "yes" or "no," on which to base the students' grades. Numerous factors have to be taken into account, not the least of which the students' engagement in what they are doing, how they have tried to solve the problems they have been given, and how ambitious their project was in the first place. These criteria should help both them and their teacher in determining a grade.  Sometimes the most complex part of having an interdisciplinary PBL project is the evaluation, as teachers who are most of the time not used to having to evaluate a common project, are put into a new for them situation. This is where formative assessment is very helpful, as it allows for one of the teachers (whose subject is the predominant), to grade the work at the end. While their colleagues just guide students as to how to improve the project in the required area. This is also possible through common formative assessment where all the teachers evaluate the project throughout the whole year and still give ideas for improvement, relating to their field. The explored component of this work was to investigate the influence of formative assessment, participation grade, self and peer assessment and only "leading teacher" assessment in project-based learning on the learning outcome of students and also to probe the level of reliability and validity of these methods of assessment in project-based learning.  For the purpose five types of checklists were developed:

### 2.1. Assignment in google classroom for weekly report, assigned and graded by the faculty member (formative or interim assessment)

Tutorial sessions ran once a week for three main subjects for an hour and a half in the seven-month course for grade 12th. In this particular case three main disciplines were included – Math, Physics/Entrepreneurship, Information Technologies (IT)/Informatics. The scale for each criterion (weekly communication and report, self and peer assessment and practice presentation) ranged from 0% to 100%. Every assessment type was not assessed weekly; criteria that were considered for each tutorial session depended on the objectives to be covered in that particular session, which were defined in the beginning of the school year, and they also depended on the PBL step the group of students was working on. After each tutorial session the "leading teacher" (Math teacher) of the project assigned each group one grade for participation (interim assessment) that ranged from 0% to 100%, for "weekly communication" criteria. It is very controversial whether participation can be assessed. Jacobs and Chase identify several reasons for not grading class participation: professors generally don't provide instruction on how to improve participation; interpretation of student behavior is difficult and subjective; participation often depends on a student's personality thus disadvantaging shy or introverted students; record-keeping is problematic: participation scores for a given individual are hard to justify if challenged. Despite these objections, Bean and Peterson believe that grading class participation can send positive signals to students about the kind of learning and thinking an instructor values, such as growth in critical thinking, active learning, development of listening and speaking skills needed for career success, and the ability to join a discipline's conversation. Throughout the project, participation had to be assessed regardless of teacher preference as it was one of the only ways to assess student engagement. They were given a rubric for participation with several criteria (workload, participation in surveys and after-class meetings, acceptance, and request for feedback from the teacher) that allowed to better understand (for both teacher

and student) how much is learned during group work. This means that if both parties follow this guide and determine which criteria are met and how, students will be able to self-assess by filling out a Google form and explaining why they deserve a certain grade. Teachers will be able to separate individual performance from group performance and see if the feedback provided is accepted. The papers for each group were also compared against themselves to see if, as students became familiar and comfortable with PBL over the course of the semester, they had become more engaged and motivated. At the end of the month, the "leading teacher" summed the formative grades obtained by each group from all the teachers and entered one average interim grade for "Weekly report" criteria. The last grade of students had both formative and summative value. At the end of the month each subject tutor assessed performance of the roles taken by each student during the classwork (leader or participant). Role assessment served a formative purpose to improve student performance in their future work but had no summative value.

### 2.2. A self-assessment checklist (formative assessment)

-Making a questionnaire, on which to ask the students, in order to determine whether they are moving correctly and whether they will achieve the goals that they have set. Self-assessment took place at the end of each month.

- Checklist, which contains questions towards the criteria to measure the cognitive outcomes from the study. In this way the students can reflect on their learning outcomes at the end of each semester.

### 2.3. Peer-assessment checklist (formative assessment)

**-**Making every group look at another group's project, in order to give feedback or feel motivated to move faster. The peers might also think of things that the teacher might have missed when making their own questionnaires. It helps students to analyze why their classmates assessed their performance in a particular way. Peer assessment took place at the end of each month.

### 2.4. Final report (summative assessment)

**-** A definitive questionnaire that gives the students the ability to self-evaluate their final product by giving them questions, concerning how it works, whether it works, whether it follows the goal of the initial plan.

## 3. Results

The samples were 120 students from the American College of Sofia divided into two groups of 60, taught through two consecutive school years. During the 2019/2020 school year only summative assessment was applied, while in 2020/2021 formative assessment was used as well. The average of students' results in math entry tests for all students are very similar. Table 2 includes a summary of all grades, including the scores received on each of the projects for both the final product and the participation. The grades were determined according to the ACS grading scale. What can be seen from this table is that even though the first project only required knowledge of mathematics and IT and only included one topic, the student performance levels on the interdisciplinary project were higher than the scores of the Group 2019/2020. The author did not expect such a conclusion as the interdisciplinary project was developed under the demands of three teachers. This fact makes the author believe that it's very useful if the formative assessment precedes summative. Even when we did our best to collaborate, sometimes it was not possible to get everyone together and students had to continue to pursue their next goal on their own. The students were also given to fill out a Google Form questionnaire where they had to answer whether their project was what they planned on doing initially. Their answers varied in the detail they provided, but it was found that most students seemed to determine that their projects were sometimes even more sophisticated than they initially planned. That is thought to be because of the guidance of the teachers. Some of the students had to change topics, again deciding that it was better than their initial idea, as it resulted in a more interesting and useful project that developed skills they might need in the future. Given that this case study was conducted with a small group of students from only one school and one class, and the criteria for the participation rubrics were developed by only one teacher, expectations could skew the results of the formative assessments and the results of the study may not be accurate.

*Table 2. Results from PBL.*

| GRADE | PBL Project Summative (Math) Grade 2019/2020 | Interdisciplinary PBL Project Formative (Math) Grade 2020/2021 | Interdisciplinary PBL Project Participation / Peer Grade 2020/2021 | Interdisciplinary PBL Project Summative Grade 2020/2021 |
|---|---|---|---|---|
| Poor (<59.5%) | 2 | 2 | 0 | 0 |
| Low (59.5% - 70.4%) | 0 | 30 | 0 | 0 |
| Average (70.5% - 80.4%) | 6 | 16 | 0 | 0 |
| Above the average (80.5%-91.4%) | 28 | 8 | 14 | 6 |
| Excellent (≥91.5%) | 24 | 4 | 46 | 54 |

## 4. Conclusion

Project-based learning is intimidating at first, as it requires a change in the core principles of the school curriculum – from grading and participation to the roles that the students and the teachers have in the classroom. However, those different types of assessment are freeing, as they allow the students to experiment and get more engaged in what they are doing, without the fear of being negatively impacted, as there simply exist no right or wrong answers. However, it also allows the teachers to improve their criteria throughout the school year, depending on what they find to be more valuable, while also allowing different students to be graded fairly, depending not only on the result, but the effort that they put into their projects. PBL develops the so-called "21st century skills," a phrase that combines many skills and abilities that are looked for in the contemporary world – teamwork, problem-solving, ingenuity, and overall independency, creating something from scratch by yourself. As such, the author thinks that it can and should find place in the classroom, despite the many initial difficulties that might be faced when integrating it.

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# COLLABORATIVE ONLINE INTERNATIONAL LEARNING: A CASE STUDY

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## Abstract

This paper examines the emerging Higher Education initiative of Collaborative Online International Learning (COIL) and leads a discussion as to how we can develop an institutional approach to supporting a broad roll-out of COIL activity using the University of Glasgow as a case study.

Collaborative Online International Learning is an approach that brings students and teaching staff together across cultures to learn, discuss and collaborate as part of their class. Educators collaborate to design the experience and students collaborate to complete the activities designed. COIL becomes part of the course, enabling all students to have a significant intercultural experience within their course of study.

COIL connects staff with a contact in another country to develop collaborative projects that students complete together across time zones, language differences and geographical distance using online tools.

The four pillars of COIL are:

- **Collaborative**: staff are co-teaching the module on equal footing; students are put in a position of needing to cooperate effectively and efficiently to produce the required outputs of the activity.
- **Online**: the interaction between the students and staff in question takes place (mostly or exclusively) online.
- **International**: there is meaningful interaction between staff and students in two (or more) different countries, leading to the development of international and intercultural competences.
- **Learning**: COIL is a learning activity, and should be an integral part of the curriculum, not an optional and inconsequential 'extra'.

This paper addresses an international community of learners reflecting on how COIL supports virtual mobility, inter-cultural competences, digital and other skills development, research-teaching linkage (students and staff), inclusive learning experiences and decolonizing learning and understanding global challenges with global partners

Using as case study approach I will explore how a partnership model of design and delivery can work, reflecting on assessment design dimensions of COIL and establishing an implementation plan. The complexities of COIL will be discussed, focusing on the four pillars of COIL which are required to be in place for any activity to be considered as COIL, with a strong emphasis on International meaningful interaction. This paper addresses the key point that HEIs must ensure that students are able to gain benefit from the activity given climate sustainability and access to international experiences.

*Keywords: Collaborative, online, international, learning, global, mobility.*

## 1. Introduction

The advent of technology has led to new and innovative ways of delivering education. One such approach is Collaborative Online International Learning (COIL). COIL is an innovative teaching and learning method that brings students and educators from different cultures together to learn, discuss and collaborate as part of a class. The objective of this paper is to examine the COIL initiative and provide an institutional approach for its broad roll-out, using the University of Glasgow as a case study. The paper will focus on the four pillars of COIL, which are crucial to its success, and discuss the complexities of COIL implementation.

Collaborative Online International Learning (COIL) is a teaching method and pedagogical approach that involves connecting students from different countries and cultural backgrounds through online learning. The goal of COIL is to create a global learning environment where students can work together on shared projects, engage in virtual exchanges, and learn from one another while building cross-cultural competency and intercultural understanding.

In a COIL course, students typically collaborate on a project that is developed and implemented through a series of online interactions and exchanges, such as video conferencing, discussion forums, and shared documents. COIL provides students with the opportunity to learn about diverse perspectives and cultures, practice digital and intercultural communication skills, and develop a global network of peers and mentors.

The COIL method is becoming increasingly popular as a way to internationalize the classroom and prepare students for the global workforce, where they will need to collaborate with people from different cultures and backgrounds.

## 2. The four pillars of COIL

The four pillars of COIL are collaborative, online, international, and learning. COIL requires staff and students to work together to complete the activities designed. The interaction between staff and students takes place mostly or exclusively online, and there is meaningful interaction between staff and students in two or more different countries. The goal is to develop international and intercultural competencies. COIL is also a learning activity that should be an integral part of the curriculum and not an optional extra.

The Four Pillars of COIL are the core principles that define and guide the collaborative online international learning approach. These pillars are:

- Collaboration: COIL is built around the idea of collaboration between students from different countries and cultural backgrounds. Collaboration is seen as the cornerstone of COIL, and students work together on projects, engage in virtual exchanges, and share ideas and perspectives.
- Online learning: COIL takes advantage of digital technologies to connect students across geographical distances. The use of online platforms and tools enables students to interact and collaborate with one another in real-time, regardless of where they are located.
- Internationalization: COIL seeks to internationalize the classroom by providing students with a global learning experience. Through their interactions with peers from other countries, students can learn about different cultures, perspectives, and ways of thinking.
- Intercultural competency: COIL is designed to develop students' intercultural competency, which is the ability to understand and appreciate cultural differences, effectively communicate across cultures, and work effectively with people from diverse backgrounds.

Together, these four pillars form the foundation of the COIL approach and provide a framework for designing and implementing collaborative online international learning programs and courses.

## 3. Case study: University of Glasgow

The University of Glasgow (UofG) serves as an ideal case study for the development of COIL. By exploring the partnership model of design and delivery, the paper will reflect on assessment design dimensions of COIL and how we established an implementation plan. The paper will also discuss the complexities of COIL and how HEIs must ensure that students can gain benefit from the activity.

One of the main barriers to implementing Collaborative Online International Learning (COIL) is the need for coordination and communication among different parties. This includes the costs associated with coordinating efforts between different institutions and ensuring that all parties involved have the necessary know-how and resources. Additionally, there is the challenge of obtaining course approval for COIL activities and incorporating them into existing curricula. Assessment and recognition of achievements also pose significant challenges, as does dealing with the practicalities of working across different time zones and timetables. Staff time and workload can also be a significant barrier to successful implementation of COIL initiatives. At UofG, we established a team of academics, professional services staff to explore these barriers.

The team at UofG recognized that there are several enablers that can help facilitate successful implementation of Collaborative Online International Learning (COIL). These enablers came from extensive research into COIL at UofG and beyond. One of the most significant enablers is the presence of existing collaborations between institutions, which can provide a foundation for future COIL activities. Additionally, the increasing comfort level with online tools and the use of technology for teaching and learning can help support the success of COIL initiatives, the pandemic increased blended learning and the adoption of collaborative online tools. A positive strategic context, including a clear focus on skills and employability, can also helps create the necessary conditions for success. Staff and student interest is also a key enabler, as their engagement and participation are critical to the success of COIL. Finally, having a network of partners and internal capability can help support the ongoing development and sustainability of COIL initiatives. Together, these enablers can help institutions, such as UofG create a strong foundation for successful COIL activities

### 3.1. Initiatives at UofG

Some examples of iniaitaives at UofG are:

Nursing: embedding elements of COIL for students with Singapore Institute of Technology; Many examples within Education, especially around Children's Literacies and online courses for international and home students (ERASMUS Mundus); and English Language and Literature (culture and English language teaching) Partners are from across the globe, including South America, China and European HEIs.

There is a strong desire at UofG to embed Collaborative Online International Learning (COIL) more systematically and to facilitate it more readily within academic and service areas. To support this goal, the UofG working group has delivered a model that has the aim of creating clear guidance and a toolkit for staff. This has helped to facilitate the integration of COIL into existing curricula and make it more accessible to a wider range of students. There is also a great deal of enthusiasm for doing more COIL projects, particularly those that relate to the United Nations' Sustainable Development Goals (SDGs). This enthusiasm reflects a desire to engage with global issues and to provide students with opportunities to develop a greater understanding of the challenges facing the world today. By working together and developing clear guidance and tools, institutions can create a more systematic and sustainable approach to COIL, while also promoting a culture of global engagement and collaboration.

## 4. Assessment design dimensions

The design of COIL activities should take into consideration the assessment design dimensions of COIL. This includes how the students will be evaluated, what the assessment criteria will be, and how the assessment process will be managed. The assessment design dimensions of COIL should also consider the objectives of the activity and ensure that they are met.

The Assessment Design Dimensions of COIL refer to the various components that need to be considered when designing assessments for a collaborative online international learning (COIL) course. The assessment design dimensions of COIL typically include the following elements:

- Assessment purposes: The purpose of the assessment should be clearly defined, whether it is to evaluate student learning, provide formative feedback, or both.
- Assessment types: A variety of assessment types can be used in COIL, such as exams, essays, group projects, presentations, and digital portfolios. The choice of assessment type should align with the course learning objectives and the collaborative nature of the course.
- Assessment criteria: The assessment criteria should be clearly defined and communicated to students. This includes the standards by which student performance will be evaluated and the weighting of each assessment component.
- Assessment methods: Assessment methods should be designed to support collaboration, intercultural communication, and cross-cultural understanding. For example, peer evaluations, self-assessments, and cultural reflection essays can be used to assess students' intercultural competency.
- Feedback: Feedback is an important component of assessment in COIL. Feedback should be timely, constructive, and tailored to the individual needs of each student.
- Grading: The grading system should be transparent, consistent, and aligned with the assessment criteria. Grading should also take into account the collaborative nature of the course and the intercultural competency of each student.

The assessment design dimensions of COIL should be carefully considered in order to ensure that assessments accurately reflect student learning and support the development of intercultural competency.

## 5. Implementation

The implementation plan for COIL should take into account the four pillars of COIL. This includes ensuring that staff and students are equipped with the necessary technology, that there is a meaningful interaction between staff and students in different countries, and that COIL is an integral part of the curriculum. The implementation plan should also consider the assessment design dimensions of COIL and ensure that the objectives of the activity are met.

UofG Implementation Plan is currently being rolled out but the research and consultation that has taken place by the WG has developed clear guidance, aims and objectives. The Toolkit is developed and aids staff developing COIL processes. Yet to be decided is any incentivization for staff and students, this is a longer term goal.

## 6. Conclusion

In conclusion, Collaborative Online International Learning is an innovative teaching and learning method that has the potential to transform the way education is delivered. The four pillars of COIL are crucial to its success and must be in place for any activity to be considered as COIL. The University of Glasgow serves as a case study for the development of COIL, and the paper has provided an institutional approach for its broad roll-out. The implementation plan for COIL should take into consideration the four pillars of COIL, the assessment design dimensions of COIL, and the objectives of the activity. By doing so, HEIs can ensure that students can gain benefit from the COIL experience and develop their intercultural and international competencies.

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# THE MELARETE PROJECT: THEORY AND PRACTICE OF A KINDERGARTEN AND PRIMARY SCHOOL PROGRAM FOR ETHICAL EDUCATION

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## Abstract

The contribution aims to present the theory of ethical education that founds the MelArete project, an educative program designed for kindergarten and primary school students with the aim to engage them in reflection on good, care and virtues. A phenomenological analysis of human being makes evident that caring for and being cared by others is fundamental, and theoretical and empirical research highlight that care is a practice informed by ways of being which are definable as virtues. Socrates points out the importance of the care for the soul, that is not separated from the care for the others and the care for the common good. According to Aristotle, "living well" is one with "doing well"; and to do well means to act according to virtue. After a long period of oblivion, care has come back to the attention of philosophy thanks to Heidegger and Foucault, but it is thanks to female philosophers that care has been deeply analyzed. Recently, even pope Francis referred to the concept of care to reframe a "new humanism", that promotes a better society. According to Ricoeur, ethics is an issue that deals with the care for oneself, for others and for institutions. Starting from these theoretical premises, the MelArete project, which conceives ethical education as educating to virtues in the light of care, is designed. The educative pathways, designed both for kindergarten and primary school, will be described by presenting the activities as well as the findings of the qualitative research carried out in order to evaluate the educational effectiveness of the project.

*Keywords: MelArete, ethical education, kindergarten, primary school, qualitative research.*

## 1. Introduction

An educational research should contribute to the enhancement of the educative practice and contexts, and in order to fulfil this purpose it should take as its starting point the real educational problems (Dewey, 1929), faced by educators and teachers in their everyday educative experience. In a society characterized by an evident ethical crisis, which expresses itself with a widespread indifference for the others and for the environment, the difficulty to construct and maintain positive relationships, and a lack of attention and commitment for the common good, schools recognize the importance and highlight the necessity to develop methods and instruments to foster children's ethical flourishing. To address this need, the Center of Educational and Didactic Research (CRED) of the University of Verona (Italy) developed the MelArete project (Mortari & Ubbiali, 2017; Mortari, Ubbiali & Valbusa, 2017; Mortari, 2019), which is structured in: a) an educative program aimed at engaging kindergarten and primary school children in reflecting on ethical concepts and experience, and b) a qualitative study aimed at rigorously evaluating the effectiveness of the realized educative activities for the enhancement of participants' ethical thinking.

Designed in this way, MelArete can be defined as an educative, and not merely educational, research, because it introduces into school new hypothetically meaningful experiences, conceived to represent an opportunity for children's development, and studies what emerges from them in terms of learning outcomes. Precisely, it is a research for, and not merely with, children (Mortari, 2009), because it is designed to represent a good experience for the participants, by contributing to their ethical flourishing. Consequently, it is a transformative, and not merely an explorative, research, because it aims: to enhance the educative contexts where it is realized by improving relationships among children, who are encouraged to develop caring and virtuous postures, and to provide teachers with methods and instruments of ethical education whose effectiveness was rigorously studied. Consistently with the naturalistic epistemology (Lincoln & Guba, 1985), which prescribes to study phenomena in the contexts

where they appear, MelArete is realized in schools, which are the privileged contexts to study the educative phenomena.

This contribution presents the MelArete project by focusing on: the theory of ethical education on which it is rooted; the educative activities designed for kindergarten and primary schools; and the data collected in the first edition of the program at the end of the educative experience, when participants were required to share with the researchers their final impressions about the project. The qualitative analysis of these data does not only highlight how children evaluated the program, but also some of its educative outcomes.

## 2. Ethical education as education to care and virtues

The title of the project combines the Greek terms "melete", which means care, and "arete", which means virtue; indeed, the philosophy of care and the ethics of virtue are the main theoretical reference of the project.

A phenomenological analysis of the essence of the human being makes evident that we are relational beings, i.e. ontologically related to the others and dependent from them. However, the others can both nourish and wound our being, and this condition makes us vulnerable. Furthermore, we come to life and leave it regardless of our decision, without having any sovereignty on our becoming, and for this reason we feel fragile. Finally, we have not a pre-formed shape, but we are a bundle of existential possibilities. This is the paradox of our existence: experiencing that our being is "limited in its transience from moment to moment" (Stein, 2002, p. 58) and that we cannot exercise any control on its development, and at the same time discovering ourselves bonded to the responsibility of answering the call of shaping our being, and of making our existential possibilities flourish. Because of these qualities which ontologically define the human being, care is fundamental in life: care is essential to be cured when we are ill or wounded, but also to preserve ourselves in life, i.e. being nourished and protected, and to make our existential potentialities flourish (Mortari, 2022). The ancient Greek philosophy already emphasized the importance of care for life. Socrates recommends to care for the soul (*Apology,* 30b-36c), conceiving the care for oneself as not separated from the care for the others and the care for the common good (*First Alcibiades*, 134c-d). After a long period of oblivion, care has come back to the attention of philosophy thanks to Heidegger (1996) and Foucault (1988); but it is thanks to female philosophers that care has been deeply analyzed: Noddings (1984), Tronto (1993), Kittay (1999) argued the importance of care to understand human ontology and give form to a renewed policy. Recently, even pope Francis referred to the concept of care to reframe a "new humanism", that promotes a better society based on fraternity and social friendship (2020a), an ethical relationship with nature, "our common home" (2015), and a global compact for education (2020b). According to Ricoeur (1992), ethics is a tension, aiming at a good life lived with and for others in just institutions. This "aim" is better defined as "care" (Ricoeur, 1990), so that ethics becomes a discourse that deals with the care for oneself, for others and for institutions. This vision is very fruitful for pedagogy: education can be conceived as an act of care whose purpose is to cultivate in the others the passion for caring for the self, for the other and for the world. Theoretical (Mortari, 2022) and empirical research (Mortari & Saiani, 2014) highlight that care is a practice informed by ways of being which are definable as virtues, in particular responsibility, respect, generosity and courage. The idea that the realization of care implies to act virtuously suggests that to educate to care requires educating to virtues, and this leads to conceive ethical education as education to virtues in the perspective of care.

At this point, a question arises: is education to virtues possible and, if so, how? To answer this question we suggest returning to Socrates's and Aristotle's perspective. Starting from the evidence that it is not possible to find either teachers or students of virtue (Plato, *Meno*, 96c- d) and that "the wisest and best of our citizens are unable to transmit to others the virtues that they possess" (Plato, *Protagoras*, 319e), in *Meno* and *Protagoras* Socrates doubts that virtues can be taught. However, this conclusion can be discussed: indeed, virtues cannot be taught in the sense that they cannot be transmitted as a disciplinary content; it is not possible to make virtues object of instruction, but to learn to act according to virtues can represent one of the purposes of education, conceived as a practice of care for the other. In this way, in fact, the Socratic *paidea* can be defined, which is guided by the intention to care for the other's thinking, in order to make him learn to care for his soul (*Apology*, 29d-e), and to care for the soul requires to cultivate virtues (31b). In *Apology*, Socrates states that "it is the greatest good for a man to discuss virtue every day" (38 a), and this statement, interpreted in the light of his maieutic example, suggests that according to him to learn virtues requires to dialogue on them, in order to examine their essential meaning. While Socrates focuses on the importance of dialogically reasoning about virtues, Aristotle thinks that virtues can be learned by practicing them. According to him, the good towards which the human being aims is *eudaimonia*, and reaching this good is 'living well' that is one with 'doing well' (*The*

*Eudemian Ethics*, II, 1219b; *Nicomachean Ethics*, I, 1095a); and to do well means to act according to virtue (*The Eudemian Ethics*, II, 1219a). The structure of the MelArete project combines the Socrates's and Aristotle's educational suggestions, by inviting children both to dialogically reason on virtues and reflect on the experience of them.

MelArete is in dialogue with the two main approaches of ethical education: *character education* and *moral reasoning*. Both these positions are interpreted in the light of care theory, so to give form to an educative program that considers virtue to be a key concept for education (Sichel, 1988; Howard et al., 2004) and that gives importance to the development of critical thinking (Kohlberg, 1981; Turiel, 2010), giving value to the necessity of creating a caring context (Noddings, 2002).

## 3. Educative activities

The first edition of MelArete focuses on the concepts of good and care, and on the specific virtues of courage, generosity, respect and justice, and it was implemented for the first time in the scholastic year 2016-2017 with the involvement of 106 8-10 y.o. children of four Italian primary schools and 116 4-5 y.o. children of six Italian kindergartens. The programs designed for kindergarten and primary school are structured on the same typologies of activities, but the modalities of their implementation differ according to the different age of the involved children. The first activity is a Socratic conversation on good and care: after the reading of a story, researchers ask children the following questions: "What comes to your mind when you hear the word 'good'?", and then "What comes to your mind when you hear the word 'care'?". These are eidetic questions that invite children to reflect together on the essential meaning of some fundamental ethical concepts. The next activity is aimed at introducing the word "virtue", and then at collecting children's definitions of courage, generosity, respect and justice at the beginning of the educative experience; answers are given in oral way by kindergarten's participants and in writing form by primary school's ones. These specific virtues are deepened during the central activities of the program: for each one of them, a story is presented, after which children are invited to reflect on the virtuous action carried out by the main character. In kindergarten, the stories are animated with puppets, while in primary school they are read by the researchers and presented to the children as an illustrated text. Furthermore, for each specific virtue, vignettes or games are proposed. Vignettes graphically represent an ethical dilemma or problematic situations on which children are required to reflect, in order to: choose the virtuous solution, argue their choice and discuss about it together. The situations represented in the vignettes proposed in kindergarten and primary school have different complexity and in the first case the protagonists are animals, while in the second one the protagonists are children. The games are of different type, including puzzles and memory games, and are proposed as starting point to foster children's reflection on a specific virtue. The last activity of the program requires children to define again what courage, generosity, respect and justice mean according to them; the heuristic reason for this activity is to allow researchers to compare the answers given by the involved children at the beginning and the end of the program, in order to explore the effectiveness of the project in fostering the development of ethical thinking. During the educative pathway, participants keep a "diary of virtues", where kindergarten children draw and primary school ones write virtuous actions carried out in first person or seen carried out by others. At the end of the program, children are invited to answer the following question: "What has remained in your heart and mind of what we have done together this year?". The primary school children answer in written form. Instead, the kindergarten children answer in oral way, and if the child needs a reinforcement, researchers reformulate the question in this way: "What is the most important thing that you have learned in the pathway that we have made together?". The collected data are important to evaluate the effectiveness of the program, because they allow researchers to collect feedback from the side of the children. These data are the object of the analysis process presented below.

## 4. Analysis method and findings

The children's answers collected at the end of the first edition of the program were 91 in kindergarten and 52 in primary school. The data were qualitatively analyzed, following a methodological crossbreeding (Mortari, 2007) between the phenomenological-eidetic method (Giorgi, 1985; Moustakas, 1994) and the grounded theory (Glaser & Strauss, 1967). Each answer was firstly codified through the attribution of a first level concept or label that synthetically expresses its essential meaning; then the concepts of first level that refer to a common learning dimension were grouped in concepts of second level or categories. The outcomes of the analysis process concerning data collected in kindergartens and in primary schools are the following coding systems, which include the emerged labels and categories. Every label was quantified, to put in evidence how many times it occurred in the analyzed data.

*Table 1. Findings from the analysis of the kindergarten children's answers.*

| CONCEPTS OF FIRST LEVEL | n. | CONCEPTS OF SECOND LEVEL |
|---|---|---|
| The virtues object of the path | 31 | TO KNOW AND ACT VIRTUES |
| Other virtues | 4 | |
| The general concept of virtue | 10 | |
| To do good actions | 6 | |
| The importance (and the effort) of acting according to virtue | 2 | |
| Friendship and its value | 5 | THE VALUE OF GOOD RELATIONSHIPS |
| Love | 3 | |
| The boundaries | 1 | |
| To care | 3 | |
| The stories | 44 | THE ACTIVITIES OF THE PROJECT |
| The characters/puppets | 14 | |
| The vignettes | 1 | |
| The games | 9 | |
| The diary of virtues | 3 | |
| Side activities | 9 | |
| The figure of the researcher | 2 | |
| To draw and write | 1 | ABILITIES AND STYLE OF ACTION |
| To performance | 2 | |
| To do the puzzles | 1 | |
| Style of action: to work and get engaged | 1 | |

*Table 2. Findings from the analysis of the primary school children's answers.*

| CONCEPTS OF FIRST LEVEL | | n. | CONCEPTS OF SECOND LEVEL |
|---|---|---|---|
| The virtues object of the project | | 15 | THE VIRTUES |
| Specific virtues | Generosity | 2 | |
| | Justice | 2 | |
| | Respect | 1 | |
| The importance of virtues | | 3 | |
| The done things | | 5 | THE ACTIVITIES |
| The stories | | 12 | |
| The characters of the stories | | 2 | |
| The games | | 6 | |
| The reflections | | 1 | |
| The diary of virtues | | 1 | |
| The group works | | 1 | |
| Joy | | 1 | THE EMOTIONS |
| Happiness | | 2 | |
| Comfort | | 1 | |
| Fun | | 1 | |
| Emotions of the conclusive day | | 1 | |
| To be in company | | 2 | THE MOMENTS OF SHARING |
| The shared experiences | | 2 | |
| The educative aim | | 3 | THE POSTURE OF THE RESEARCHER |
| Kindness | | 2 | |
| Patience | | 1 | |
| The concept of virtue | | 6 | LEARNINGS OF INTELLECTUAL KIND |
| The meaning of virtues | | 2 | |
| The discovery of virtues | | 1 | |
| To express the meaning of virtues | | 1 | |
| How to act virtues | | 4 | LEARNINGS OF EXPERIENTIAL KIND |
| To be virtuous | | 3 | |
| Virtue are useful in life | | 2 | |
| You must be virtuous | | 2 | |
| To make the others learn virtues | | 1 | |

The analysis puts in evidence several aspects related to children's evaluation of the program and its educative effectiveness. In particular, a cross-reading of the two emerged coding systems highlights that the program allows children to learn virtues, at the intellectual and practical level, both in kindergarten and primary school. Indeed, children's answers refer to the effectiveness of the project in fostering both knowledge and the practice of virtues. Furthermore, both in kindergarten and in primary school, the typology of activity that seems to be most appreciated by children is the presentation of

stories. The experience of the first edition of the program, as well as the findings emerged from the final children's answers, have been taken into consideration in the designing of the second edition of the program, focused on the virtues of friendship and gratitude.

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# DIGITAL TECHNOLOGIES, MENTAL HEALTH CHALLENGES AND ACADEMIC LANGUAGE DEVELOPMENT OF INDIGENOUS YOUTH: A RETROSPECTIVE

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## Abstract

Indigenous students have experienced negative inter-generational impacts from colonization and socioeconomic stress, leading to mental health challenges and persistent subpar academic performance. Both issues intertwined pose a complex challenge that has been increasingly documented by media, research, and in government reports and has had a significant impact on Indigenous youth's wellbeing and academic achievement.

In addition to the educational disparity faced by Indigenous youth, particularly those living in remote Indigenous communities, high rates of suicide, depression, and substance abuse have prevented them from obtaining the language and literacy skills required for graduating high school and pursuing post-secondary education and professional opportunities. Educational interventions would be more effective if these issues were addressed in their design and implementation and grounded in Indigenous cultural and community practices.

Research has reported that many Indigenous youth have adopted or are keen to adopt digital technologies, which have the potential to provide e-mental health resources as well as opportunities to improve academic literacy skills. This research synthesis examines the evidence of the efficacy of using digital technologies to support Indigenous youth's mental health and the learning of language and literacy skills. It presents a profile of important studies focusing on Indigenous youth's perspectives on both issues. Based on a culturally responsive pedagogical framework, this article provides insights for teaching practice, and also identifies gaps for future research and instructional innovations that are urgently needed to support Indigenous youth students.

*Keywords: Digital technologies, mental health, academic language skills, Indigenous youth.*

## 1. Introduction

The Indigenous population in Canada is much younger than the non-Indigenous one. According to the 2016 Census of Population (Statistics Canada, 2021), young people aged 15-24 made up 17% of the Indigenous population but just 12% of the non-Indigenous population.

Some progress has been made in improving Indigenous youth's academic achievement, for example 70% of Indigenous youth aged 20 to 24 had completed high school in 2016, compared to 57% in 2006 (Statistics Canada, 2021). However, due to the historical trauma and diverse political and socio-economic factors, "Indigenous students tend to have lower enrolment rates, higher dropout rates, higher absenteeism rates, higher repetition rates, lower literacy rates and poorer educational outcomes than their non-Indigenous counterparts" (the United Nations, 2017, p. 209).

These issues, including historical displacement from tribal lands, treaty abuse, residential school attendance, the destruction of families, and inequitable access to learning resources and opportunities for teachers' professional development, have contributed to Indigenous youth's persistent academic underachievement and mental health challenges (Brown, Dickerson & D'Amico, 2016; Elias, Mignone, Hall, Hong, Hart & Sareen, 2012). Results from large-scale standardized language and literacy tests have shown that the performance of about 25% of participating Year 9 Indigenous students in Australia fell significantly below the national minimum standard (NMS) in English reading compared to 5.2% of their non-Indigenous peers; and 43.8% of the participating Indigenous students' scores were below NMS in English writing compared to 13.9% of non-Indigenous students' (National Assessment Program–Literacy and Numeracy, 2019).

Indigenous youth are especially vulnerable to mental health problems (Carlson, Farrell, Frazer, & Borthwick, 2015; Elias et al., 2012; Kumar & Jepkemoi, 2019). Research on suicide and suicidal ideation has also found high rates of suicide, depression, substance abuse, and violence among Indigenous people globally (Black, Ranmuthugala, Kondalsamy-Chennakesavan, Toombs, Nicholson & Kisley, 2015; Kisely, Alichniewicz, Black, Siskind, Spurling & Toombs, 2017; Pan American Health Organization, 2016; Pollock, Naicker, Loro, Muley & Colman, 2018). These two issues are the most pressing and formidable challenges that tax Indigenous youth's wellbeing and jeopardize their future academic and professional opportunities.

Recent research has revealed that Indigenous communities, particularly Indigenous youth, have embraced digital technologies. They are avid users of computers, laptops, tablets, and smartphones. Indigenous youth were found to be frequently engaged with several social media platforms, such as Facebook, YouTube, Twitter, Snapchat, and Instagram (Castleton, 2018; Gritton, Rushing, Stephens, Dog, Kerr & Moreno, 2017; Loebach, Tilleczek, Chaisson & Sharp, 2019; Sam, Wisener, Schuitemaker & Jarvis-Selinger, 2018). Sabato's (2019) study showed that more than 90% of American Indian and Alaska Native (AI/AN) youth participants used computers and cellphones on a daily or weekly basis, which was similar to or exceeded such use by their non-Native counterparts in the United States. Sam et al.'s (2018) study also found that First Nations, Métis, and Inuit (FNMI) youth spent 2-8 hours online each day. This holds great potential to develop innovative mental health interventions and instructional strategies to support Indigenous youth, particularly those who reside in remote and rural areas, to overcome the persistent mental health challenges and the barriers in their language and literacy learning.

A growing body of literature has reported the relevant research in these areas. Thus, to examine Indigenous youth's perspective on the impact of using digital technology to address their mental health issues and to enhance the language and literacy skills required at school, a thorough literature review on empirical studies was conducted to respond to two research questions.

## 2. Research questions

1. What are Indigenous youth's perspectives on using digital technology to support their mental health?
2. What are Indigenous youth's perspectives on using digital technology to support their learning and practice of academic language and literacy?

## 3. Methods

*Table 1. Search terms used for databases.*

| Category | Search terms |
|---|---|
| Population of interest | (Indigenous) OR (Indigeneity) OR (Aboriginal) OR ("First Nations") OR (Métis) OR (Inuit) OR (FNMI) OR ("American Indian") OR ("Alaska Native") OR (AI/AN) OR ("Native American") OR ("Native Canadian") OR ("Torres Strait Islander") OR (Māori) OR ("Pacific people") AND (teen* OR adolescen* OR youth OR "young people") |
| Digital technology | (technology) OR (ICT) OR ("digital media") OR ("new media") OR ("digital literacy") OR ("digital storytelling") OR (filmmaking) OR (videomaking) OR ("digital learning") OR (eLearning) OR ("online learning") OR ("Internet learning") OR ("web-based learning") OR ("blended learning") OR ("mobile learning") OR (mLearning) OR ("mobile device") OR ("social media") OR ("social networking") OR (Facebook) OR (Instagram) OR (Snapchat) OR (Twitter) OR (YouTube) OR (blog) OR (texting) OR (Tumblr ) OR (gaming) |
| Subject (Mental health and literacy and language) | ("mental health") OR ("mental wellbeing") OR ("mental wellness") OR (stress*) OR (depression) OR (anxiety) OR ("substance abuse") OR ("drug abuse") OR (alcohol*) OR (trauma*) OR (suicid*) (language) OR (literacy) OR (multiliterac*) OR (reading skill*) OR (writing skill*) OR ("English learner*") OR (L2) OR (ESL) OR (TESOL) OR (TESL") OR (translanguag*) |
| Youth perception | (perception* OR perspective*) |

This systematic review was conducted, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Liberati et al., 2009). The searches were conducted for empirical studies published between 2020 and 2021. Using the terms listed in Table 1, relevant databases were searched. These included 1) Indigenous databases: Bibliography of Native North Americans via EBSCOhost, Informit Indigenous Collection, and Indigenous Studies Portal, 2) APA PsycInfo via ProQuest, Web of Science via Clarivate Analytics, and PubMed for mental health, 3) ERIC, and Education

Source via EBSCOhost, 4) Computers and Applied Sciences Complete, and Communication & Mass Media Complete via EBSCOhost, 5) Canadian Business & Current Affairs, and Canadian Reference Centre databases, 6) Scholar's Portal Journals and Academic Search Premier via EBSCOhost, and multidisciplinary scholarly search engines, such as Microsoft Academic, Semantic Scholar, and Google Scholar.

Through all the searches reported above, and after removing duplicate copies and manually screening each article for relevance, a total of 15 articles were eligible for this review. Finally, hand-searches of the reference lists of the 15 articles found three additional articles. At last, 18 articles were included in this review for Indigenous youth's perspectives on using digital technology to support their mental health (n = 9) and their language and literacy development (n = 6).

## 4. Data analysis

To analysis Indigenous youth's perspectives on using digital technology to support their mental health and language and literacy learning, grounded theory (Glaser, 2001) was applied for open coding (Braun & Clarke, 2019) of all results reported in the studies reviewed. As no study addressed both of the topics, relevant idea units were coded separately first, then were categorized, tallied, and consolidated into the themes that responded to the two research questions.

## 5. Results

### 5.1. Indigenous youth's perspectives: Digital storytelling for healing and e-mental health

Regarding using digital technology to address the mental health issue, Indigenous youth's perspectives were reported from three categories of the relevant studies reviewed: 1) five studies reporting on Indigenous youth's feedback on digital storytelling, and video- and film-making projects focusing wholly or partly on mental health issues (Linds, Sjollema, Victor, Eninew & Goulet, 2019; Loebach, Tilleczek, Chaisson & Sharp, 2019; Riecken, Scott & Tanaka, 2006; Stewart, Riecken, Scott, Tanaka & Riecken, 2008; Wexler, Gubrium, Griffin & DiFulvio, 2013); 2) three studies about Indigenous youth's report on their use of digital technologies for mental health purposes (Carlson et al., 2015; Gritton et al., 2017; Hefler, Kerrigan, Henryks, Freeman & Thomas, 2018), 3) a study regarding Indigenous youth's perspective on eMH tools (Fleming, Merry, Stasiak, Hopkins, Patolo, Ruru, et al., 2019).

Among the five Indigenous youth digital storytelling or film-making research projects, Wexler et al.'s (2013) study engaged Alaska Native youth in the production of digital stories, exploring protective factors of suicidality. The other four studies focused on the role of film production or digital storytelling on Indigenous youth's overall health and their personal and community wellness (Linds et al., 2019; Loebach et al., 2019; Riecken et al., 2006; Stewart et al., 2008). The results showed that digital storytelling and filmmaking activities were well-received by Indigenous youth and reported positive and meaningful experiences, such as a higher percentage of youth feeling "satisfied" with digital storytelling projects (Wexler et al., 2013).

Furthermore, many AI/AN youth participants believed that technology-based interventions and resources would be effective for supporting mental health (Gritton et al., 2017). Studies examining Indigenous youth's perspectives of critical social media posts, such as those expressing suicidal intent, found that Indigeneous youth would try to help others who posted worrying content such as suicidal intent; however, some of them felt they were not confident in their abilities to help (Carlson et al., 2015; Gritton et al., 2017). Certain complicated barriers could prevent them from intervening, such as their inability to "[decipher] the true meaning of concerning posts" and "frustration when attempts to intervene proved ineffective" (Gritton et al., 2017, p. 73). Regarding Indigenous youth's perspectives and experiences with eMH tools, research found Indigenous youth had varying preferences for digital tools and this should be taken into consideration for the development of future eMH (Fleming et al., 2019).

### 5.2. Indigenous youth's perspectives: Digital storytelling for multiliteracies and language and literacy instruction and practice using digital technology

Six studies examined Indigenous youth's perspectives on using digital technology to support their language and literacy learning and practices. Similar to the research on mental health, digital storytelling projects were well-received by Indigenous youth. They believed that digital storytelling and narratives effectively supported their learning of multiliteracies, i.e., language, literacy, and technology skills, Indigenous knowledge, and other skills required at school and work, and also contributed to their wellbeing and identity empowerment (Begoray & Brown, 2018; Pirbhai-Illich, Turner & Austin 2009). For example, students created digital historical poems and narratives to retell Indigenous Dreamtime stories, acknowledging the significance of transgenerational storytelling and that its tradition should be continued through digital mediums (Mills, Davis-Warra, Sewell & Anderson, 2016).

For Indigenous youth's self-initiated language and literacy practices using digital technological tools (Bussert-Webb & Díaz, 2013; Jacobs, 2019), participants reported that telephone and email communications with their families helped them maintain their first language, and translanguaging (the use of more than one language) was also commonly practiced through digital mediums (Bussert-Webb, & Díaz, 2013). Research also found that Indigenous youth used visuals to help their comprehension during communication (Bussert-Webb & Diaz, 2013).

Moverover, Indigenous youth participants overall responded positively to digital technology-based language and literacy instruction. They were more inclined toward technology-based curriculum activities than traditonal paper-based ones, and preferred searching for information on the Internet over textbook-based reading comprehension tasks (Pirbhai-Illich, 2009). They were also more interested in technology-based reading comprehension exercises for homework than paper-based ones to help them prepare for the state-mandated standardized test (Bussert-Webb and Diaz, 2013). Some mixed feedback was also reported by Indigenous undergraduate nursing students in an English writing class via Facebook. While they felt the course to be motivating, satisfying, collaborative, and helpful with their writing skill development, there were some concerns over whether the web-based environment could be as stimulating as face-to-face instruction for their learning and interaction with peers (Yu, 2018).

## 6. Conclusions

Mental health and academic English language development are two of the most intertwined and challenging issues faced by Indigenous youth. It is important to understand Indigenous youth's perspectives and their needs, so educators can be better prepared to address these barriers in both areas holistically with a culturally responsive approach. This article is the first to report on a systematic review of empirical evidence from extant research in the hope of providing insight for researchers and educators, so innovative interventions ranging from mental health to the development of language and literacy skills can be developed organically to provide effective support for Indigenous youth.

There are some limitations with this review and the articles it is based on. First, as all of the reviewed articles were published in English, this review was unable to capture more diverse Indigenous youth's perspectives. Work published in other languages will provide additional information for the design and implementation of digital technology-based interventions to engage Indigenous youth more broadly. Second, most of the studies reviewed had a short duration and all of them addressed the two issues separately, therefore longitudinal research is needed to examine the impact and effect of Indigenous students' engagement and progress with digital technology-based programs for improving both mental health and academic language skills. This would help students build a sense of belonging with the program team, through which they could feel that their efforts were being acknowledged, while fostering a positive cultural and academic identity against detrimental historical and socioeconomic factors. Most importantly, future interventions should strive to collaborate with Indigenous community members and provide adequate training to practitioners.

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# CREATIVE SPACES TO DEVELOP DIGITAL COMPETENCE: CHALLENGES IN A UNIVERSITY COURSE

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## Abstract

In the province of Quebec, Canada, the government has published a Digital Action Plan (MEES, 2018) aimed at integrating and leveraging digital technology for the success of all students and citizens. The Plan identifies creative labs as one of the global trends in education. Inspired by third places (Oldenburg, 1999 ; Tremblay et Krauss, 2019) and makerspaces (Hatch, 2014), creative spaces allow people to make, transform, and equip themselves, as well as participate, share, and learn. These actions support the democratizing effect of the maker movement (Hatch, 2014) as well as the development of people's agency (Blikstein, 2013).

In the wake of the Plan, the government released a Digital Competency Framework (MEES, 2019), a local way of interpreting 21st century skills. The Framework identifies dimensions deemed essential to learning and growing in the 21st century for students and faculty members (MEES, 2019). This competency has quickly found its place in the "Competency Referential for the Teaching Profession."

In order to train future teachers, a course was developed in the bachelor's degree in primary education in Quebec, allowing students to address dimensions of the competency that were previously absent from their training. Thus, the course "Creative Technologies and Networked Learning in Education" is in line with the Plan, which emphasizes that the educational system must ensure the development of the competencies essential to tomorrow's citizens.

The focus of the course is the purpose and possibilities of creative spaces. One of the issues that quickly became apparent was the challenge of fitting the creative space and its informal learning into the formal context of an educational program. In its reflective aspect, the course addressed pedagogical innovation. The presentation will relate how twenty students negotiated a collective definition of pedagogical innovation. On a practical level, networked learning was at the heart of the actions and projects. Particular attention was paid to the production of pedagogical objects or the improvement of educational processes. Creative spaces, their tools or ways of doing things, were at the heart of the course activity. Thus, activities such as visits of creative spaces and the exploration of virtual reality supported an ambitious collaborative production project with sixth-grade students. The paper will provide an opportunity to recount, in an autopraxeological way (St-Arnaud, 2003), the experience of the first iteration of a course on pedagogical innovation that focused on the integration of creative spaces.

*Keywords: Creative space, digital literacy, university, education, innovation.*

## 1. Introduction

Recently, in the province of Quebec, Canada, the government released a digital action plan (Plan d'action numérique) (MEES, 2018) aimed at effective integration and optimal exploitation of digital for the success of all people. The Plan identifies creative labs as one of the global trends in the integration of digital tools in educational systems and provides directions for integrating and valuing them in teaching and learning. The Plan is accompanied by financial measures deployed over several years, and creative spaces will be an increasingly important part of the province's educational landscape—as they are in other provinces in Canada, such as New Brunswick.

## 2. Concepts

### 2.1. Makerspaces

Creative spaces allow users to craft, transform and equip themselves, as well as participate, share and learn. These actions enhance the democratization effect of the maker movement (Hatch, 2014) and the development of the empowerment made possible in creative spaces (Blikstein, 2013; Davidson and Duponsel, 2021). A makerspace is a "collaborative work space inside a school, library or separate

public/private facility for making, learning, exploring and sharing that uses high tech to no tech tools" (makerspaces.com, s. d.). It is the maker's mindset of creating something out of nothing and exploring one's own interests that is at the heart of a makerspace.

For several years, creative spaces and digital fabrication have been envisioned as an unprecedented opportunity for educators to advance a progressive educational agenda in which project-based, interest-driven, student-centered learning are at the center stage of students' educational experiences (Blikstein & Krannich, 2013). These spaces were identified in the 2015 and 2016 Horizon Report as trends to watch in education (Educause, 2020). Creative space initiatives, often modest, are emerging in educational institutions, alongside larger scale makerspace in libraries, community centers, or museums. While bridges can be built between these two realities, they do not have the same goals. While educational settings must deal with a government-defined curriculum, creative spaces in public places are more supportive of informal and non-formal learning. When these environments come together or meet, tensions in their systems of activity can arise (Parent & Lord, 2022). In recent years, initiatives have been developed to adapt makerspaces to the formal education context, building on the strengths of this environment, notably with the Learning Lab initiative, a place and ecosystem for experimentation and innovation in new forms of collaborative work and learning. These innovative collaborative spaces simultaneously use digital tools, environments, equipment, learning materials and pedagogical methods that promote collective intelligence (Learning Lab Networks, n.d.).

## 2.2. Digital competence

The government has also published a Digital Competency Framework (MEES, 2019), a local way of interpreting so-called 21st century skills. Digital competence is a set of skills related to confident, critical and creative use of digital technology to achieve goals related to learning, work, leisure, inclusion in or participation in society. This competency encompasses the dimensions deemed essential for learning and growing in the 21st century for both the student population and faculty/professional staff (MEES, 2019). Competence quickly found its place in the "Référentiel de la compétence de la profession enseignante." It is identified as cross-cutting, since it is deployed across the various fields of intervention, as well as in teachers' activities and work situations. Since 2020, teachers have been invited to mobilize digital technology (MEES, 2020). However, the competency does not appear in the student training program.

Pre-service education has therefore adapted to integrate the new framework into teacher training. To prepare future preschool and elementary school teachers, a course has been developed in a bachelor's degree program offered in initial training in a Quebec university. The course allows students to address dimensions of competence that were previously absent from their training. Thus, the "Creative Technologies and Networked Learning in Education" course is in line with the Plan, which emphasizes that the education system must ensure the development of skills and the acquisition of knowledge essential to the training of today's students, as well as tomorrow's citizens, who will be free, creative, responsible, autonomous, critical thinkers, and capable of communicating and collaborating in a constantly changing world (MEES, 2018).

## 3. Objectives

The focus of the course is to use and learn to integrate innovative technologies into teaching and learning, and to build and mobilize a learning network. The focus of the course is the purpose and possibilities of creative spaces. In its reflective aspect, the course addressed pedagogical innovation. On a practical level, makerspace and networked learning was at the heart of the actions and projects.

From the beginning of the integration of the maker approach in classrooms, challenges have been identified: how to make sense of this learning, what to do if students do not want to create or share, what happens if it does not work? (Hira, Joslyn & Hynes, 2014) There is no single answer and the solutions must be adapted to the context in which the projects are carried out. This is the purpose of our initiative. In our context, one of the issues that quickly became apparent was the challenge of fitting the creative space and its informal learning into the formal context of an educational program. More specifically: how to integrate the creative space and its philosophy into a formal educational context?

## 4. Methods

We share the first iteration of a course on pedagogical innovation based on the integration of creative labs. The students (19 girls and 1 boy) took the course in the winter of 2022. The course was offered in the final semester of a four-year bachelor's degree leading to the Early Childhood Education and Elementary Teaching Certificate required to be legally qualified to teach in Quebec. For the first project (p1P), they were paired with students from a grade six class (11–12 years old) in downtown

Quebec City. Three university professors, a teacher, a project manager and guest educational consultants were involved in this project. The second project was done in class at the university.

The paper will provide an opportunity to relate, in an autopraxeological way (St-Arnaud, 2003), the experience of the first iteration of a course on pedagogical innovation that focused on the integration of creative spaces according to the experience of one of the university teachers involved in the project. In a self-referential approach, the sequence of events is described and interpreted and theoretical links are proposed. This allows researchers who take an autopraxeological approach to develop generic knowledge that can be activated in other contexts (Albert & Michaud, 2016). As a complement, the end-of-course evaluation questionnaire completes the look of the learning experience.

## 5. Findings

Activities such as visits to creative spaces, meetings with fabmanagers, and exploration of tools such as virtual reality were offered to students. Three main projects were conducted: reflection on the learning journey in a creative space, a collaborative project with students in a 6th grade class, and the development of a collective negotiated definition in a knowledge forum. We will focus on the last two projects. The next few paragraphs will describe the objectives and progress of the projects.

### 5.1. Project: Primary-university first peoples (p1P)

The First Peoples Project (p1P) is a project carried out with the university students of the course and the students of a 6th grade class. This project, part of a research project, aimed to develop knowledge of the uses of digital technology likely to foster educational success, based on the establishment of a partnership between the educational research and teaching practice communities. On the university side, the project aimed to support the development of the dimensions of digital competence of university students. On the primary school side, the pedagogical objective was to support students' learning in the social world, particularly in terms of their understanding and awareness of the realities of the first Aboriginal peoples.

First, the elementary students documented the reality of the First Peoples. Then, individually, each student chose a topic on which he or she did research. The university students were invited to suggest ways to highlight the results of the research by using digital technology. They prepared presentations on media such as augmented reality, different media to produce video, interactive presentations, podcasts and even making materials with a vinyl cutter. The sixth graders chose the digital medium through which they wanted to enhance their topic and were paired with university students.

On three occasions, the students went to meet the Grade 6 students. The students worked in close collaboration with the university students. A shared online document allowed the teams to learn about the project asynchronously. This collaborative phase supported each student's productions at a much higher level than if only the teacher was present in class. However, there were many challenges, both for the students and for the supporting teaching team.

Recall that in its reflective aspect, the course addressed pedagogical innovation with digital. No boundaries were set to mark the production. Even when the Grade 6 students had ideas for digital productions that involved materials we did not have, the team worked to get them. This was especially true for the podcast production that required to borrow a sound system. Students' ideas of how to enhance their project were discussed with the university students, who ensured that they supported student engagement and considered what was feasible. Thus, there were practical limitations in mobilizing makerspace tools: materials were not always available when they were needed. Sometimes we had to wait for the next meeting, especially with the machines—the use of the vinyl cutter, for example.

For some tools, the learning curve was quite significant. For example, the interactive map of the province's Aboriginal nations required QR codes, a content presentation tool, and several modalities combined for a project that met the grade six students' aspirations. To get to their end, the students had to search for answers, try, and sometimes get it wrong. Sometimes several members of the project team came together to come up with a solution, as it was the case for a challenge on the ethical use of sources in a project. This mobilization of several people, the mobilization of the expertise of adults and youth, was an innovative element mentioned by students in the end-of-term evaluation.

The project has also been a challenge for classroom management. The organization of work and the rules of a makerspace brought a messiness of its own. The multiplicity of subjects, productions, people and tools used in the project is similar to the makerspaces approach. Teams were scattered throughout the school, using the teachers' room to conduct interviews or cubicles to record narratives. However, the elementary teachers and university students were not used to this type of activity within the classroom, and in this case, the entire school. It would be fair to state that many of the people involved in the project stepped out of their comfort zones.

## 5.2. Project: Collectively negotiated definition

In the second project, the twenty students were invited to negotiate a collective definition. In class and in asynchronous mode, they worked with a digital tool that they were not familiar with, the Knowledge Forum (KF). Part of the computer-supported collaborative learning (CSCL), the KF is an electronic group workspace designed to support the process of knowledge building. The KF uses scaffolding to build collective discourse. In our case, the students were asked to propose a definition of pedagogical innovation. The principles of knowledge co-construction, presented and linked to the KF scaffolds, helped the students to write contributions, to use various scaffolds, to solicit sources of authority, and ultimately, to improve and transform the discursive practices of the community.

If what is created is not a tangible object, the initiative is in line with the maker philosophy: Creative spaces allow users to craft, transform and equip themselves, as well as participate, share and learn. Indeed, "Maker culture is a form of experiential learning with technology that promises engagement of learners via iterative, ill-defined problem solving and self-directed learning to satisfy 21st century needs" (Davidson & Price, 2017, p. 103). The KF is an online creative space that achieves the same goals. In keeping with the maker spirit, the activity supported the democratization effect as a true negotiation took place.

In this project, the professor almost completely stepped aside. She challenged them to create a negotiated collective definition, dropped off the KF user guide on the learning management system (LMS), and left them with a blank KF page. In the end-of-term course evaluation, many students mentioned that at the beginning, the objective was not clear to them. Others mentioned that they stepped out of their comfort zone. One student mentioned that this was the most chaotic work she had done in her academic career. She added that it was very rewarding, in the end, to confront her ideas with the tools (technological and cognitive) available. One student noted that "the work goes beyond simply composing a definition, the work has made us realize that collaboration among colleagues provides a pedagogical strength that will be useful throughout our careers." Several students mentioned that if they were to do it again, they would probably speak up more in group discussions. It was the fear of errors that held them back. While mistakes are welcomed in creative spaces, they seem to be less welcome in formal learning.

Although teacher involvement was minimal in this project, several challenges were observed. The tool that supported the co-construction of collective discourse offered technological and cognitive affordances that were entirely new to the students.

More than the tools, it is the mindset of creating something from scratch and exploring one's own interests that is at the heart of a makerspace (makerspaces.com, n.d.). However, creating something from scratch in a university course setting may have created discomfort for some students. Indeed, the professor perceived moments of hesitation, uncertainty and sometimes stress in some students invited to participate in this collective exercise. Two periods of synchronous work in class allowed the students to consult each other and organize the work. These periods were very beneficial in reminding the students of the criteria for the work and reassuring them.

## 6. Discussion

Recall that we are interested in how to integrate creative spaces and their philosophy into a formal educational context, in our case, a university course.

Inspired by the maker movement, which supports the development of empowerment made possible in creative spaces, the course wanted to offer the most authentic learning opportunities possible. University students are more accustomed to traditional courses, where they are taught theory before practice. As they begin their careers, they are still developing the reflexes that could be used for projects like the ones they were introduced to. While some technological tools were less familiar to them, the conceptual tools were also a challenge. The innovation they had to demonstrate in the first project and the scaffolding, conceptual tools of knowledge co-construction, in the second project are conceptual tools that had to be tamed to support their empowerment.

In addition, beginning teachers have a classroom management concern. When the university students and the project team visited the students' classrooms, some might have felt a certain loss of control. However, it can also be approached as a flexible just-in-time format that allows everyone to adapt their environment to the task.

Finally, in creative spaces, knowledge and skills, both individual and collective, serve the project or problem solving. The organization of classes is difficult to cope with the tinkering process of creative spaces, which requires time (not always counted in periods) and the ability to accommodate advances, setbacks and errors in the learning process. Students, future teachers, who are more comfortable in an environment that submits well to traditional lecture-based teaching may have lost their footing at some point in the course. By reassuring them on their competence to teach and make them learn, the professor insisted, however, on the various dimensions of the digital competence to be developed by the citizens of tomorrow and the value of socioconstructivism in a context of mobilization of the digital competency.

## 7. Conclusion

This was the first iteration of the course. The course evaluation indicated that the majority of students (94%) enjoyed the course. We have learned some lessons from this first year. First, despite our intention to allow as much freedom as possible, there is a good chance that if we were to do the first project again, more guidelines would be given to the students. In particular, the balance of effort and deliverables: some projects seemed modest while the effort to complete them was considerable, but the reverse was also true. Because the project was linked to a research project that is now complete, the project will not be repeated.

As for the negotiated collective definition project, it would be redone in much the same way. The students created a negotiated collective definition and deliver a reflection of which they were proud.

The course is evolving and the second iteration, offered in winter 2023, will feature even more creative spaces. This will be an opportunity to continue thinking about how to integrate creative spaces and their philosophy into a formal educational context, in our case, a university course.

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# DUAL EDUCATION IN SLOVAKIA AND ITS IMPACT ON THE EMPLOYMENT OF GRADUATES

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## Abstract

Dual education in Slovakia brings the first graduates into practice. The paper presents the first original results of dual education in Slovak conditions. This type of education in the conditions of Eastern and Central Europe is experiencing a renaissance, because during the time of the socialist establishment in the conditions of the Czechoslovak Socialist Republic, it was a common method of education in apprentice schools. The article summarizes the economic and other impacts on employers who cooperated in dual education. Paper focuses specifically on the job classification of graduates, the impact of completed education on the labour market, their application in practice and their standard of living. The article also includes proposals for changes in the principles and conditions of this type of education. The covid and post-covid era brought new conditions that have an impact on the rules of education in practice. The contribution maps the intensity of involvement in education in the individual regions of Slovakia and correlates the relationship with the level of living standards in the region. In the conclusion, the possible application of dual education to university conditions is outlined.

*Keywords: Dual education, Slovakia, employment, quality of life, quality of work.*

## 1. Introduction

Education in general has a very important social role. Society, especially a transforming society, creates its own education systems. These systems respect the tradition of the culture, the needs of the labour market and the market in general, the contexts of global changes. Transforming societies that have passed from the country's central management system at all levels and areas to market management methods are looking for their own personal systems in the confrontation with other countries in the global context. System changes are associated with the need to respond flexibly to market needs and future developments such as Industry 4.0. The transformation of education needs is based not only on a change in the management system of society, but also on an adequate response to current challenges such as the Covid crisis and its impact on society, the economic crisis associated with the conflict in Ukraine and inflation, which is a consequence of the development of the economy, expected impacts associated with changes in the area of remuneration employees and the development of energy prices, which radically affect the existence of companies, the market and business. A systemic change in the field of education and preparation of graduates for the needs of the labour market should respond to all these aspects and external circumstances of the global world. The article deals with one of the ways to respond adequately in a short period of time to the current needs and stimuli of the labour market system, which is dual education.

## 2. Design

The system of dual education as one of the forms of vocational education and preparation of pupils for the performance of a profession in the context of market needs.

In Slovakia, after the system change in 1989 and after independence in 1993, under the influence of an unsustainable education system that was unable to prepare graduates for changes in the labour market, school reform began to be enforced. One of the main reform ideas for the popularization of secondary apprenticeship education is to rename Secondary Vocational Schools into Vocational Schools. It was only

a "cosmetic change" that lacked real internal methodological changes. In a way, society demanded it, as the whole society perceived the big difference between learning at an "apprenticeship school" and learning at a vocational school. The dual education system is a response to the real needs of the labour market and the needs of educational change.

The goal of dual education is to connect practical training at a specific employer with professional theoretical education at secondary vocational schools. This system has been in effect since 2015. In our opinion, it could also be applied at universities and thus expand its application.

Dual education, as a work of the State Institute of Vocational Education, is financed by the Ministry of Education. The total authorized expenses of the project in the period 01/2016 – 09/2021 amounted to € 31 711 257,73€. (SIOV, 2022) This system is exceptional in that it assumes a partnership relationship between the student and the employer in the form of a signed learning contract. One of the main goals of this national project was to implement education across the board in all teaching and study fields, as far as possible. In addition is to deepen the relationship between the school, the business entity and the student. Also, adapt study fields to the needs of entrepreneurs, certify businesses and thus increase the professional readiness of employees, or save costs for recruiting employees.

Companies that want to join this training system need a certificate of competence, thanks to which the employer can provide practical training in the aforementioned training system. This competence is assessed by professional and professional organizations. However, the business entity must apply for this certificate in writing. Subsequently, the expert committee will evaluate whether the employer meets all the requirements associated with the legal conditions. It is mainly about spatial and personnel criteria, material and technical requirements for the desired study field. (Mazur, 2015) After meeting all the necessary criteria, the state or professional organization will issue a certificate in which the substantive scope is related to the field of study. The employer can then implement practical training. All necessary conditions established by law are determined by the Decree of the Ministry of Education, Science, Research and Sport SR 251/2018 Coll., Annex no. 9. (Slov-Lex, 2022) The Republican Union of Employers is responsible for all detailed information through industry experts who are available to provide information. Also, this organization brings possible improvements and modernization of the set educational system.

The certificate itself is only valid for a certain period and needs to be renewed. Especially if the employers has not started with practical training. The decree itself fulfils, among other things, an advisory activity. This educational system has the advantage that it provides sufficient flexibility and employers can set the rules as they need and demand through internal regulations and directives. Through these guidelines, the employer can correct and set the necessary rules for students. The system of dual education also allows for practical teaching through productive work at a place other than where the student has signed a dual contract with the employer. However, it is necessary to comply with the conditions in accordance with the applicable legislation. These are mainly cases when a student at the so-called in the advanced workplace, he can acquire skills that are directly related to his practical teaching and can acquire new skills as a result. The employer is responsible for the student in practical training. The dual contract can be terminated by both parties, with the proviso that the student must have a pre-agreed operation in which he will carry out practical teaching upon the required termination of the dual contract.

In such a complex area as the system of dual education, one must realize that the effectiveness of its setting has a significant impact on the overall potential of Slovakia's GDP. Statistics show that more than 75% of secondary vocational school graduates did not find employment in the field they graduated from, and more than 41,000 people retire from secondary vocational schools every year. In this context, according to estimates, more than 35,000 people will be missing annually, who should replace those with secondary education who are retiring (Slovak Business Agency, 2018).. According to the available data, the persistence of the inefficient system could have the maximum estimated impact on the GDP creation potential at the level between 1.1-1.6 billion EUR per year, which means cumulatively in the period 2016-2024 more than 12 billion EUR. Therefore, the effective setting of the education system will increase the probability of maintaining the competitiveness of the Slovak economy. In this context, it is therefore necessary to create prerequisites for a quality education system and for fulfilling the requirements of the labour market. In connection with the above, approximately only 25% of secondary school graduates are employed in the field they graduated from or at least a related field, which represents approximately only 4,000 graduates per year and the rest, have to retrain in order to apply in another field, or are included in the group of unemployed (Slovak Business Agency, 2018).

## 3. Objectives

The aim of the article is to find out what economic impact a dually educated graduate has on the company, based on the results obtained from a survey of dual education participants by employers (enterprises). What are the other (social) impacts (placement of graduates in job positions, on the labour

market) and what impact does their method of education have on their social inclusion and standard of living.

On the basis of this knowledge and a functionally set educational system, we want to propose the application of this or a similar system in education at universities. We are of the opinion that the dual education system has untapped potential and could be applied in this segment as well.

University students would thus be able to perform compulsory internships linked to part-time work in certified establishments, which would lead to an attractiveness of the labour market in the country.

The main goal is to check the interest of employers in the extended form of the dual education system at universities, as well as to evaluate the current situation on the market.

This educational system has been active since 2015, and therefore we are interested in the very results of the success of this form of education.

## 4. Methods

To obtain data for our research, we used a web questionnaire via a Google form and evaluated some answers using the statistical functions of the Excel program, where we looked for significant correlations at level 5. The questionnaire is composed of simple questions. Questions are closed and open. It consists of 11 questions. 150 employers were approached, we have a 35% success rate in the sample of respondents, that is, 48 respondents answered our questions. All the respondents come from the Prešov region. We chose the region because it has the 2nd highest number of employers involved in dual education in Slovakia (Helbrich, Ulbíková, 2018), this region is the poorest and most at risk of poverty of all regions in Slovakia (Slovak Statistic, 2022). The sample of respondents is thus from one region of Slovakia. The purpose of dual education is to ensure the growth of living standards and also to protect graduates from poverty and dependence on support in the field of unemployment (Slovak Business Agency, 2018)..

Other data are part of statistics and evaluations and are publicly accessible on websites.

As of September 15, 2021, there were a total of 423 secondary schools in the Slovak Republic with 6,244 classes, in which 132,133 students studied. The teaching process was provided by 11,252 teachers and 2,558 masters of vocational education. Of the total number of secondary schools, there are 323 state, 81 private and 19 church schools. At the same time, as of September 15, 2021, there were 234 gymnasiums and secondary sports schools in the SR, which were attended by 73,236 students, and 17 conservatories, where 3,197 students studied. So, in the 2021/2022 school year, secondary school students represented more than 63% of all high school students. (Helbrich, Ulbíková, 2018)

One of the goals was to verify in practice the fulfilment of the goals set by the national dual education program.

## 5. Discussion

We focused the first group of questions on the effectiveness of education (that is, whether graduates continue to work for the employer where they did their internship during dual education) and we investigated in which area of industry the graduates are most employed.

It turned out that only 37.5% of employers answered yes, that graduates continue to be employed by the same employer where they did their internship. Many as 62.5% of employers stated that graduates do not continue as employees after the internship. They state as the reason: leaving for the competition, continuing to study at university or other education, and the third and statistically evaluated as the most relevant reason is the poor economic situation in the region (purchasing power of the population, low regional wages, poor services for the population such as the availability of services, health care, quality of education and standard of living). We also asked employers whether they employ graduates from another company where they did their internship. The answer was that only 6.2%, that is only 3 out of 48 answers, are employed. In other words, going to the competition is not a relevant reason for not being employed in the region in the performance of one's profession.

Next, we investigated in which field of industry or business the most respondents work. The highest proportion of respondents is from the field of gastronomy and tourism. This industry makes up 20% of the respondents. The second highest representation is in the field of construction, geodesy and cartography. They make up more than 13%. Other, leading industries include public administration, electrical assembly construction work, the automotive engineering industry, and the food industry. These answers show us the need for the labour market and the areas in which dual education is most developed in the region of the Prešov self-governing region. This is due to the low level of industrial production due to poor transport conditions in the region, and it also has a geographical character, as tourism and areas living from tourism are largely developed here.

A very important research area is the ways of working communication and working relationships during the educational process. In this group of questions, we investigated the extended cooperation between students and their employers and the time when professional practice takes place. It turned out that part-time work, i.e. the continuation of work even outside the mandatory internship, is one of the important factors that subsequently affect the employment of graduates. Up to 42.1% of respondents use these forms of cooperation, and then half of part-time students continue to work in the company even after completing their education. Up to 47.7% of interviewed employers allow their students to do their internship in the afternoon or on weekends. We assume that this fact is connected with the possibility on the part of the employers to respond to the needs of the workload of the employees, and just as such flexibility is perceived by the students themselves as a great advantage. In this area of questions, the possibility of exercising a future contractual relationship with students was also investigated, with the fact that the employer used this option in only 21.1% of cases. 5.3% of respondents did not count on this option at all. The lack of interest was mainly on the part of students who wanted to continue their studies at university.

The third investigated issue is financial favouritism. The tax benefit, which is the main advantage and a directly targeted means of supporting dual education, the development of the region and the support of entrepreneurship, is received by the employer if he claims a total of 78.9% in the tax return for dual education per pupil. More than 5% of employer respondents did not know about this possibility.

Graduates job assignment, and their financial evaluation. We asked the respondents how dual education graduates are classified in their companies after the internship. 80% of the respondents stated that they hold leadership roles because they know the company and the job, and employers have already prepared them for the positions they needed to fill during their studies. It follows that, compared to other graduates; they have the advantage of a position in society and on the labour market, and thus also associated benefits such as higher earnings. Our respondents confirmed that such employees earn on average 10% more than other employees with a comparable length of experience.

The last group of questions focused on the potential use of the method of dual education at universities. When asked whether they would accept the possibility of including university students in the dual education system, 89.5% answered yes. Up to 94.7% of respondents would accept the possibility of linking part-time work of university students with the system of dual education and exemption from levies and tax benefits. Also, 94.7% of respondents would use the form of financing for university students as in the current system of dual education at secondary schools.

## 6. Conclusions

From the results of the investigation of the implementation of the principles of dual education in Slovakia in the very specific region of the Prešov region, where there is the greatest poverty and the most people at risk of poverty, there is a great interest in dual education. We also found out that there is an interest on the part of employers to create these partnerships with schools and provide spaces for practice for students and professional help from qualified employees in guiding students.

The question is the effectiveness of the education system in relation to the resources spent. Even the Supreme Audit Office in its study: Implementation of the system of dual education in Slovakia from August 2022 (NKU, Implementation of the system of dual education in Slovakia, 2022) notes inefficiency in the area of using the potential of dual education in Slovakia. The specifics of the region of the Prešov self-governing region, especially the high level of poverty, the threat of poverty and the low quality of life, mainly connected with the complicated form of distribution of services ensuring the quality of life, cause graduates of dual education to leave the region for work or to study at university.

We also see a lack of information about the conditions for the allocation of benefits for employers cooperating in dual education. Up to 5% did not know about benefits in the area of tax benefits, and only over 42% exercised the option of offering a part-time contract, or just over 20% exercised the option of signing a contract on a future contract with a student and future employment in the region.

The benefits were educated young people who were applicable on the labour market in their profession, compared to 2019 and 2020, up to 90% in the cohort (NKU, 2022), which reduces the costs of solving unemployment problems on the labour market. Furthermore, the study shows that the average salary of dual education graduates was 12% higher in 2019 and up to 17% higher in 2020 than that of employees without dual education on average in Slovakia. The share of workers in the department was up to 60%.

The lack of dual education in Slovakia shows the low flexibility of the education system in relation to the needs of the labour market. It turns out that the school system cannot respond flexibly and adequately to the needs of the labour market, so in non-additional professions such as sanitation, metallurgical production and the butchery industry, schools do not provide education, or only to a very small extent, where they cannot cover the needs of the market.

The research clearly demonstrated the unused potentials of the implementation of the potential and principle of dual education in the conditions of universities. This pressures the representatives of institutions preparing curricula and educational systems at universities to the need for a paradigm shift in the field of higher education.

We see that the potential of dual education on a global scale in the conditions of Slovakia is bearing its positive fruit. However, as a stabilizing element that would ensure an increase in the quality of life and mitigate the risks associated with poverty, it must be supported by the central policy of developing regions and reducing differences between them. It concerns decision-making processes in the area of investments in transport and the provision of general services such as healthcare and education.

In conclusion, I can state the high potential of the contribution of dual education for increasing the quality of life of graduates and the use of the potential for the contribution of graduates in all areas of the development of society. It is necessary to make systemic complex changes that would condition the multiplication of the use and potential of education and the areas in which education takes place. There is also a need to change the system, which would increase the flexibility of education for the needs of the labour market. A significant challenge is the implementation of the principles of dual education in the conditions of higher education, thus connecting it with practice, which creates prerequisites for creating innovations and increasing the effectiveness of education and industry. the education quality system at universities is connected with reflecting the needs of practice. (Závadský, Osvaldová, Janíčková, Závadská, 2022) These factors have a direct impact on raising the standard of living, creating GDP and the company's growth potential.

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# ENHANCING STEM EDUCATION IN INDIGENOUS SERVING SCHOOLS USING CULTURALLY RESPONSIVE PEDAGOGY

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## Abstract

The DINÉ project (Diné Institute for Navajo Nation Educators) was designed to engage teachers of Indigenous students in a rich, content-focused, long-term professional development program, honoring their cultural expertise to design culturally responsive STEM learning experiences. A different cohort of teachers worked with content expert university faculty over an 8-month period during each of the past four years to gain content mastery, develop grade/subject specific STEM instructional units, and learn to become effective pedagogues bringing in cultural relevance to the STEM subject matter. During the 8-month period (March – November), teachers had monthly group meetings with the university faculty and a 2-week intense summer residency at the university. By the end of the 8-month program, teachers would have created ONE instructional unit (1 – 3 weeks duration) on the STEM topic area in which they engaged with the university faculty member and relevant for use in their own classroom. The unit employed culturally relevant pedagogy learned during the program and was taught in their designated classroom before the end of the 8-month program period. The program culminates each year with a show-case and open house in December during which the teachers displayed and presented their units along with samples of work their students did within the unit.

This paper describes program impact on teachers' ability in STEM curriculum development (high quality instructional units), instructional practice, and incorporation of culturally responsive approaches to STEM education. The impact was investigated using the SCOOP Notebook protocol; an internally developed and validated questionnaire to assess elements of culturally responsive practices specific to the Indigenous context; and focus group interviews of faculty facilitators and teacher leaders in the program. Results indicate positive impact of the program on each area investigated (curriculum development, instructional practice, and culturally responsive pedagogy), indicating the effectiveness of the professional development program and the content-rich learning model it employs, which is based on the Yale National Institute© (YNI) model of K-12 in-service teacher professional development.

*Keywords: Indigenous education, STEM education, culturally responsive pedagogy, teacher professional development.*

## 1. Introduction

Whether it is science, math, or reading scores; high school graduation rates; access to advance coursework; enrollment in post-secondary schools; or post-baccalaureate degree attainment; there are multiple persistent educational gaps between Indigenous youth and their peers in the United States (Faircloth & Tippeconnic, 2010; Claren, 2017; Brayboy et al., 2012; Field, 2017). Factors contributing to these student outcomes include high mobility rates of teachers in schools serving Native youth, minimal access to curricular and professional development resources, and lower levels of advanced training than their teacher colleagues elsewhere. Indigenous youth deserve access to the best educational opportunities available. Although educational attainment is impacted by a complex set of factors, teacher quality is one of the most impactful school-based factors that influences student learning and attainment. Thus, improving teacher quality is an important strategy for increasing the educational attainment of those most adversely impacted by the persistent achievement gaps in our nation's schools. Furthermore, our nation's

K-12 teacher shortage is even more acute in our rural Indigenous communities. An important strategy for addressing these crises is to improve teacher quality and retention.

The DINÉ project (Diné Institute for Navajo Nation Educators) was designed to do just that by engaging teachers in a rich, content-focused, long-term professional development program that honored their cultural expertise and challenged them to improve their instruction in a culturally responsive manner. In working over an 8-month period with university faculty who are content experts, teachers in schools serving Native youth gained the opportunity to develop as instructional leaders and learn to become effective pedagogues. With a focus on STEM Education, our team investigated the impact of this professional development by way of the following research questions:  1) To what extent and in what ways does the DINÉ professional development program impact teachers' curriculum development abilities and instructional practices in Native-serving schools? 2) To what extent and in what ways does the DINÉ professional development program impact teachers' ability to incorporate culturally responsive approaches in STEM curriculum development and instructional practice?

## 2. Model & theory of change

The DINÉ project is modeled after the Yale National Institute© (YNI) for K-12 in-service teacher professional development, which was initially developed through a partnership between Yale University and the New Haven public school system. It has been used in that community for 40 years, and in several other urban communities across the nation for over a decade. The YNI approach has undergone external evaluation efforts, leading to the development of the *theory of change* presented in Figure 1. Importantly, data from various local YNI Teachers Institutes suggest that teacher retention is improved, and that teachers report higher efficacy in content knowledge mastery (Kisker, 2011, 2015). This theory of change provided the foundational starting point for our efforts in the DINÉ project. However, the YNI model's applicability to rural Indigenous contexts, its impact on teacher practice, and on incorporation of culturally responsive pedagogy has never been investigated. These are important components of professional development that the DINÉ project was designed to explore.

The DINÉ project embodies many elements of effective teacher professional development. It focuses on content knowledge, is long- term, engages active learning strategies, and is aligned to local and state standards (Archibald et al., 2011; Benilower, Heck, & Weiss, 2007; Kisker, 2015; Penuel, 2015; Penuel et al., 2009; Penuel et al., 2007). High teacher turnover is a barrier to maximizing the impacts of PD (Shear & Penuel, 2010), and teacher turnover is especially significant across Indian Country. But we also know that collaborative approaches are particularly suited for Indigenous contexts (Cronin & Ostergren, 2007; McCarty et al., 1997; Parker & White, 2015), and that culturally responsive curriculum produces more engagement and learning (Castagno & Brayboy, 2008). While the DINÉ project involves teachers of all grade levels and subject areas, this presentation will focus on project impact on instruction in STEM disciplines, which is the NSF funded part of this project.

## 3. Design / procedure

### 3.1. Methodological approach

Project impact on participating teachers with regard to the research questions, identified in the *Introduction* section above, was investigated using a mixed-methods approach employing a collective case study (or multiple case design) and informed by Critical Indigenous Research Methodologies (CIRM).  While quantitative and qualitative data were collected from individual teachers, the cohort of teachers in each of the three years of the project (2019, 2020, 2021) was considered a "case" and comparison of teacher data across yearly cohorts formed the collective case study/multiple case design (Creswell & Creswell, 2018; Creswell & Poth, 2017).  Given that this project and research occurs in Indigenous-serving schools, with teachers who mostly identify as Indigenous, the principles of CIRM were an important element in the research design. These principles include fore-fronting the inherent sovereignty and self-determination of tribal nations, honoring and building on relationships within and between researchers and community members, and pursuing research questions that will advance community needs and interests (Brayboy et al., 2012; Smith, 1999; Wilson 2008).

*Figure 1. Theory of Change for Teacher Institutes.*
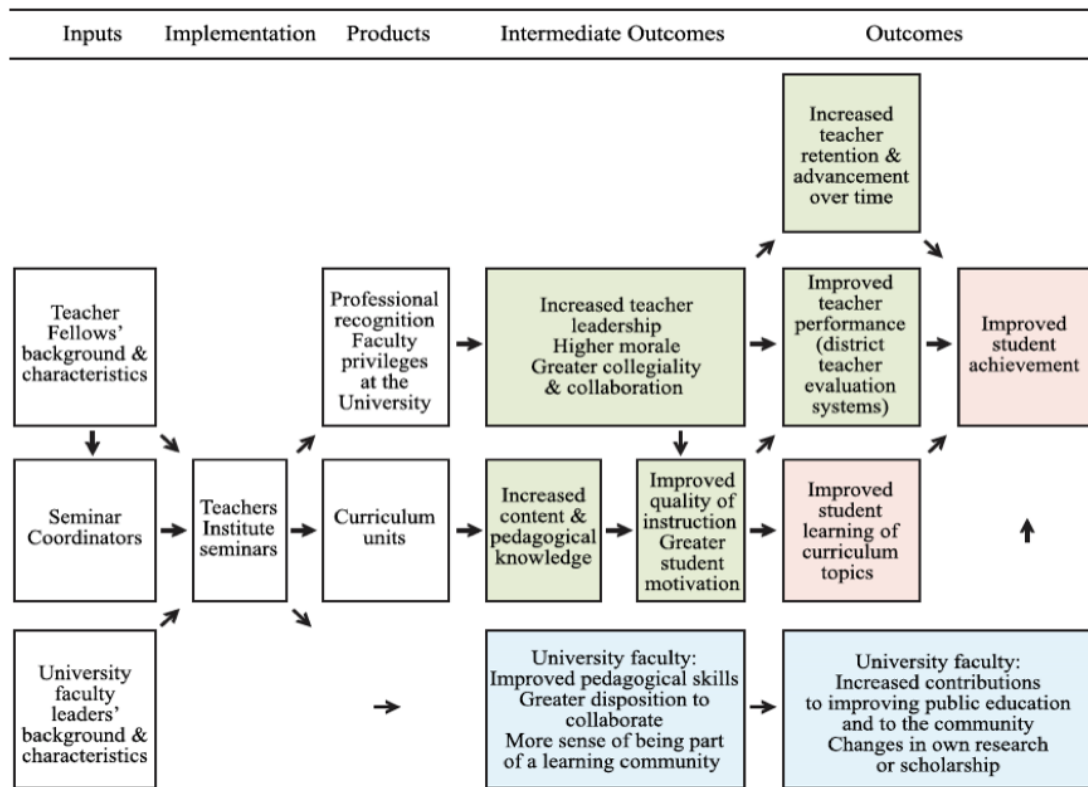


## 3.2. Instruments and analysis approach

For examining the impact on STEM instructional design and delivery, each instructional unit developed by participating teachers was analyzed using the SCOOP Notebook protocol (Martínez, et al., 2012). For examining teachers' ability to incorporate culturally responsive pedagogy, specific to the Indigenous context, in STEM instruction, the project developed and validated a new protocol titled *Culturally Responsive Assessment of Indigenous Schooling* (CRAIS Tool; Joseph *et al*, 2022, in review; Castagno *et al*, 2021). Each teacher's instructional unit was analyzed using this questionnaire to assess the extent of culturally responsive instruction. Both the SCOOP Notebook protocol and the CRAIS tool yielded quantitative data. Additionally, corroborating qualitative data were collected via individual interviews of faculty facilitating the professional development "courses" each year, and focus group interviews of the teacher leaders of these courses each year.

Each of the 11 domains (10 specific domains and one "overall" category) of the SCOOP Notebook Protocol are scored on a 5-point scale, with specific descriptors for each point on the scale provided by the developers of the SCOOP Notebook Protocol.

The CRAIS Tool contains 23 items classified into 5 thematic clusters. The scoring scale for each of these items is a 7-point scale (-3, -2, -1, 0, 1, 2, 3) plus a 'Not Applicable' option. There are descriptors for each point of the scale to guide the rater in determining the score for each item on the tool.

## 4. Analyses and findings

The two primary analysis instruments used in this study include the SCOOP Notebook Protocol and the CRAIS Tool. The primary source of data were the instructional units written by each individual teacher in the program each year, which they also taught during late Fall or early Spring in their classes. Corroborative data were also collected via interviews as described in the last section. Due to space limitation, only the analyses of written instructional units designed by the teachers, which were the primary source of data, are presented here.

Both the SCOOP and CRAIS instruments were used to analyze the instructional unit written by each teacher, each year. Each instructional unit was assigned randomly to three members of the project team for analyzing by the SCOOP and CRAIS instruments. Thus, each instructional unit received three scores on each domain of the SCOOP Notebook Protocol and each item of the CRAIS tool. These three scores were averaged into one score for each domain of the SCOOP Notebook Protocol and each item of

the CRAIS tool. These single scores on each instructional unit were further averaged to yield an overall composite score on the SCOOP Notebook protocol and another overall composite score on the CRAIS tool. Thus, for example, the instructional unit of a specific teacher may end up with a 2.5 composite SCOOP Notebook score and a 2.5 composite CRAIS score. Also, these composite scores of all teachers within a yearly cohort are averaged to get a year-specific composite score for the purpose of comparison between yearly cohorts to look for "trends" or progression of project impact on teachers' instructional quality.

Since a different set of "courses" are offered each year, several teachers have participated in the program each year and written a different instructional unit each year. Thus, another line of analysis being pursued is the comparison of their scores from one year to the next. This line of analysis provides information about how multi-year participation in the program impacts teachers' overall STEM instructional quality and their facility with incorporating culturally responsive pedagogy in STEM instruction.

Scores on individual SCOOP Notebook domains and individual CRAIS items are also averaged across all teachers within a yearly cohort. The resulting scores help identify which SCOOP Notebook domain/s and which CRAIS item/s received high scores and which ones received low scores. The project activities and mentoring from faculty facilitators and teacher leaders are then adjusted to try to improve on the low scoring areas for the next year.

Finally, the SCOOP Notebook scores and the CRAIS scores of each specific teacher are compared to find any relationship between a teacher's general STEM instructional quality and their ability to incorporate culturally responsive pedagogy in STEM instruction. The question being examined here is whether or not there is a positive correlation between general STEM instructional quality and the ability to incorporate culturally responsive pedagogy.

Given the relatively small number of teachers participating in each course, each year (<15), only descriptive statistics are used in order to find trends or progression, rather than inferential statistics to claim statistical significance of the results of these analyses. Some sample summary results are presented in Tables 1 and 2 below.

*Table 1. Composite CRAIS scores by years.*

| 2019 | | | 2020 | | | 2021 | | |
|---|---|---|---|---|---|---|---|---|
| All Teachers in the Program (n = 19) | Teachers in the Science Course (n = 13) | No Math Course offered | All Teachers in the Program (n = 22) | No Science Course offered | Teachers in the Math Course (n = 7) | All Teachers in the Program (n = 22) | Teachers in the Science Course (n = 10) | Teachers in the Math Course (n = 5) |
| 1.8169 | 1.8094 | | 1.8395 | | 1.5191 | 1.5064 | 1.4945 | 1.5004 |

*Table 2. Composite SCOOP Notebook scores by years.*

| 2019 | | 2020 | | 2021 | |
|---|---|---|---|---|---|
| Teachers in the Science Course (n = 13) | No Math Course offered | No Science Course offered | Teachers in the Math Course (n = 7) | Teachers in the Science Course (n = 10) | Teachers in the Math Course (n = 5) |
| 2.284 | | | 3.8586 | 3.610 | 3.855 |

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# AN APPROACH TO GAME-BASED LEARNING, COLLABORATION AND DESIGN CHALLENGES FOR TEACHING THE DESIGN OF MECHATRONIC SYSTEMS

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## Abstract

In this paper, the teaching of a methodical design approach for mechatronic systems is presented. The students are collaborating in teams and must design and build a real prototype for a robot that carries a fragile load and is entered into a final contest at the end of the course. Applied teaching principles include game-based learning with Moodle quizzes, design challenges to engage with the students and weekly theoretical lectures linked with practical sessions that include the use of mechanical construction kits, CAD design and rapid manufacturing using 3D printing. The project is time-boxed and organized according to the methodical framework of the guideline VDI 2221.

*Keywords: Game-based learning, collaboration, design challenges, constructive alignment, methodical design approach.*

## 1. Introduction

In today's world, developing new products is more complex than ever. Conflicting goals of product cost, quality and limited time as well as post-pandemic part shortages increase the difficulty. Due to the inherent complexity of mechatronic systems, students very rarely have enough time in one semester course to experience a complete design approach, starting from planning, designing up to the manufacturing of a prototype and its testing. But, for students to be successful in the industrial world, it is crucial to know how to use design frameworks in a time-efficient way and how to maneuver upcoming problems and conflicts. Therefore, teaching the design of mechatronic systems under real-world conditions is a necessity to improve important skills of students (Bender 2012).

This paper proposes a teaching approach which challenges the students with a given design task under the following boundary conditions: open solution space, limited time of 4 months, fixed cost budget of 150€ per team, inherent complexity of the product, sudden part shortages, a realistic collaboration setup and the usage of rapid manufacturing as production means.

## 2. Design project and teaching approach

The goal of the chosen mechatronic project is to develop a remote-controlled robot, which operates on flat surfaces with inclines of up to 3° and carries a fragile load. It should be able to interact with other robots and manipulate their fragile load while protecting its own load, i.e. it can support up to one offensive / defensive function. The students collaborate in teams with up to 6 members and are graded based on their team effort at defined milestones. The final goal is to manufacture and assemble a working prototype which is tested by entering a 1vs1 contest against other robots. The specified requirements are maximum build space of 250x250x200mm, a design budget of 150€, the usage of predefined electric actuators and electric batteries with a fixed capacity (due to safety), a maximum weight of 2 kg for the complete robot, no metal parts in the offensive/defensive functions, no possible harm in human interactions and no usage of projectiles. Apart from that, the solution space is completely open and can be explored by the students.

From a teaching perspective, a methodical design approach inspired by the guideline VDI 2221 with preset milestones is combined with game-based learning and biweekly design challenges. Weekly lectures, which cover the theoretical input for each phase, are accompanied with weekly practical sessions, in which the teams apply the new knowledge on a concrete design challenge for their robot. Every two weeks, the teams must turn their results in for examination. Following a game-based learning

approach, each lecture is also accompanied by a multiple-choice test, which can be taken at any time at any place and quizzes the students about their level of understanding. These quizzes are automatically graded and award a new badge in Moodle to the students, showing their accomplishment. This adds motivation and allows to check the progression and get feedback on "blind" spots (Gibbs 2010).

Since the robotic design project itself is quite challenging and time-consuming as well as imposing high requirements with regards to self-organization, communication and collaboration, motivation is a key factor for the success of the student teams. Therefore, different levels of motivation are implemented, the most obvious ones being a design price for the most innovative robot and a price for winning the final robot contest. Both prices are endowed and officially handed over to the winning teams by a local Foundation for the Westphalian University, reinstating the importance for the students.

Apart from this, it is highly recommended that the course design itself meets the Constructive Alignment of Biggs (see figure 1). This will result in high overall motivation and a clearer understanding of each activity (Biggs 2003). The paradigm of the Constructive Alignment states that the learning outcomes should be aligned to the teaching activities and the assessment, i.e. exams.

*Figure 1. Constructive Alignment for the selected teaching approach (accord. to Biggs 1999).*
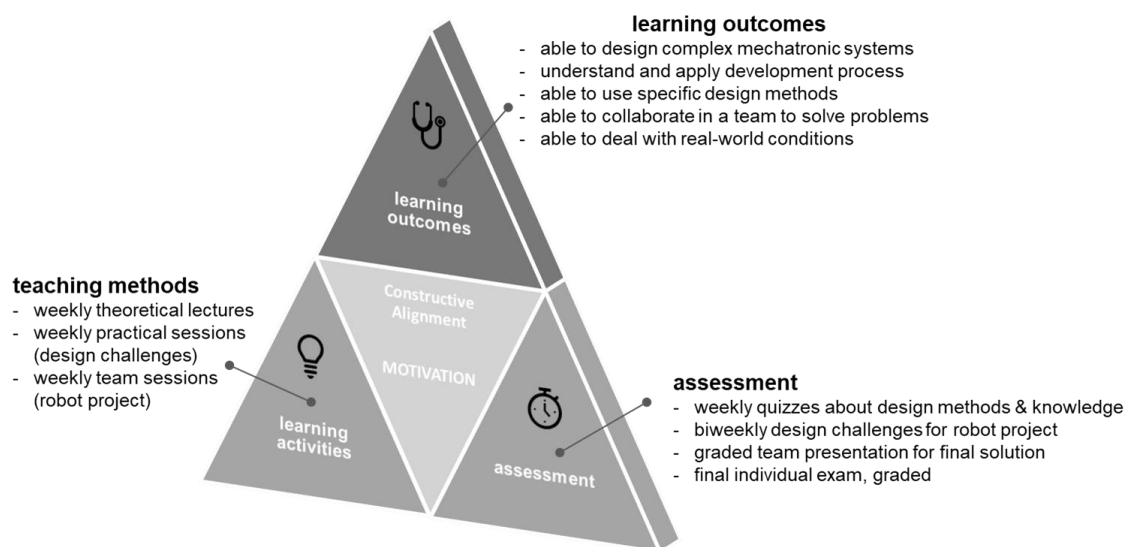


In this presented teaching approach, each teaching method (e.g. theoretical lecture or practical session) is directly linked to a corresponding learning outcome (skill needed for the completion of the design challenge). The learning outcomes are individually tested by Moodle quizzes as well as team-wise by the turned-in design challenges. This is coupled with almost direct feedback on the quizzes and tasks, so that students can improve on potential weaknesses. Furthermore, the final written exam of the course builds on the exact same learning outcomes that the students achieved during the robot design project, increasing the motivation to finish this project in time.

## 3. Overview of the methodical development process

In order to organize the overall development process and reproduce industrial standards, the German VDI guideline 2221 (VDI 1993) is applied (see figure 2). It provides 4 basic phases, which the students must pass during the design project: specification (1), conceptualization (2), draft (3), design/testing (4). In the first phase, the given task of developing a remote-controlled robot is examined and further requirements are specified. This results in detailed specifications and a first functional description for the robot. The second phase of conceptualization entails a thorough search for physical solutions, i.e. active principles, to solve the abstract functions of the product (Lindemann, 2009). The solution space is enlarged during this phase in order to find a large number of possible solutions. Since the final design of the product is still undetermined, it makes sense to generate a high number of potential solutions, in case one of the selected principles fails (Pahl et. al., 2007). All identified principles are gathered in a Morphological Box, which lists the product functions together with the possible solutions. The third phase starts with selecting principles from the Morphological Box and joining them into three different concepts for each team, which are then evaluated by constructing them with a mechanical LEGO set. The best concept then gets selected for further detailing.

*Figure 2. Methodical design approach and phases of the student project (inspired by Jansen, 2007).*
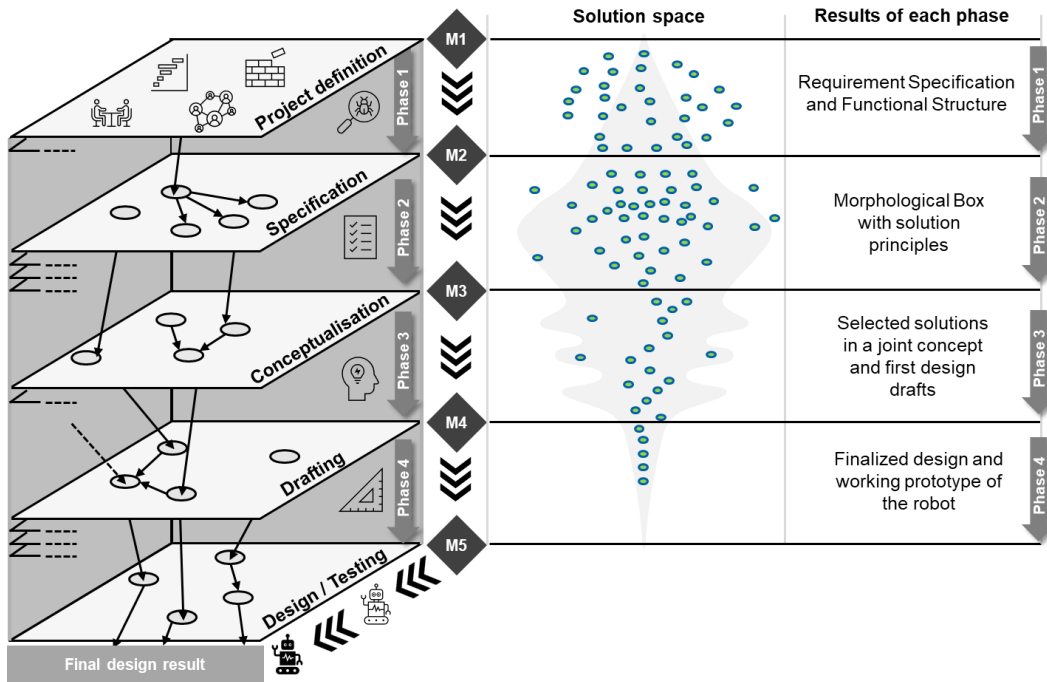


The project concludes with the fourth phase by realizing each selected concept as a real prototype. The students use CAD software to design the robot with its components and rapid manufacturing in form of 3D printing to realize the prototype. At the end of the course, each robot enters the final contest as a form of a design evaluation. Each phase is time boxed and provides a milestone (M1-M5), at which the students must turn in their results for grading.

### 3.1. Learning activities during planning (1) and conceptualisation (2)

The main target of the first phase is to generate a complete set of specifications for the design of the robot. To mimic the real-world experience, the students had to interview a customer (role-played by a university employee). Customer requirements included the description of the fragile load, timeframe, max cost, weight, build space, inspection intervals, available assembly tools and time as well as typical terrain. These requirements had to be specified with quantitative values to allow for testing in phase 4.

In order to finish the first phase, the students also had to find technical functions which realized the identified requirements, e.g. supply energy, carry load, defend load, move robot forward, steer robot, attack robot. This step helped to focus on the functions without jumping directly to solution ideas. All functions can be interconnected by different flows (i.e. material, energy, signal), thus representing an early design architecture of the robot.

Starting with the second phase, the students needed to find physical means of realization for each of the included technical functions. Different forms of support were given to the students to use, e.g. a physical effect catalogue, mechanical design catalogues for common functions or analogy searches in the field of biology. Figure 3 represents the Morphological Box of one student team, which includes three functions: move robot, defend load and attack robot. For each function, six solution ideas had to be found, with at least one solution based on a biological analogy. Before continuing, three concepts had to be marked and realized as a small prototypes to evaluate their feasibility (see figure 3). The feasibility study was approached from two directions.

Firstly, each team had to build their concepts with LEGO construction kits that included remote controlled motors during in a 90 minutes design challenge. This massively helped the students to manifest the abstract idea of the concepts and to form a viable opinion about the prospects for each concept. Necessary design work was divided by the team members.

Secondly, each concept was systematically assessed via fixed criteria including speed, grip, stability, reliability, force, frequency, range and protection effectiveness. At the end of this phase, one concept had to be chosen within each team. The methodical assessment helped to limit friction within the teams and provided a common for the next phase.

At the end of each phase, the students had to turn in their results, which were graded teamwise: specifications and functional architecture (M2), Morphological Box, LEGO concepts, final concept (M3).

*Figure 3. Morphological Box for physical solutions and realised LEGO concepts (phase 2).*



**Morphological Box** → **3x LEGO concepts**
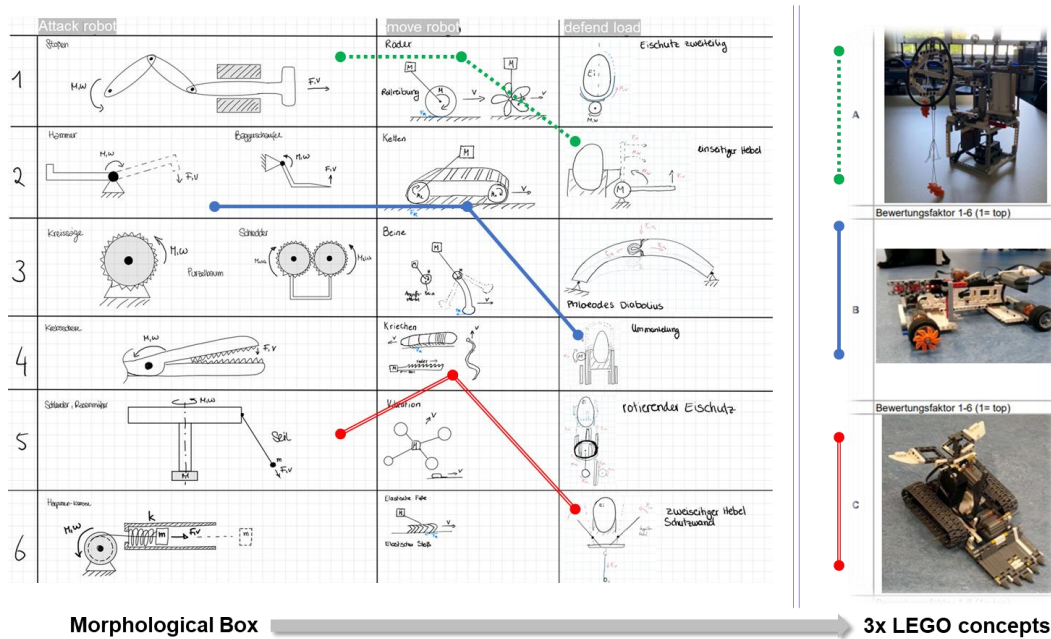
## 3.2. Learning activities during design, implementation (3) and testing (4)

The highest ranked concept then had to be designed using CAD software and should be realized as a 3D printed prototype using FDM (fused deposition modelling with PLA). The chassis of the robot had to be built out of the construction kit, while the remote-controlled motors could be used for moving, defending and attacking. The defend/attack functions had to be fully designed in a sub-assembly without the use of metal parts and should only entail self-designed printed parts. For each sub-assembly, technical drawings were expected and graded at M4.

The prototypes had to be fully functional and tested against their specifications before they were allowed to enter the final contest (see figure 4). This was implemented by having each team uploading a video of the working prototype at M5, showing every function of the robot. Students could come up with creative solutions as on how to present their results, resulting in impressive "cinematic" videos including overlays, background music and professional voice overs using veed.io, which shows their motivation.

Finally, after passing a mandatory safety test, each robot was successfully entered into the 1on1 contest, where the goal was to protect the own fragile load while attacking the other robot in fixed arena of 3m x 3m. The tournament ended with a clear winner and the design price as well as the tournament price was handed over to the different student teams.

*Figure 4. CAD designs and final 3D printed prototypes (phase 3 and 4).*



**CAD Design** → **Drawings** → **Manufacturing**

## 4. Critical review of the teaching approach and outlook

The overall goal of teaching mechatronic system design under real-world conditions was achieved during this course, judging by the quality of the final outcomes of the teams in terms of functional robots and the successful competitive contest at the end. Each robot was able to perform all predefined actions as specified and all teams completed the design project on time and within their budget. They overcame numerous challenges that also exist in industrial projects, i.e. non-working components, electrical problems, part shortages, mechanical fractures during testing or failed 3D prints.

According to Jara & Mellar 2010, student feedback is one the most important parameters for course improvement. Therefore, this course was thoroughly evaluated by the students via anonymous forms. Regarding this feedback, the robotic project was very positively mentioned due to the possibility of applying theoretical knowledge directly to a practical project. Further positive remarks include the chance for teamwork, the quizzes with badges and a high motivation due to the real-world design process. The final competitive 1vs1 contest also added motivation. Some students also mentioned that the milestones with predefined deadlines helped them to stay engaged and not to lose focus.

Critical remarks by the students included the very high effort for the team project with regards to the composition of the final grade (1/3 project + 2/3 written exam). As a solution, it was proposed that the project presentation or the contest could replace the final exam. In addition, more time was requested for the final CAD design of the prototypes, especially compared to first the phases of the project (time-distribution was roughly equal for phases 1-2 and 3-4). Another remark was the high overall workload for the students due to other projects in their current semester. This is a point that clearly needs to be addressed and checked when planning such a practical project.

Overall, it can be summarized that the game-based teaching approach was very successful. During the students' collaboration, not one team had problems with the team dynamics, which might be attributed in part to the clear setup with milestones and quick feedback rounds. The online quizzes help the students to test their theoretical knowledge. The continuous grading of the results each team turned in at the various milestones ensured constant feedback on their performance.

Most notably, the added value of the practical design project was immense. This was highly reflected in the motivation of the students to work far more in order to become the winning team in the final contest, showing their competitive nature and again highlighting the importance of the Constructive Alignment (Biggs 2014). In the next instance of this course, the students' feedback will be incorporated. The composition of the grades will be adjusted to 50/50 and the draft and design phase will receive a large timeframe, while the graded online quizzes and the design challenges will be continued. Furthermore, it is planned to conduct empirical research in form of a descriptive study (Blessing et. al. 2009) regarding the effectiveness of this teaching approach.

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# DIALOGUING ON FRIENDSHIP AS POLITICAL VIRTUE: AN EXPERIENCE OF CITIZENSHIP EDUCATION FOR PRIMARY SCHOOL CHILDREN

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## Abstract

Citizenship education is an urgency: contemporary sociologists and philosophers describe our society as characterized by indifference, lack of empathy, disengagement in the "common good", violence and unresponsiveness for social rules. Citizenship is a concept referring to the relational and political dimension of human being that, in Western philosophy, is presented as a "political being", for whom existing is co-existing, whose "singular-plural" life is strictly connected to the life of the community. The sense of citizenship emerges from the awareness of reciprocal dependency. According to Aristotle (*Nicomachean Ethics*) every being tends to the good; for the human being this good is contemporary personal and political: and that is *eudaimonia*, the good quality of personal-communitarian life. *Eudaimonia* can be reached through the practice of care: for the self, for the other, for the common space. And care is a practice informed by virtues: specifically, care of the common space is characterized by friendship, that is considered by Aristotle as the political virtue par excellence. In conclusion, to live the experience of an engaged citizenship consists in experiencing care and political virtues, above all friendship. Friendship is one of the objects of the second edition of the MelArete project, a program of ethical education designed by CRED (Center of Educational and Didactic Research) of the University of Verona (Italy) to engage kindergarten, primary and middle school children in reflecting on those virtues which are central for the development of citizenship. In this contribution, we will present some texts written by the pupils and the Socratic conversations about friendship, developed during the implementation of the program, in which the children were invited to define this concept. These conversations were recorded, verbatim transcribed and qualitatively analyzed following a methodological crossbreeding between the Phenomenological-eidetic method and the Grounded Theory. Also the written texts were analyzed following the same method. Findings bring to light what friendship is according to the participants and how they experience it. The results are finally discussed in light of the importance of such proposal in promoting citizenship education.

*Keywords: Ethical education, citizenship, friendship, phenomenological research, primary school.*

## 1. Contrasting civic disengagement: An educative challenge

The scientific literature shows that one of the main challenges of the XXIst Century education is the phenomenon called *civic disengagement* (Putnam, 2000; Norris, 2001; Torney-Purta & Amadeo, 2013; Albacete, 2014; Kisby & Sloam, 2014; Pontes et al., 2019). Some sociologists and philosophers refer that this attitude is expressed in the form of indifference among the others, absence of empathy, non-disposability in involvement in prosocial actions such as voluntarism, up to real anti-social and violent behaviors (Bauman, 2000; Pulcini, 2009; De Monticelli, 2011; Boella, 2018). Some authors retrieve the origin of this crisis in the decline of the civic virtues in our contemporary society, and solicit the necessity and urgency to redefine them (Hirzalla & Zoonen, 2009; Scheufele & Shah, 2000).

Also teachers and educators who daily meet children in educational contexts, highlight the urgency of facing the challenge through promoting civic engagement (Mortari, 2019).

In international documents engaged citizenship is considered as one of the most important activities for the passage from childhood to adulthood (The World Bank, 2007; Brady et al., 2012).

The concept of civic engagement is not simply definable and this weakens its performative potentiality in educational and political actions (Berger, 2009). Lister (2007) recognizes as a characteristic of civic engagement an action where the youngsters are social stakeholders, able to contribute to society as active citizens. Camino and Zeldin (2002) define it as being able to influence choices in collective

action (p. 214). Zaff et al. (2010) underline that civic engagement includes the exercise of rights and responsibilities, feeling a sense of care for the common destiny of a society or a nation.

In the guidelines proposed by international agencies, the promotion of civic engagement within formal or informal educational contexts is clearly underlined. In the Agenda 2030 the promotion of a good quality education is considered both personal and social (UN, 2015, p. 14). The European Union proposes as a prior educative aim the active and collaborative participation of the youngsters in the community life (European Union, 2016; Gulubeva, 2018).

## 2. Educative research to promote citizenship education: The MelArete project

The answer to the phenomenon of civic disengagement is the educative action (Lee et al., 2021). But educative work is always a risk and almost a sort of bet, since there is no possibility to be sure that its aim will be reached. That is why it is necessary to carry out a continuous reflection on the educative practice in the scientific form of research, i.e. the radical interrogation on an educative project, from its theoretical foundation to the value of its implementation in the participants' learning. In fact, pedagogy is a practical wisdom that can be carried out in a dialogue between the theoretical research and the empirical inquiry (Mortari, 2009; see Dewey, 1916; 1938). According to Mortari (2019) an empirical research in education can have two different purposes: an explorative one, aimed at understanding what happens in a specific phenomenal area, and an operative one, aimed at putting an educative hypothesis to the test of facts. In a radical adherence to a pragmatist approach (Dewey; Rorty), it is possible and appropriate to design a research which does not only aim to offer to the practitioners some operational suggestions, but is an educative process in itself, offering to participants (students) learning opportunities while participating. This last conception is called "*educative* research" or "research *for* children" (Mortari, 2019): a research that collects data while carrying out an educative project. The planning of an educative research consists in three phases: (a) to elaborate a theoretical proposal able to give a solid framework to educative activities; (b) to design a project in which every activity is planned in order to have both an educative and a heuristic aim; (c) to analyze the collected data in order to understand the learning outcomes in participants' experience and validate the quality of the educative proposal itself.

According to this conception of educative research, we designed a project called "MelArete – At school of friendship and gratitude" aimed at promoting citizenship education in children attending kindergarten, primary and middle school. The name of the project is composed by two different words of the Ancient Greek language: *melete*, that means care, and *arete*, that means virtue. The project represents the second edition of the MelArete project (Mortari, 2019; Mortari & Ubbiali, 2017; Mortari, Ubbiali & Valbusa, 2017): after inviting children in reflecting on the ethical concepts of good and care, the first edition focused on the virtues of courage, generosity, respect, and justice, while the second edition focuses on the virtues of friendship and gratitude.

From a theoretical point of view, in fact, it is possible to refer to the civic engagement as a disposition enlivened by virtues, in particular by friendship. In the classical tradition, in particular in Plato (*Politics*), Aristotle (*Nicomachean Ethics*) and Cicero (*Laelius*), the civic virtue par excellence is friendship. In fact, it is friendship that preserves the free choice of living together among citizens, that free choice of living together and building a free city (the *polis*). This tension, that gives to friendship an ethical direction, makes it the caring relationship that looks for the common good. As every practice of care, also friendship is enlivened by virtues: gratuitousness, helpfulness, attention, delicacy, faithfulness, but also courage and frankness (Mortari, 2022). The theoretical research has laid the foundation for the design of an educative path where children were involved in Socratic conversations (Reich, 2013), discussions around ethical dilemmas, invention of stories and reflecting writing on their lived experience of friendship and its virtues. Every activity was designed with an educative and a heuristic aim, so that we were able to stimulate children's thinking on friendship and contemporaneously collect data.

Among the big quantity of collected data, we chose as object of this paper the Socratic conversations and some written texts, both on the theme of friendship, developed within the implementation of the program with primary school children.

## 3. Implementation of the educative path, data collection and analysis process

The activities considered here are related to the implementation of the Melarete project during the 2021-2022 scholastic year in three fourth grade classes (number of puplis= 72) of a primary school located in northern Italy. The project program envisaged a total of 6 meetings in which a trained researcher met each class; the activities here of interest were carried out in the second meeting, structured as follows: the researcher presented the story "The jaguars at the school of the forest" which recounts friendship experiences between small jaguars; at the end of the reading the children were involved in a

conversation, starting with some questions such as "Did you like the story? Why? What do you think happens in this story?". After leaving the room for a while in order to allow the free thoughts of the children, the researcher focused their attention on the theme of friendship by starting from the ideas that emerged from the children themselves and proposed them to give their own definition in writing. After writing, the researcher invited the children to share their definitions by reading them aloud. Starting from the definitions of the children, the whole class was then involved in a Socratic conversation on friendship.

The written texts were first of all anonymized, and then analyzed following a methodological crossbreeding between the Phenomenological-eidetic method and the Grounded Theory (Mortari, 2007; Mortari & Silva, 2018); Socratic conversations were recorded, verbatim transcribed and qualitatively analyzed following the same method, that includes: repeated reading of the data, identification of significant units, labeling and categorization according to a recursive process until the construction of a comprehensive coding system is reached. In particular, the analysis process takes place according to the following steps: each identified significant unit is translated into a descriptive label; the descriptive labels are then grouped into conceptual labels based on the principle of analogy, and a work of recursive analysis continues with further groupings and abstractions, still by analogy, until reaching at first the categories and finally the macro-categories. At the end of the process we arrive at the coding system which states a descriptive theory of the investigated phenomenon, that in this specific case is which definitions of friendship emerge from the children involved in the proposed activities of writing and Socratic conversations.

Since the development of both the coding systems is still in progress, here we present the results emerging from the data analysis carried out so far.

## 4. Results and discussion

A total of 69 written definitions were collected. The qualitative process of data analysis achieved so far led to the development of the following four macro-categories: "Qualities of friendship", "Help", "Goodness" and "Conditions of friendship". The categories related to "Qualities of friendship" were: respect, connection, feelings, kindness, trust/confidence and sharing. The categories related to "Help" were: to help those in difficulty, care, support/closeness. The categories related to "Goodness" were: to love, to feel good, to do the good. The categories related to "Conditions of friendship" were: do not exclude, do not treat badly. It is interesting to note that within the macro-category relating to the qualities of friendship, children have focused on fundamental values for citizenship education such as sharing, trust, and the virtue of respect. A wide space has been given to the meaning of friendship as help and support, sometimes assuming nuances that expand the concept of help as not only provided to a close friend but "to all", "to those in need", "to those in difficulty" (i.e. "Friendship means helping everyone!"; "For me friendship is: [...] helping people in difficulty."; "For me friendship means that you always have to help people when they need and also be friends."). In some cases, the virtues of care and gratuity have also been highlighted, as in the following definitions: "Friendship means [...] helping others and without expecting anything in return."; "In my opinion, friendship is the care of a person [...].". Even within the macro-categories of "Goodness" and "Conditions of friendship", some definitions have emerged that go beyond friendship understood as a close relationship but extending it to the others in general, as in the following examples: "Doing good to a friend of yours and to a child you don't know."; "Wait for others"; "Don't exclude anyone".

The themes that emerged from the Socratic conversations in the three classes were numerous and varied. The engaged children initially mainly addressed the researcher and gradually involved themselves more and more in a comparison among them: a fruitful dialogue was developed which promoted listening skills, respect for the point of view of others, collaborative skills and critical and reflective skills. By now the analysis of the conversations is leading to the creation of a rather complex coding (still in progress) for the numerous nuances of meaning on the theme of friendship that emerged in the children's thoughts.

The macro-categories emerged so far are "Qualities of friendship" and "Conditions of friendship", as the first two macro-categories related to the written texts; other macro-categories are under development. In reference to the qualities of friendship, some categories overlap with those relating to the written texts (in particular "respect", "feelings", "confiding") while "the power of friendship" and "the different degrees of friendship" emerge as new categories. With reference to the macro-category "Conditions of friendship" the categories are still under development.

The categorization process is currently continuing and allows us to make the following considerations: the results related to the conversations deepened those deriving from the analysis of written definitions, in particular with respect to the virtues that inform friendship such as respect and mutual help. Children's thinking has been enriched through the development of aspects such as the different degrees of friendship (from closer to less close ties), openness (openness to different ideas,

friendship towards everyone), understanding the reasons of the other, and the difficulties of friendship (i.e. managing jealousy, conflicts, the fear of being teased if you are friends between males and females).

The exchange among children was particularly intense regarding the possibility or not of being friends with everyone: the children in fact confronted each other expressing different opinions. Some of them affirmed that, in order to be friends, it is necessary to have a thorough knowledge and common interests while others showed openness towards helping a companion even if he/she is not really "friend friend", or to play together and ask how he/she is even if they are not really friends. Below are some examples: "If a child is left alone even if he is not my friend, maybe I can always help him because he is always my classmate."; "Actually it's not that I've really become friends with him, but when we meet at the oratory maybe we can play. In fact, last time we played door to door. Sometimes… I tell him: «What's up? How are you?».”; “[...] You have to commit to playing together, to play, and then they become friends.".

A particularly relevant aspect concerned the theme of bullying: some children reflected on the possibility of being friends with a bully, or at least with a child who does not behave well. Here too the opinions were conflicting, but it was interesting to observe how, thanks to the reciprocal exchange, some children began to engage in understanding the reasons behind such behaviors, showing a form of empathy. For example, someone assumed that these behaviors are due to the will of proving something (i.e."In my opinion, since B. sometimes steals the ball from us, it's because, in my opinion, he wants to show the other boys that he's strong and he's good. [...] In fact I understood it a bit and so when we meet at the oratory we play together."), or to the fact of having experienced suffering (i.e. "Why do bullies have, have this behavior, because some have suffered. And so if you're pure in heart and you ask him to be his friend there's a small chance he'll say yes […] you tell him what his problem is and he can be your friend.") or not being supported by the family (i.e. "Yes, also because they suffered, but also because they have a family that doesn't involve him, doesn't scold him and doesn't love him."). Finally it should be noted that some reflections concerned what makes friendship as such and the values to be pursued for it to come about: the fact that it is important not to exclude anyone but also to have appropriate behaviors in order not to be excluded, and the value of reciprocity and a common commitment.

## 5. Conclusions

The project has shown how it is possible to engage children in particularly fruitful activities in relation to the objectives of citizenship education. Children's definitions of friendship have revealed important potential in reflecting on friendship in ethical terms and for the purpose of the common good; the involvement in Socratic conversations has made it possible to further promote the reflexivity of the children who have come to think about openness to the different and question themselves about the reasons for the negative behavior of the other and how to remedy it. The sharing of definitions in class and the development of conversations has promoted at the same time relational and collaborative skills, becoming an experience of dialogue that respects the opinion of others and fosters to reflect together for a common goal. Overall, the results, while being still in progress, show how a rigorously founded educative project, which stimulates the ethical thinking of children through activities such as reflective writing and Socratic conversations starting from a very familiar experience for them such as that of friendship, can be fruitful and promising in promoting the values of citizenship education.

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# SCAFFOLDING ARGUMENTATIVE ESSAY WRITING: AN ONLINE SCRIPTED PEER FEEDBACK AND PEER FEEDFORWARD MODULE

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## Abstract

This study compared the effects of support for peer feedback, peer feedforward, and their combination on students' peer learning processes and argumentative essay quality. Participants were 86 BSc students who were randomly divided over 43 dyads and assigned to peer feedback, peer feedforward, mixed, and control conditions. In an online environment, students were asked to write an argumentative essay, engage in peer learning processes, and revise their essays. Overall, the results showed that students in the three experimental conditions benefited more than students in the control group in terms of peer learning processes and argumentative essay quality. However, there was no significant difference among the three experimental conditions.

*Keywords: Argumentative essay writing, online learning, peer feedback, peer feedforward.*

## 1. Introduction

Undergraduate students are often tasked with writing argumentative essays when they deal with controversial issues (Banihashem et al., 2023; Latifi et al., 2023; Noroozi et al., 2022a). Many scholars emphasize that writing argumentative essays requires students to provide a clear position on the issue, supported with logical evidence, and followed by counter-arguments against the main position (Bayat et al., 2022; Kerman et al., 2022a). Furthermore, the essay needs an integration of the pros and cons of the issue at stake leading to a general conclusion on the issue (see Latifi et al., 2021). This suggests that argumentative essay writing needs solid argumentation strategies (Wingate, 2012).

Various factors may contribute to the poor quality of students' argumentative essays including students' lack of knowledge of the features of an argumentative essay (Bacha, 2010; Kerman et al., 2022b; Noroozi et al., 2022b), the difficulty of transferring argumentation knowledge (Wingate, 2012), and the complexity of writing argumentative essays and imposing a large amount of intrinsic cognitive load on learners (Crowhurst, 1990). Peer learning has been considered as one of the approaches that can be used for supporting students to write high-quality argumentative essays (Latifi et al., 2021; 2021b).

Peer learning is considered as knowledge acquisition through active helping and supporting among status-equal students (Topping, 2005). Peer learning has recently been used as a highly applicable strategy for improving the quality of students' writing (Huisman et al., 2019).

Despite the aforementioned benefits of peer learning, asking students to engage in the peer learning process without appropriate support does not guarantee successful learning performance especially when it comes to writing argumentative essays. Implementation of peer learning through online environments provides various opportunities for supporting peer feedback and peer feedforward which is not possible in traditional face-to-face environments. Such environments allow students to submit their essays and provide feedback on their peers' works reciprocally and anonymously without the restriction of time and space (Lin, 2018). Especially, this environment allows for embedding various types of instructional supports (such as scripting and guidance) that can guide students to provide their peers with more reliable, valid, and relevant feedback and feedforward (Khaneh et al., 2022; Latifi et al., 2021).

The most important challenge for peer learning is that most students focus on responding to the actual task with respect to the actual performance of their learning peers (so-called peer feedback). In most cases, students do not provide information on possible directions or strategies (so-called feedforward) for their learning peers to attain the desired goal (see Banihashem et al., 2022; Noroozi & Hatami, 2019). This is striking since peer learning should not only focus on the peer's actual work and performance but also indicate a direction by delineating a goal to be attained (see Hattie & Timperley, 2007). From this perspective, peer learning can be more effective when the feedback also includes

information about the progress and more importantly how to proceed (Hattie & Timperley, 2007). This implies that peer learning can take place in the form of feedback, feedforward, or both.

To summarize, previous research has shown that engaging in high-quality peer learning processes can enhance essay writing quality (see Noroozi et al., 2016; 2023). There is not yet empirical research comparing the effects of support for the feedback, feedforward, and their combination on various aspects of learning processes and outcomes of argumentative essay writing. The picture is unclear whether the provision of feedback on the actual task is more beneficial or rather the provision of feedforward on the possible direction towards achieving the desired goal. Thus, in this study, we aim to compare the effects of support for peer feedback, peer feedforward, and their combination on students' peer learning processes and argumentative essay quality. We have formulated the following questions to achieve the main goal of this empirical study:

1. What are the effects of support for peer feedback, peer feedforward, and their combination on students' quality of peer learning processes?
2. What are the effects of support for peer feedback, peer feedforward, and their combination on students' quality of argumentative essay writing?

## 2. Method

### 2.1. Context and participants

The study took place at Kharazmi University, Tehran, Iran. Participants consisted of 86 BSc students in the field of Educational Sciences. They were randomly divided over 43 dyads and assigned to four conditions including peer feedback (n=22), peer feedforward (n=22), mixed (n=20), and control group (n=22) conditions.

### 2.2. Learning task and procedure

The learning task was 'Mobile Learning'. Students were asked to write a draft argumentative essay on the following statement: 'Should mobile phones be banned in classrooms?'. Then, they were asked to engage in peer learning processes, and finally, they had to revise their original essay draft based on their peer's comments. All the activities of students were implemented through an online platform named EduTech.

### 2.3. Experimental conditions

Table 1 shows an example of the types of support in the form of question prompts for each experimental condition. The first column shows two elements of an argumentative essay (of the eight elements) in the field of educational sciences. Students in the experimental conditions were supported with question prompts during their online peer learning processes. Students with peer feedback support were provided with pre-structured feedback question prompts related to various aspects of an argumentative essay about the peers' actual task and/or performance (see Table 1, column 2). Students with peer feedforward support were provided with pre-structured feedforward question prompts related to various aspects of an argumentative essay about possible directions or strategies to pursue towards reaching a desired goal (see Table 1, column 3). Students in the mixed condition were provided with pre-structured peer feedback and peer feedforward question prompts (see Table 1, column 4). The learning partners in the control group condition received no further support beyond being asked to type their feedback and/or feedforward into a blank text box during the peer learning phase. The question prompts were designed based on literature (see Noroozi et al., 2016; Toulmin, 1958; Leitão, 2003), and adjusted and validated by a panel of experts in the field of educational sciences.

*Table 1. Components of an argumentative essay in the field of educational sciences (column 1). Question prompts for feedback "FB" (column 2), feedforward "FF" (column 3) and their combination "FB+FF" (column 4).*

| Elements of high-quality essay | Feedback (FB) | Feedforward (FF) | Feedback with feedforward (FB+FF) |
|---|---|---|---|
| The clear position on the topic. | To what extent your learning partner provide his/her clear position on the topic? Please explain. | What is your advice to your learning partner to (better) provide his/her clear opinion on the topic? Please explain. | To what extent your learning partner provide his/her clear position on the topic? What are your suggestions? |
| The introduction (attention grabber and background information) for the topic. | To what extent your learning partner provide introduction for the topic? Please explain. | What is your advice to your learning partner to (better) provide his/her introduction for the topic? Please explain. | To what extent your learning partner provide introduction for the topic? What are your suggestions? |

## 2.4. Instruments

We used an adjusted rubric designed by Noroozi et al. (2016) and Latifi et al. (2021) to measure the quality of students' argumentative peer learning processes and their argumentative essays. This rubric was built on the components of the argumentation model (see Table 1, column 1). A single score (From zero to two) was assigned for each component both for the peer learning processes and argumentative essay writing phases (draft and revised versions).

## 3. Results

## 3.1. Results for RQ1

One-Way ANOVA test indicated a significant difference among students in four conditions in terms of their argumentative peer learning quality, $F (3, 82) = 18.54$, $p < 0.001$, $\eta2 = 0.40$. The Tukey HSD test revealed that students with peer feedback support ($M = 11.8$, $SD = 3.74$), peer feedforward support ($M = 8.50$, $SD = 4.68$), and mixed support ($M = 10.45$, $SD = 3.17$) significantly outperformed students in the control condition ($M = 4.09$, $SD = 1.15$), $p < 0.001$. However, there was no significant difference among the three experimental conditions ($p > 0.05$).

## 3.2. Results for RQ2

ANOVA test for repeated measurement showed that, overall, the mean scores of students' written argumentative essays in all conditions improved significantly from the draft version to the revised version, Wilks $\lambda = 0.40$, $F(3, 82) = 118.16$, $p < 0.001$, $\eta2 = 0.59$ (see Table 2). The Tukey HSD test revealed that students with peer feedback support, peer feedforward support, and mixed support significantly outperformed students in the control condition, $p < 0.001$. However, there was no significant difference among the three experimental conditions ($p > 0.05$).

*Table 2. Students draft and revised mean scores for quality of argumentative essay writing (max = 16; min = 0).*

|  |  | Draft | Revised |
|---|---|---|---|
| Control | Mean | 6.59 | 5.36 |
|  | SD | 1.09 | 1.39 |
| Peer feedback | Mean | 4.68 | 10.40 |
|  | SD | 1.39 | 2.19 |
| Peer feedforward | Mean | 4.72 | 8.42 |
|  | SD | 0.82 | 2.85 |
| Mixed | Mean | 5.65 | 9.95 |
|  | SD | 3.26 | 2.03 |

## 4. Discussions

## 4.1. Discussions on RQ1

As results show, students in all three experimental conditions significantly engaged in higher quality peer learning processes than students in the control group condition without peer learning support. Previous findings (see Noroozi et al., 2016; Latifi et al., 2021) suggest using such question prompts made students familiar with clear assessment criteria and standards which allowed them to engage in more relevant and structured peer learning processes.

## 4.2. Discussions on RQ2

Students in the experimental conditions outperformed students in the control group condition in terms of improvement of their quality of argumentative essays from the draft phase to the revised phase. In other words, high-quality peer learning processes were also reflected in the argumentative essay writing of the students in the experimental conditions. This is in line with previous literature (e.g., Noroozi et al., 2016). When students engage in high-quality peer learning processes, they write high-quality argumentative essays. In the experimental conditions, students who received higher-quality feedback and feedforward from their peers wrote higher-quality argumentative essays compared with those students who received lower-quality feedback and feedforward and vice versa. However, students in the experimental conditions showed no differences from one another with regard to the two dependent variables. In other words, peer feedforward is as equal as peer feedback when it comes to peer learning processes and their outcomes. This implies that attention should also be given to the peer feedforward next to the peer feedback during peer learning processes. Also, students in the mixed condition underperform students in the other two experimental conditions. This could be due to the effects of "over-scripting" and the short duration of the study. In this short-duration study, when the two types of question prompts were combined in the mixed experimental condition, students may have arbitrarily

chosen to follow one set of question prompts or parts of each set of question prompts to comply with the requirements and completion of the task within the limited time. This could have led them to ignore parts of the question prompts for fulfilling the learning task rather (Dillenbourg & Tchounikine, 2007).

## 5. Conclusions, limitations, and suggestions for future research

This study compares the effects of support for peer feedback, peer feedforward, and their combination on students' peer learning processes and argumentative essay quality. The findings showed that various types of support embedded in the EduTech environment can improve the quality of students' argumentative peer learning processes which in turn can lead to improvement of their argumentative essay quality.

The important conclusion that can be drawn from this study is that students with peer feedforward support would benefit to the same extent as students with peer feedback support. The most important practical implication of the findings of this study is that teachers and educational designers provide opportunities for students to also give feedforward next to the standard feedback.

There are two methodological issues that should be considered in future research. First, in this study, we analyzed and assessed the quality of students' argumentative peer learning processes and the quality of their argumentative essays quantitatively. We recommend also using qualitative measurement methods in further research to see if the outcomes would be the same or not. Second, all 86 students in this study were female. We did not have any influence on this gender bias since this study was conducted in a real educational setting and this limited us from further experimentation.

Last but not least, emerging AI technologies such as ChatGPT can largely impact students' performance in argumentative essay writing in both positive and negative ways, future studies should focus on exploring how ChatGPT can be effectively used for improving students' argumentative essay writing (Farrokhnia et al., 2023).

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# THE IMPACT OF POLYCHRONICITY ON STUDENT PERFORMANCE IN DIGITAL TEST SITUATIONS

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## Abstract

Polychronicity, an under-researched dimension of diversity, refers to the degree to which a person likes to engage in several tasks at once. While people differ regarding their preferences for engaging in multiple tasks simultaneously, jobs also differ in that some tend to require the successive completion of tasks, whereas others demand that the person's attention be divided among several activities at once. A body of literature which we have summarised has hypothesised, and to some degree empirically ascertained, that productivity gains also ensue from a person-job fit with respect to polychronicity. This would imply that as digitisation progresses and the demand for multitasking in the workplace continues to rise, polychrons will increasingly be sought on the labour market.

This paper adds to that literature by testing, among a group of undergraduate students, the performance effects of the interaction between polychronicity and a digital task design. While one half of the students were randomly assigned to a set of tasks that was to be completed sequentially, the other half were given the choice of how to allocate their limited time across the set of tasks, and in what order. While falling short of downright multitasking, as employed by most prior studies, the latter setup allowed the students to jump back and forth between the individual tasks, which should cater to the preferences of polychrons. We found that this more flexible task arrangement improved average performance across the board, i.e., irrespective of the degree of polychronicity. At the same time, however, performance was also significantly higher when there was a match between time style and task type, i.e., when monochrons were given the sequential tasks and polychrons the flexible, simultaneous task structure.

*Keywords: Monochronicity, polychronicity, performance, person-job fit, multitasking.*

## 1. Introduction

The anthropologist Edward T. Hall (1959) coined the terms *monochronic* and *polychronic* for a particularly insightful dimension along which we may conceptualise human attitudes towards time. Monochronic persons ('monochrons') or cultures tend to approach tasks sequentially, beginning the next one only after the first one has been completed; they have a mechanistic concept of time and value punctuality and planning. At the other end of this spectrum, polychronicity refers to an attitude where time is viewed as fluid, being associated not so much with clocks but more with states and processes of nature. To polychronic persons ('polychrons'), punctuality is less important than building and maintaining relationships, and they tend to address several tasks simultaneously, freely and spontaneously jumping back and forth between them without a strong need for immediate closure.

A person's degree of monochronicity or polychronicity – their *time style* or *time personality* (Lindquist/ Kaufman-Scarborough, 2007) – will determine their actions and wellbeing in all areas of life, but perhaps nowhere as acutely as in the workplace, where time – the proverbial equivalent of money – is usually the scarcest resource. And just as humans differ in the way they approach time and tasks, so do the tasks themselves. Sometimes a set of tasks must be completed in a given order, with no room for digression or spontaneity. This is typically the case, for example, when the individual tasks built upon one another, making it imperative that the first one be completed before the next one is begun. We might refer to this as a *sequential* task structure. At other times, however, the order in which we address and complete a set of tasks will not matter, so we are free to devise our own work schedules and revise or abandon them as we please – or as the circumstances demand. Indeed, efficiency and/or effectiveness may require that we engage in several tasks at once and constantly adjust their order of priority as contingencies arise.

Examples of such *simultaneous* task structures abound in modern working environments: the original task is interrupted by an urgent new email, whose processing is in turn interrupted by a phone call, etc.

It seems natural to expect that a worker's productivity and well-being will benefit from a *match* between her *time style* and the *task type*, which in the literature is also known as a *person-job fit*, i.e. a monochronic person facing sequential tasks or a polychronic person facing simultaneous tasks. Hence, investigating this hypothesis should be in the interest of a wide range of social sciences, including anthropology, sociology, cultural studies, psychology and management. The present paper focuses on the performance effect of a person-job fit with respect to polychronicity, on which surprisingly little research has been done so far. This lack of evidence is all the more remarkable since matches between time style and task type are not random occurrences in life; often they can be *created* by mindful employees, recruiters, supervisors, etc. We often have a choice about the task structures that we want to tackle (employee's perspective, e.g. when choosing a career) or whom to give a certain task (employer's perspective, e.g. in recruitment). If a systematic performance premium indeed exists, much is to be gained by better understanding a person's time style and making an effort to ensure her tasks accord with her inherent, culturally- and personality-driven attitudes to time and work.

To test for any productivity effect of the match between time style and task type, we conducted an online experiment among German undergraduate students of Human Resource Management. To ascertain the students' time styles, we applied a rudimentary two-item instrument based on Kaufman-Scarborough/ Lindquist (1999). The students were presented with either of two versions of a set of tasks. The first version catered more to a monochronic time style, whereas the other version was rigged to be more amenable to polychronic students. This setup allowed us to check for any systematic performance advantage in case of a match between time style and task type.

## 2. Research design

All students enrolled in the 2021 class of the undergraduate course "Human Resource Management" at the University of Hamburg, Germany, were invited by email to fill in an online questionnaire that would test their understanding of the material learnt so far. They were told that this exercise would help them prepare for the upcoming exam and at the same time provide the basis of a social science experiment with some relevance to the aims of the course. Some 400 students were invited; about 150 entered some data, of whom 127 provided a sufficiently complete set of information to be included in the analysis. The participants' age range was 19 to 37 years, except for one outlier at 44 years, and the median was 23 years. Around 70% of the students were female.

The questionnaire comprised two parts. Part 1 contained ten revision questions relating to the course material. Five response options were given for each question, one of which was correct. The total number of correct responses submitted by each student constitutes our measure of PERFORMANCE, the dependent variable in the subsequent analysis. The students were given eight minutes to complete Part 1. Considering that there was a fair amount of text to be read and the alternative response options for each question were quite similar, this time limit was reasonably tight, the intention being to create an element of pressure so that time management and time styles become relevant to performance. The passage of time was indicated by a progress bar at the top of the page.

There were two variants of Part 1, among which the participants were distributed at random. In Part 1M ('mono'), each of the ten questions was displayed on a separate page, so that the students were forced to work through the tasks sequentially, in the given order. The questionnaire allowed the students to proceed to the next question but not to go back, and the students knew this before launching into the first question. That way, the students had to decide how much time to allocate to a question without knowing whether the remaining questions would be more or less difficult. This design of Part 1M was intended to be more amenable to monochronic time styles, or at least to prevent students with more polychronic styles to play to their strengths.

By contrast, Part 1P ('poly') of the questionnaire was designed to better accommodate a polychronic time style. All ten questions were displayed on a single page, so the students were able to scroll up or down to preview or revisit the questions as they pleased. Again, the students were made aware of the setup on a start page that preceded the questions. For those who preferred such a workstyle, this presentation of the task held a substantial benefit: It allowed them to make an initial assessment of the difficulty of each question, then to answer the easy ones (the 'low-hanging fruits') first, and finally to spend whatever time was left on the more difficult questions. On the downside, the students were at risk of dedicating so much time to devising their time management tactic (previewing the questions, re-reading them in a second pass, scrolling back and forth) that not enough time was left to think about the actual substance of the task.

Having completed either Part 1M or Part 1P of the questionnaire, all students were forwarded to Part 2, which asked them for a set of socio-demographic details that might be relevant to their performance regarding Part 1. Finally, the questionnaire asked the students to indicate to what extent they agreed with the following statements (in German):

1: "Sometimes during the day, I am not sure what to do next."
2: "Changes in my schedule upset me."

These are two items from a much longer list of statements whose responses Kaufman-Scarborough/Lindquist (1999) showed to correlate with polychronicity – positively in the case of the first statement, and negatively in the case of the second. In our sample, as expected, there is a strongly significant, negative correlation ($r = -0.31$) between the responses to these two statements, which provides some support for the viability of our instrument of time styles. For our preliminary study, we preferred a small number of statements in order not to overtax the students' patience (Kaufman-Scarborough/ Lindquist (1999) themselves used a three-item instrument of polychronicity.) We selected these two items because, unlike the other suggested items, they are not too closely related to the test situation at hand, and so there was less risk of endogeneity – the students selecting their responses to the statements under the impression of their recent experience of Part 1.

Agreement with the statements was to be indicated on a five-point Likert scale, which we translated into values of -2 to 2. By subtracting the value of agreement to the second statement from the value of agreement to the first statement, we formed POLY, a measure of how strongly a student is associated with a polychronic time style. Our hypothesis thus suggests that students with high POLY scores should perform better when faced with the simultaneous task (Type 1P) and less well when allocated to the sequential task (Type 1M).

## 3. Results

For a first glance at the results, we divided the POLY spectrum into quartiles and compared only the first (strong monochronicity) and the fourth (strong polychronicity) quartile. Goonetilleke/Luximon (2010) use a similar strategy of comparing extremes in terms of time styles. Table 1 shows the resulting subsample averages for PERFORMANCE by task type.

*Table 1. Subsample means of PERFORMANCE by task type and POLY quartiles.*

| PERFORMANCE averages | | POLY score | | |
|---|---|---|---|---|
| | | first quartile | fourth quartile | total |
| Task type | sequential | 3.714 | 3.118 | 3.486 |
| | simultaneous | 3.611 | 4.333 | 4 |
| | total | 3.656 | 3.688 | 3.724 |

In support of our hypothesis, the polychrons outperformed the monochrons when facing the simultaneous task, i.e. when there was a person-task fit, and the monochrons did better than the polychrons on the sequential task – the other type of fit. When we combine the two subsamples that exbibit a match and compare them to the two non-match groups, the difference in average performance scores – 4.03 vs. 3.37 – is pronounced but not statistically significant.

While intuitive and insightful, the comparison of means does not account for the potential influence of any other variables. Controlling for such influences calls for a multivariate regression model with PERFORMANCE as the dependent variable. The results of that model are reported in Table 2. PART_1P is a dummy variable that equals 1 if a student was assigned the version of the questionnaire that permitted a polychronic working style, as opposed to the sequential presentation of the questions. We see that those students who were allowed to tackle the tasks in an order of their choosing and to freely allocate their time among them tended to do better – by almost 0.8 correct answers.

To test our main hypothesis, the model includes the explanatory variable MATCH, which indicates the degree to which a student experienced a person-task fit in terms of polychronicity: MATCH simply equals POLY in case the student in question was assigned questionnaire Part 1P, i.e., the layout that should be more amenable to polychrons. In that case, a high value of POLY directly translates into a high value of MATCH – the person in question prefers a polychronic style, and she happened to receive the corresponding task type, so there is a match. For monochrons who were assigned Part 1P, MATCH

will be low, as time style and task type do not match. Conversely, for those students who were assigned Part 1M, the monochronic task type, MATCH equals the negative value of POLY, by the same logic. In sum, MATCH is our measure of the strength of the fit between time style and task type. Our hypothesis thus suggests that we should see a positive correlation between MATCH and PERFORMANCE.

The results do confirm this, the regression coefficient being significant at the 5%-level. However, this estimate is quite sensitive to specification changes. Furthermore, the overall explanatory power of the model is modest, so this result should be considered indicative at best.

Among the additional control variables, DELAY stands out for its highly significant effect. The variable refers to the number of days that a given student submitted her questionnaire after the very first questionnaire in the class was submitted. It appears that those students who submitted late – immediately prior to the exam – tended to be those who followed the course more diligently. A_LEVELS and ENTRY_TEST are proxies for the students' prior qualifications. GRANDPARENTS refers to migration background, representing the number of a student's grandparents who were born in Germany. Finally, LANGUAGE refers to the degree to which a student felt that her command of the German language may have impeded her understanding of the test questions. Surprisingly, those who were challenged in terms of language tended to do better in the test; however, the result is not significant.

*Table 2. Regression results to explain PERFORMANCE.*

| Variable | Coefficient | t-Statistic |
|---|---|---|
| PART_1P | 0.768 | 2.145** |
| MATCH | 0.665 | 2.023** |
| DELAY | 0.076 | 2.566** |
| A_LEVELS | 2.19 | 1.955* |
| ENTY_TEST | 1.969 | 1.499 |
| GRANDPARENTS | 0.173 | 1.449 |
| LANGUAGE | 1.045 | 1.397 |
| Observations | 127 | |
| $R^2$ | 0.1494 | |
| Poisson regression. Constant term included but not reported. */** indicate significance at the 10%-/5%-level. | | |

The regression confirmed that polychrons tended to perform slightly better than monochrons, by about a quarter of a point (not reported in the table). However, this difference is again not significant.

## 4. Conclusion

A good person-job fit – where 'job' may refer to any variety of organised human endeavour, also beyond the labour market – has been widely shown to yield considerable psychological and productivity benefits. Since one person's productivity and well-being has strong positive externalities, these benefits accrue not just to the person in question but also to those around her: most evidently her supervisor, her colleagues and the organisation's stakeholders, but also to more distant parties. Accordingly, there are strong incentives to achieve such a fit. The preconditions for that may sound obvious, and yet they are anything but trivial in practice: to know what the job requires and what the person has to offer.

Of the countless dimensions of human diversity that will determine the quality of such a fit, this paper has focused on time styles or, in Hall's (1959) original terms, a person's degree of monochronicity versus polychronicity. While people differ regarding their preferences for engaging in multiple tasks simultaneously, jobs also differ in that some tend to require the successive completion of tasks, whereas others demand that the person's attention be divided among several activities at once. A body of literature has hypothesised, and to some degree empirically ascertained, that productivity gains also ensue from a person-job fit with respect to polychronicity. This would imply that as digitisation progresses and the demand for multitasking in the workplace continues to rise, polychrons will increasingly be sought on the labour market.

This paper adds to that literature by testing, among a group of undergraduate students, the performance effects of the interaction between polychronicity and a novel task design. While one half of the students were randomly assigned to a set of tasks that was to be completed sequentially, the other half were given the choice of how to allocate their limited time across the set of tasks, and in what order.

While falling short of downright multitasking, as employed by most prior studies, the latter setup allowed the students to jump back and forth between the individual tasks, which should cater to the preferences of polychrons.

We found that this more flexible task arrangement improved average performance across the board, i.e., irrespective of the degree of polychronicity. At the same time, however, performance was also significantly higher when there was a match between time style and task type, i.e., when monochrons were given the sequential tasks and polychrons the flexible, simultaneous task structure. Since these results are not overly robust with respect to specification changes, they have only exploratory value and require confirmation through additional, larger-scale research, which could also address the present study's limitations.

Some of these limitations concern the sample we employed. The fact that only about a third of the invited students actually participated left room for self-selection. While this need not cause bias in the results, it limits their generalisability. Furthermore, most of the students were socialised in Germany – a predominantly monochronic culture, according to Hall's original categorisation. This means that the polychronic end of the time style spectrum was likely underrepresented. However, even if we had drawn our sample from different universities throughout the world, it would still be limited to students, who differ systematically from the general population, especially with regard to time styles (Poposki/Oswald, 2010). Other limitations concern our choice of a somewhat rudimentary, two-item instrument, and the simple nature of the task structure, which did not test a wide range of skills. Different choices with respect to these and other aspects of the experimental design would likely have yielded clearer results.

What can we take away from the preliminary results of this study? While the performance effect of the person-job fit in terms of polychronicity requires further confirmation, there are nevertheless strong reasons for all parties involved to aim for such a fit wherever the opportunity arises: the benefits of well-being, for example in the form of reduced stress, are undisputed (e.g. Hecht/Allen, 2005; Poposki/Oswald, 2010; Wu et al., 2020). Therefore, anyone who is in a position to match tasks to persons will do very well to think carefully about the needs, abilities and requirements of both sides of the match, which includes intuiting or more formally eliciting the person's degree of polychronicity. Wherever possible, the persons facing the tasks should be allowed to self-select, as they will – or should – know best which tasks or jobs suit their individual time styles. Anyone who is unaware of their own preferences can resort to one of the polychronicity measures. Accepting and appreciating the different time styles as another important dimension of human diversity can thus help to bring out the best in employees, in students or, more generally, in people.

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# PEDAGOGICAL & TECHNOLOGICAL KNOWLEDGE AND USE OF DIGITAL TECHNOLOGIES BY FACULTY BEFORE AND DURING PANDEMIC TIMES

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## Abstract

This paper describes the methodological design and main results of a research project whose main objective was to analyze the relationship between technological and pedagogical knowledge and the use of ICT by faculty at a public university before and during the pandemic. For data collection, an electronic questionnaire was applied to 250 faculty members, and frequencies, contrasts, and correlations of variables were analyzed. Among the main findings were the detection of a significant difference between both type of knowledge, with the later showing higher values in both periods, but the former experiencing a greater increase between periods. We also found significant differences before and during the pandemic in the use of ICT by faculty for planning, designing, and managing environments and experiences; for teaching, learning and curriculum development; and, for assessment and evaluation. However, the greater difference we detected was in the use of ICT for teaching, learning, and curriculum development. Finally, we also detected that technological knowledge is the factor that most strongly predicts ICT use by faculty. We can conclude that the success of universities in guaranteeing academic continuity in the face of similar contingencies necessarily requires a teaching staff competent in the knowledge and pedagogical use of existing and future digital technologies.

*Keywords: Pedagogical-technological knowledge, digital technologies, faculty, pandemic.*

## 1. Introduction

As a result of the pandemic caused by COVID-19, the World Health Organization (WHO, 2020a) recommended the closure of public and private institutions, affecting all fields of human endeavor. Educational institutions were one of the most affected.

In order to meet the needs of students and guarantee their learning, most countries implemented various measures to accomplish their goals (Dreeseni, et al., 2020; UNESCO, 2020). One of these strategies was remote teaching. This situation generated unscheduled changes, especially in higher education institutions (HEIs) such as the execution of strategies and actions related to the use of communication media such as newspapers, radio, television and other tools based on the use of the Internet such as videoconferences, MS Teams, Google's G suite, chats, streaming and online video, among other applications that work as a bridge to connect institutions, teaching staff and students (Fernández et al., 2020).

Remote teaching requires teachers to have a certain level of skill in the use of ICT, especially related to the use of digital technologies for remote monitoring, management and evaluation of learning (Ayciriet, 2020; Dussel et al., 2020; Kiekel et al., 2020; Zang, 2020). However, traditionally the use of digital technologies in teaching does not usually have a solid pedagogical basis. On the contrary, it is generally at the mercy of fading fads, which in turn causes that "the actual use of these technologies in teaching is not at the required level" (Ahmed et al, 2020, p. 59).

The objective of this work was to analyze the level of pedagogical and technological knowledge and the use of digital technologies by faculty of a Mexican public university, who faced the challenge of teaching remotely during the pandemic

## 2. Methods

This study was quantitative, descriptive, and correlational. A digital questionnaire (http://encuestaunison.online) with Likert scale responses was used for data collection. A non-probabilistic sample of 250 faculty from the University of Sonora (Mexico) belonging to different areas was used. The academics were selected by convenience using as a criterion that they had been teaching during the semesters in which classes were suspended due to the pandemic.

Of the faculty members who participated in the study, 50.8% were men and 49.2% were women, whose ages were between 27 and 80 years old. Half of the sample had an average of eleven years working at the university, while 10% had been working at the institution for more than two decades. Most of the subjects (85%) had a laptop while the rest had a personal computer or an electronic tablet.

To measure technological and pedagogical knowledge, the questionnaire of Ladrón et al. (2021) and the proposals of Mishra and Koehler (2006) and Zabalza (2003) were used as a reference. The questionnaire was contextualized to the population, so the components of the TPACK model were adapted in two dimensions: technological knowledge (items 11 to 23) and pedagogical knowledge (items 24 to 30), making a total of 20 questions.

Regarding the reliability and validation of the instrument, reliability was measured by calculating Cronbach's alpha. The value of the test was .95, which indicated a high consistency among the items that make up the measurement of the instrument. An exploratory factor analysis of maximum likelihood with oblique rotation was also performed, obtaining a value of .953 in the Kaiser-Meyer Olkin (KMO) measure, which indicates that the covariance matrix is sufficiently robust to allow assessment of the degree to which each of the variables is predictable by the others. In relation to the construct validation, the oblique rotation through the sedimentation plot allowed us to identify, as expected, a two-factor solution: 1= technological knowledge, 2= pedagogical knowledge. The percentage of variance explained by the scale was 67.24%, therefore, it was considered acceptable.

## 3. Results and discussion

This section presents findings on the technological and pedagogical knowledge of teachers at the University of Sonora, as well as the relationship of such knowledge with the use of ICT for teaching both before and during the health contingency caused by the COVID-19 pandemic.

### 3.1. Differences between technological and pedagogical knowledge by faculty before and during the COVID-19 pandemic

Results indicate that: (1) there is a significant difference between the technological and pedagogical knowledge of faculty before and during the pandemic with the later showing higher values in both periods, and (2) there is a slight increase in technological knowledge before and during the pandemic (T=-6.72, d=-0.35, p <.001), while pedagogical knowledge did not change (See Table 1). This suggests as Schildkamp et al. (2020) argues, that due to the circumstances of the health contingency, technological knowledge was given higher priority to ensure the continuity of the classes.

*Table 1. Technological and pedagogical knowledge of faculty before and during the pandemic.*

|  | Before pandemic | | During pandemic | | | | |
|---|---|---|---|---|---|---|---|
|  | M | SD | M | SD | T | p | d |
| Technological | 3.43 | .98 | *3.75 | .84 | -6.72 | < .001 | -0.35** |
| Pedagogical | 4.13 | .75 | 4.13 | .69 | .023 | .981 | ---- |

SD=Standard deviation                    Prepared by the authors
\* Size of the effect between small and moderate

### 3.2. Use of ICT by faculty before and during the pandemic

As can be seen in Table 2, when comparing before and during the pandemic we found significant differences in the use of ICT for planning, designing, and managing environments and experiences (T= -10.15, d=0.62, p<.001) for teaching, learning and curriculum development (T= -3.65, d=-0.81, p<.001) and, for assessment and evaluation (T= -11.50, d=0.20, p<.001).

*Table 2. Type of ICT use before and during the COVID-19 pandemic.*

| | Before | | During | | | | |
|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | T | P | d |
| Planning, designing and management of environments and experiences | 3.50 | 1.01 | 4.07 | .80 | -10.15 | < .001 | -0.62** |
| Teaching, Learning & development of curriculum | 2.42 | 1.16 | 3.37 | 1.16 | -3.65 | <.001 | -0.81*** |
| Evaluation | 2.28 | .96 | 2.48 | 1.03 | -11.50 | <.001 | -0.20* |

SD=Standard Deviation                Prepared by the authors.
*Small effect size; ** Moderate effect size; *** Large effect size

The greater difference we found in the use of ICT before and during the pandemic was in the use of ICT for teaching, learning, and curriculum development, which is consistent with the findings of Arras et al. (2021) with teachers at a public university who reported similar results. It should be noted that both before and during the pandemic, 86% of teachers almost always and always used digital presentations to teach. Thus, the use of this tool transcended the health contingency and is expected to be of greater importance in the immediate future.

The second category that experienced the greatest change was related to tools for planning, designing, and managing environments and experiences. It is worth noting that within this category the use of course management programs such as Moodle, Blackboard, Google Classroom, Schoology, and Microsoft Teams increased by 43% during the pandemic, which makes sense since classes were taught remotely.

Regarding the use of ICT for evaluation, it was the area where they have been less used (M < 2.48), which coincides with the results of Jogezai et al. (2021) who also found that teachers made little use of technologies to evaluate their students.

## 3.3. Technological, pedagogical, and content knowledge as predictors of ICT use in teaching

The results on the weight of technological and pedagogical knowledge on the use of ICT in teaching practice are presented below. Table 3 reports information about the knowledge before the pandemic and Table 4 shows information on the same issue but during the time of the pandemic.

*Table 3. Summary of the analysis of technological and pedagogical knowledge as predictors of ICT use in teaching before the pandemic.*

| Variable | B | SD B | B | T | P |
|---|---|---|---|---|---|
| Technological Knowledge | .514 | .044 | .619 | 11.650 | P < .001 |
| Pedagogical Knowledge | .011 | .073 | .010 | .144 | .858 |

Note. $R^2 = .654$ (N=250, p <.001), SD= Standard deviation

The results in Table 3 show that technological knowledge is positively associated with ICT use before the pandemic (r > 0; P < .01), and predicts its use with greater weight (B=.514; P<.001).

*Table 4. Summary of the analysis of technological and pedagogical knowledge as predictors of ICT use in teaching during the pandemic.*

| Variable | B | SD B | B | T | P |
|---|---|---|---|---|---|
| Technological Knowledge | .419 | .051 | .504 | 8.180 | P < .001 |
| Pedagogical Knowledge | .096 | .074 | .095 | 1.301 | .195 |

Nota. $R^2 = .632$ (N=250, p <.001), SD= Standard deviation

Table 4 shows how technological knowledge most strongly predicts ICT use (B=.419; P<.001). The results indicate that this knowledge has the strongest influence on the use of ICT in teaching. This finding can be understood as a positive association between the level of knowledge and the ability to use ICT by faculty, independently of the pandemic factor.

## 4. Conclusions

Summarizing, when comparing faculty members´ ICT technical and pedagogical knowledge before and during the pandemic we detected that there is a significant difference between periods, with the later showing higher values in both periods. However, only the former experienced a significant increase between periods. We also found significant differences before and during the pandemic in the use of ICT by faculty for planning, designing, and managing environments and experiences; for teaching, learning and curriculum development; and, for assessment and evaluation. Nevertheless, the greater difference we detected was in the use of ICT for teaching, learning, and curriculum development. Finally, we also detected that technological knowledge is the factor that most strongly predicts ICT use by faculty.

Transforming teaching through technological and pedagogical knowledge, or a combination of both, is a complicated task, especially when faculty is forced to "improvise" in an unknown context, as in the case of the health contingency caused by the COVID-19 pandemic. From the findings of this study, it can be argued that updating, increasing and improving not only technological but also pedagogical knowledge of university professors facilitates their incorporation into different contexts, as is the case of remote emergency teaching, while helping to discover new work spaces that allow experimentation with different forms of teaching. Finally, we can conclude that the success of universities in guaranteeing academic continuity in the face of similar contingencies necessarily requires a teaching staff competent in the knowledge and pedagogical use of existing and future digital technologies.

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# PREDICTING STUDENT PERFORMANCE FROM MOODLE LOGS IN HIGHER EDUCATION: A COURSE-AGNOSTIC APPROACH

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## Abstract

The institutional adoption of learning management systems (LMS) aims to improve educational outcomes and reduce churn through student engagement with educational content. Modern LMS record all student interactions and store them as activity logs that encode patterns of learning behaviour. Previous research has shown that insights derived from log data can detect students at risk of failing in a single or a few courses, but comprehensive institution-wide surveys are few and far between.

The work presented herein uses machine learning to create predictive models to identify students at risk or excellent students using the Moodle logs generated by a sample of 9296 course enrollments at a Portuguese information management school. 31 candidate features were extracted to create and train different predictive models. Model performance was evaluated through 30 repetitions of Stratified K-Fold Cross-Validation, using the area under the receiver operating characteristic (ROC) curve (AUC) and the F1-score. All experiments were repeated with the addition of the average of the intermediate grades obtained by the student in the course as a 32nd candidate feature.

The results suggest that features extracted from Moodle logs are good predictors of students at risk, as indicated by the 0.752 AUC score achieved by Random Forest. The addition of intermediate grades significantly improves the predictive performance, leading to an AUC score of 0.922 and F1-Score of 0.693 for the best classifier, Gradient Boosting. However, the performance for identifying excelling students was comparatively lower, with an AUC score of 0.781 and F1-Score of 0.567 for Gradient Boosting. Future work should focus on exploring the implementation of an early warning system that can assist educators in identifying students in need while there is still time to provide feedback and develop corrective measures.

*Keywords: Student performance, learning management systems, higher education, classification, machine learning.*

## 1. Introduction

The potential role of higher education institutions (HEI) in promoting prosperity and sustainability in communities and society at large is widely recognised by scholars (Žalėnienė & Pereira, 2021) and policymakers worldwide have, throughout time, made efforts to democratise and increase flexibility in access to tertiary-level education in their countries (OECD, 2022). However, increases in student enrollment have also brought a plethora of new challenges to HEI, with the decreased ability of educators to track and monitor the progress of each individual being among the main ones (Clancy & Goastellec, 2007; Macfadyen & Dawson, 2010).

Learning management systems (LMS) are digital tools with close to ubiquitous adoption by HEI whose primary purpose is facilitating the engagement of students with the educational content, whether it is accessing course materials or communicating remotely with educators (Coates, James, & Baldwin, 2005; Walker, Lindner, Murphrey, & Dooley, 2016). Modern LMS keep timestamped records of every student interaction with the system, referred to as clickstream data, which educators and researchers use to track student progress and provide personalised support (Bernacki, Chavez, & Uesbeck, 2020; Macfadyen & Dawson, 2010).

Clickstream data has gathered the interest of researchers and educators that attempt to predict student performance since the mid-2000s. In 2006, Calvo-Flores, Galindo, Jiménez, & Pérez (2006) extracted features from the LMS logs of 240 students attending a course at a Spanish university to train an artificial neural network (ANN) that achieved 80.2% accuracy when predicting whether a student would pass or fail. While arguing that clickstream data could play a role in the early identification of students at risk, Macfadyen and Dawson (2010) used a Logistic Regression (LR) to correctly identify 80.9% of the

students at risk while maintaining an accuracy of 73.7%. Throughout time, research in student performance prediction has branched into different niches. In the first niche, works like Zacharis (2015, 2018) were mainly focused on making predictions using models trained from data from a single course. In recent years, the work presented in Bernacki et al. (2020) went a step beyond identifying struggling students in a course, but it also allowed some of them to receive timely feedback and outperform the struggling students that did not receive that feedback. In a second relevant niche, works like Gašević, Dawson, Rogers, and Gasevic (2016) or Conijn, Snijders, Kleingeld, and Matzat (2017) skeptically explored the possibility of creating models trained on data from multiple courses and eventually argued against the use of general models due to their poor performance against course-specific models. The research works in the third niche mainly focused on general course-agnostic models that could be applicable in multiple contexts. For example, Romero, Espejo, Zafra, Romero, and Ventura (2013) and Tsiakmaki, Kostopoulos, Kotsiantis, and Ragos (2020) obtained average accuracies of 66% and 86.1% respectively, using models trained on data from 7 different courses. In addition, there is also a set of works that achieves outstanding performances with models trained with data from more than 600 courses (Baneres, Rodriguez, & Serra, 2019; Riestra-González, Paule-Ruíz, & Ortin, 2021). Despite these efforts, literature on institution-wide surveys that aim to predict student performance is scarce. Moreover, most works focus solely on identifying students at risk, rather than identifying students with high potential.

This study investigates the potential of data from the Moodle LMS to predict and identify students who are at risk and, in a parallel problem, identify students who are excelling. The research question being addressed is: *Can institution-wide clickstream data from a Learning Management System accurately predict and identify at-risk and high-potential students in higher education institutions?* To answer this question, we compare the performance of different course-agnostic predictive models trained on features extracted from Moodle logs obtained from courses taught at a Portuguese information management school. The results suggest that features extracted from LMS logs exhibit predictive potential and can contribute to future development of more generalisable early warning systems, pedagogical strategies and support systems in higher education institutions.

The remainder of this paper is structured as follows: the following section presents the data and methods used in this study. The third section presents and discusses our main findings, followed by the conclusion and reccomendations for future work.

## 2. Methodology

### 2.1. Data

This work analysed data from 138 courses taught at a Portuguese information management school collected during the 2020/2021 academic year. The data comprised 9296 course enrollments by 1590 unique students and included the Moodle logs, intermediate grades, and final course grades associated with each enrollment. The final grades of each student were used to create two binary variables. The first variable classified students as being *at risk* (1) if they scored less than 11 out of 20 in a course, with the remaining students being *not at risk* (0). The second variable classified students as *excelling* (1) if their final course score exceeded the $85^{th}$ percentile of the course and *not excelling* (0) otherwise. Table 1 showcases the distribution of courses, students, and enrollments according to the program level. Notably, undergraduate level courses had close to 50% (911 out of 1872) of the enrollments labeled *at risk* across all program types despite only representing a third of the total number of enrollments. Moreover, the largest proportion of excelling students was found in courses taught in master's level programs.

*Table 1. Overview of the characteristics of courses and students per program level.*

| Program level | Courses | Unique Students | Student enrollments | Enrollments per course | Students at risk | Excelling students |
|---|---|---|---|---|---|---|
| Undergraduate | 55 | 409 | 3387 | 61.58 | 918 | 769 |
| Master's | 62 | 872 | 5013 | 80.85 | 833 | 1543 |
| Postgraduate | 21 | 325 | 896 | 42.67 | 121 | 262 |
| **Total** | **138** | **1606** | **9296** | **67.36** | **1872** | **2574** |

### 2.2. Data analysis

Figure 1 illustrates the experimental design followed for each classification problem. The work was divided into two stages and, unless explicitly noted otherwise, all data manipulation and analysis were performed in Python (McKinney, 2018) using Scikit-learn (Pedregosa et al., 2011). In the first stage, Moodle logs were preprocessed and converted into a dataset suitable for training various machine learning classifiers, with 31 candidate features extracted per student enrollment. The second stage

involved creating and training different machine learning classifiers using the dataset created in the first stage to address the two classification problems. Ten traditional machine learning classification algorithms were trained for each classification problem: K-Nearest Neighbors (KNN), LR, Naïve Bayes (NB), Classification and Regression Tree (CART), ANN, Support Vector Machines (SVM), RF, Extremely Randomised Trees (ExtraTrees), Adaptive Boosting (AdaBoost) and Gradient Boosting (GBoost). Model performance was initially evaluated using the average area under the receiver operating characteristic (ROC) curve (AUC), with the best models being evaluated by the F1-score, a metric computed from precision and recall. All performances reported herein refer to the average model performance across 30 repetitions of training with Stratified 10-Fold Cross-Validation.

*Figure 1. Overview of the experimental approach adopted for each classification problem.*
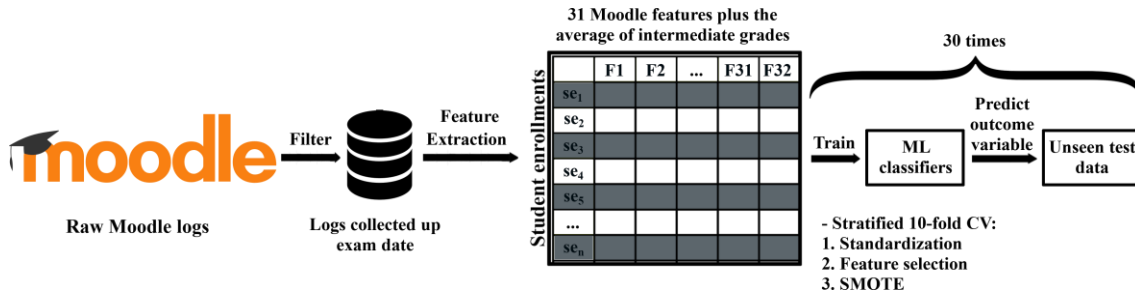


Standardisation, feature selection, and Synthetic Minority Oversampling Technique (SMOTE) (Chawla, Bowyer, Hall, & Kegelmeyer, 2002) were performed independently for each fold. The choice of which features to keep in each classification problem was made by a multi-layered feature selection process that required a feature to be found relevant by a minimum of four of the following eight algorithms: Recursive Feature Elimination (Guyon, Weston, Barnhill, & Vapnik, 2002) in its simple and with cross-validation forms, Ridge Regression, Lasso Regression, ElasticNet Regression, and the application of SelectFromModel to LR, Random Forest (RF), and Light Gradient Boosting Machine (Ke et al., 2017), with the latter not having a Scikit-learn implementation. Moreover, the experimental procedure was repeated on a modified dataset that also featured the average of the student's intermediate grades. A brief description of all features used in this study can be found in Table 2.

*Table 2. List and description of the 32 candidate features extracted from the source data.*

| Features | Description |
|---|---|
| Total clicks (n) | Number of clicks made in the course |
| Clicks (% of course total) | Number of clicks made relative to total clicks of all students in the course |
| Online sessions (n) | Number of online sessions |
| Clicks/session (n) | Total clicks / Online sessions |
| Clicks/day (n) | Total clicks/ number of days |
| Forum clicks (n) | Number of clicks on the course forum |
| Discussions viewed (n) | Number of discussions and course forum posts viewed |
| Forum posts (n) | Number of posts and replies in discussions and course forum |
| Folder clicks (n) | Number of clicks on folders |
| Resources viewed (n) | Number of course educational resources viewed |
| URLs viewed (n) | Number of clicks on external links |
| Course clicks (n) | Number of clicks on course pages |
| Assessments started (n) | Number of assessments and quizzes started |
| Assignments viewed (n) | Number of assignment page views |
| Assignments submitted (n) | Number of assignments submitted |
| Submissions (% of course total) | Number of submissions relative to total submissions made in the course |
| Total time online (min) | Sum of the duration of all online sessions undertaken by the student |
| Aver. duration of online sessions (min) | Total time online / Online sessions |
| Largest period of inactivity (h) | Largest temporal interval between consecutive online sessions |
| Days with 0 clicks (n) | Difference between the number of days and days with at least one click |
| Days with 0 clicks (% of period) | Percentage of Days with 0 clicks |
| PercCourse_1Login | Percentage of course duration at the 1st login by the student in the course |
| PercCourse_2Login | Percentage of course duration at the 2nd login by the student in the course |
| .... | Percentage of course duration at the nth login by the student in the course |
| PercCourse_10Login | Percentage of course duration at the 10th login by the student in the course |
| Average of intermediate grades | Average of the intermediate grades obtained by the student in the course |

## 3. Results and discussion

Table 3 presents the average performance of the classifiers used in this study. Model selection was primarily performed using AUC score, with F1-score being a secondary criterion. The models selected from the initial screening stage for each experiment and classification problem are highlighted in bold.

*Table 3. Average AUC, Accuracy and Recall scores obtained by each classification algorithm.*

| | Students at risk | | | | Excelling Students | | | |
|---|---|---|---|---|---|---|---|---|
| | Moodle | | Moodle + Intermediate grades | | Moodle | | Moodle + Intermediate grades | |
| | AUC | F1-score | AUC | F1-score | AUC | F1-score | AUC | F1-score |
| KNN | 0.714 | 0.435 | 0.839 | 0.570 | 0.587 | 0.421 | 0.623 | 0.447 |
| LR | 0.707 | 0.422 | 0.783 | 0.518 | **0.616** | **0.432** | 0.634 | 0.450 |
| NB | 0.677 | 0.392 | 0.716 | 0.443 | 0.600 | 0.397 | 0.608 | 0.414 |
| ANN | 0.712 | 0.432 | **0.898** | **0.666** | 0.584 | 0.404 | 0.673 | 0.476 |
| CART | 0.678 | 0.413 | 0.843 | 0.654 | 0.569 | 0.378 | 0.708 | 0.545 |
| SVM | **0.727** | **0.445** | 0.894 | 0.642 | **0.618** | **0.429** | 0.690 | 0.498 |
| RF | **0.752** | **0.460** | **0.921** | **0.693** | **0.621** | **0.389** | **0.756** | **0.563** |
| AdaBoost | 0.704 | 0.418 | **0.906** | **0.658** | 0.607 | 0.391 | **0.755** | **0.553** |
| GBoost | **0.742** | **0.421** | **0.922** | **0.693** | **0.616** | **0.332** | **0.781** | **0.567** |
| ExtraTrees | **0.724** | **0.432** | **0.897** | **0.640** | **0.626** | **0.436** | 0.720 | 0.526 |

Before adding the average intermediate grades as a feature, RF achieved the highest AUC (0.752) and F1-score (0.460) for identifying students at risk. For the identification of excelling students, the best classifier was ExtraTrees with an AUC of 0.626 and an F1-score of 0.436. Adding average intermediate grades improved performance, making GBoost the best classifier for both problems. GBoost had an AUC score of 0.922 and a F1-score of 0.693 for students at risk and an AUC score of 0.781 and a F1-score of 0.567 for excelling students. Interestingly, the classifiers with the highest AUC score always had the highest F1-scores, even among the non-selected classifiers. However, this trend was not consistent when comparing between all models.

### 3.1. Discussion

Per the nomenclature adopted by Gašević et al. (2016), a classifier exhibits acceptable discriminative capabilities if it achieves an AUC score greater than 0.7. While exclusively using Moodle logs, 9 out of 10 classifiers met this threshold when identifying students at risk. However, when identifying excelling students the best performances did not go beyond poor discrimative capabilities (with ExtraTrees achieving 0.626 AUC). Nonetheless, the results demonstrate that features extracted from LMS have discriminative power on their own even if they do not encapsulate all of the information that would reasonably be accessible to an educator when making the prediction, as is the case of intermediate grades obtained throughout the course.

The addition of the intermediate grades led to substantial bumps in discriminative performance in both classification problems. For students at risk, RF, AdaBoost and GBoost achieved AUC scores greater than 0.9, with ANN, Extratrees and SVM nearly reaching this benchmark as well. For identifying excelling students with intermediate grades, 5 classifiers met the 0.7 benchmark with RF, AdaBoost and GBoost having AUC scores greater than 0.75. These results are consistent with other works that have found intermediate grades to be among the influential predictors of performance (Conijn et al., 2017; Riestra-González et al., 2021).

Overall, features extracted from LMS clickstream exhibit the potential to help educators identify either students at risk or excelling students. That potential can be enhanced by combining the LMS features with other data from other reasonably accessible sources of data, as is the case with the partial grades obtained throughout the course.

## 4. Conclusion

The work presented herein uses LMS log data collected from a Portuguese information management school to create models that predict student performance. The findings show that LMS data exhibits good discriminative power in, at least, the identification of students at risk. Future research could explore whether the discriminative power seen in the analysis can be extended to early identification of students of interest, and potentially implement these models into a customized version of Moodle for real-time identification.

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# ART VS SCHOOL DROPOUT:
# THE THEATRE-EDUCATION OF 'MAESTRI DI STRADA' NARRATED BY EDUCATORS AND PUPILS

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## Abstract

In Italy, the percentage of adolescents dropping out of school is really high. According to several studies, extra-curricular activities can promote dropout recovery. The "Maestri di Strada" Association carries out socio-educational projects in Neapolitan suburbs, by countering school dropouts even through art education. Among several workshops is that of theatre – a powerful educational tool, which supports identity and empowerment. The present study aimed to document and evaluate the multi-year workshop journey of a group of adolescents, by giving them and their educators a voice through semi-structured interviews. The latter were conducted with 9 pupils at the end of the penultimate year (Ad-T1) and of the last year (Ad-T2) of their journey and with 3 of their educators (theatre experts) a year after the end of their journey (Ed). The large textual Corpus collected was subjected to Thematic Analysis of Elementary Contexts (T-Lab Plus). The findings (Ad-T1: 6 cluster; Ad-T2: 5 cluster; Ed: 6 cluster) show that both adolescents and educators agree to consider this workshop a precious space where one can reclaim their own desire to learn and grow. Notably, in T1, pupils emphasize differences between theatre and school, their meaningful relationship with educators, learning to regulate emotions and to cooperate, and the alliance with families and the local community. In T2, pupils emphasize the importance of the group, the personal experiences had in each staged performance, and their new idea of adulthood. Similarly, educators regard the group as fundamental, as well as the relationship between the school and the local community, and future prospects.

*Keywords: School dropout, extra-curricular activity, theatre-education, adolescence, T-Lab Plus.*

## 1. Introduction

In Europe, Italy presents one of the highest school drop-out rates - one out of four students drops out. Particularly, in the Italian context, Neapolitan suburbs show one of the highest school drop-out rates. School dropout can be defined as the culmination of a long process of disinterest, disengagement and detachment from schooling (Vinciguerra, 2021; Liinamaa et al., 2022). These are regarded as consequences of a progressive deterioration of the bond between young people, school and society (Nita, 2021). Indeed, suburbs of contemporary cities are often delineated as complex and conflictual territories, characterised by housing deprivation, high unemployment, and undeclared work, family discomfort, youth deviance, and educational poverty. In general, social and economic changes have caused a profound shift in the experience of growing up, by slowing down young people's transitions to adulthood and creating more uncertain, complex and risky pathways (Coleman, 2000). In the process of building their independence, young people may engage in risky behaviours, especially when no other means are available, such as extracurricular activities or community services (Hughes &amp; Wilson, 2004). Indeed, according to a large body of literature, extra-curricular activities can prevent school dropout and deviance (Davalos et al., 1999; Neely & Vaquera, 2017), by promoting engagement, self-esteem (Eder & Kinney, 1995), good academic performance (Fredricks & Eccles, 2006), higher educational aspirations (Fredricks, 2012) and by reducing delinquency rates (Cohen et al., 2007). Furthermore, theatre workshops can engage students in a greater and more complex understanding of their own territory (Boal, 1979), by fostering transformations and changes in their behaviour within their own life contexts (Uria-Iriarte, Galarreta-Lasa & Lizasoain-Hernández, 2021).

Art has the power to help individuals make meaning of their external and internal worlds, provide an enriching emotional experience, and offer opportunities for aesthetic appreciation, play and

entertainment. Furthermore, it represents a tool to build social bonds with other members of one's territory and self-reflect as a community (Lambert et al., 2023). Particularly, Theatre in Education (TIE), uses theatre techniques and imaginative power to place learners at the centre of their own learning. Educators challenge learners, but at the same time they communicate confidence and trust in their "intelligent sensitiveness" and consequently in their ability to reflect and find their own solutions. That allows learners to think and act in order to find their own personal solutions (Jackson & Vine, 2013). Thus, TIE is particularly useful in promoting engagement, agency, reflexive and socio-emotional skills (Lyngstad, Baraldsnes & Gjærum, 2021; Uria-Iriarte et al., 2021), and also in adjusting and strengthening learners' social bond with family, schools and society (Hirschi, 1969). In conclusion, theatre education is a powerful tool that can prevent and contrast early school leaving.

## 2. Context

The Eastern area of the city of Naples, in Southern Italy, has been transformed by continuous industrial crises into a degraded suburb, often humiliated and demeaned by fights between criminal gangs. In this area, minors at risk are twice as many compared to the rest of the urban area, and school dropout reaches very high percentages: 34% of dropouts, 58.8% of NEETs and 67.5% of youth unemployment, according to ISTAT data (Carillo et al., 2022). Schools cannot cope with such an emergency by themselves, so they are often supported by no-profit associations, such as 'Maestri di Strada' (Street Teachers). Maestri di Strada carries out complex socio-educational interventions both inside and outside schools in order to fight school dropout and promote young people's social inclusion. Since 2010, the Association has been launching several intervention projects, by re-motivating young people to engage in learning processes and active citizenship practices, also through the involvement of schools, families and territory. Young people are supported in their schooling, they are involved in art education, citizenship workshops, and community events. Among several art education workshops, is the 'Trerrote' Theatre Workshop (TTW). The TTW young student-actors' training aims to treat mind-body relationship, mediated introspection (i.e. looking at the inner world through the theatre mask), and relationship with the group. The whole course is supported by reflexing spaces both for students (e.g. circle time) as well as educators and peer educators, through the Multivision Group (Parrello et al., 2019; Parrello et al., 2021). Educators pay particular attention to the student-school relationship – their achievements in the TTW are carefully communicated to their teachers, and the latter are invited to students' performances. Moreover, educators also record any improvement in students' school careers or persistent difficulties and offer home-study support and support for final exams.

## 3. Aims

The present study documents and evaluates the multi-year workshop journey of a group of adolescents at risk of dropout and of their educators. After investigating their experience, both adolescents' and educators' points of view were compared in order to understand whether and to what extent this experience supported the growth of students as well as the development of their bold with school, families and territory.

## 4. Method

We compared two qualitative studies – a first longitudinal research conducted with a group of TTW students and a second study involving their educators. Specifically, semi-structured interviews were conducted with the aim of investigating participants' experience and evaluation regarding the TTW, at the end of a long workshop cycle.

### 4.1. Participants and procedure
Participants include 9 adolescents between the age of 16 and 17 (4 F and 5 M) – selected from the TTW group by a degree of seniority and diverse personal school backgrounds – and three educators – the TTW director and two psychologists with an expertise in theatre-education. All participants were subjected to semi-structured interviews, audio-recorded and then verbatim transcribed. Particularly, the interviews with adolescents were conducted at two stages, one year apart from each other – Time 1 (Ad-T1, end of 2018) corresponds to the end of their penultimate year, and Time 2 (Ad-T2, 2019) to the end of their last year. The interviews with the educators (Ed) were conducted between 2019 and 2020.

### 4.2. Data analysis

Each corpus went through a Thematic Analysis of Elementary Contexts (TAEC), through T-Lab Plus software (Lancia, 2004). TAEC divides the text into Elementary Context Units (ECU), which are consequently classified according to the distributions of words in terms of frequency. Cluster analysis was carried out by an unsupervised ascendant hierarchical method (Bisecting K-Means Algorithm). Each cluster consists of a set of keywords (vocabulary) that appear in specific selections of ECU, and which were ranked according to the decreasing value of chi-square. A label was then assigned to each cluster by researchers. Results obtained through this type of analysis can be considered an isotopic map of the main themes running through the narratives of interviewees.

## 5. Results

### 5.1. Ad-T1 - end of penultimate year (adolescents)

This first corpus – made up of the interviews carried out with adolescents at the end of the penultimate year of the Workshop (Ad-T1) – consists of 23,565 occurrences, 2,931 forms, and 1,897 lemmas. TAEC classified 572 ECUs out of 712 identified ones (80.34%) and divided them into 6 clusters of different sizes, each one presenting its own vocabulary.

**Ad-T1.1 - Emotional regulation: managing anxiety (18.53%).** Pupils get in touch with their emotions and they learn to manage their anxieties, by starting from those felt backstage, before going on stage. The audience has a fundamental function in emotional regulation when on stage.

**Ad-T1.2 - Meaningful relationship with educators: not grades, but care, advice, and reprimands (21.15%).** The relationship with educators and peers is described as fraternal and characterised by care, confidence and trust, which allow pupils to accept advice and reprimands. Unlike teachers, educators do not give grades and do not judge.

**Ad-T1.3 - In the theatre: authenticity, cooperation and life (10.49%).** Theatre represents a reality in which everyone can be themselves and can be recognised by significant adults. There, it is possible to constitute oneself as a true company, by experiencing a feeling of strong harmony, as well as being able to identify with characters and situations, and learning to face one's life's difficulties.

**Ad-T1.4 - The educating community: Street Teachers, families and territory (15.03%).** The work of Maestri di Strada involves entire families and contributes to building an educational community in the suburbs. This positively influences one's path within the workshop.

**Ad-T1.5 - Theatre vs. School: a different story (22.55%).** School is perceived as a strict institution and is associated with negative experiences, whereas the workshop is described as a place where one can be authentic, and active and have positive experiences.

**Ad-T1.6 - Taking stock of the journey: exploring, having fun, expressing oneself (12.24%).** Pupils recall the first moments in the TTW, some of the shows and characters performed, trips, fun moments and how they learned to regard themselves from a different perspective.

### 5.2. Ad-T2. End of the last year (adolescents)

This second corpus – made up of the interviews conducted with adolescents at the end of the last year of the Workshop (Ad-T2) – consists of 32,010 occurrences, 3,401 forms, and 2,221 lemmas. TAEC classified 722 ECUs out of 873 identified ones (82.70%) and divided them into 5 clusters each with its own vocabulary.

**Ad-T2.1 - In the shoes of adults (20.78%).** Some of the characters played over the years have helped pupils reflect on the adult world, by making them wonder what becoming an adult means and understand their own model: an adult balanced between responsibility and the ability to have fun like a child.

**Ad-T2.2 - "Every show has taught me something" (25.62%).** There are shows pupils are particularly fond of, but each show has taught them something, in terms of knowledge, self-awareness, empathy and emotional self-regulation.

**Ad-T2.3 - The group changes you (26.04%).** Over the years, this group has evolved from just 'being together to perform as actors' to building meaningful relationships – friendships. Thus, the group is no longer seen merely as a collection of individuals, but as a laboratory of emotions and a promoter of change.

**Ad-T2.4 - Towards the future: theatre between life and work (11.50%).** Thinking about their future, there are those who imagine turning the theatre into a real job and those who want to take other paths. Either way, the desire they all share is to keep on changing and growing, always keeping this experience with them and keeping in touch with educators.

**Ad-T2.5 - School and theatre: differences and shifts (16.07%).** Despite the differences between school and theatre, also in terms of study, the translations in terms of method, self-correction of errors and management of emotions in the classroom are highlighted.

## 5.3. Ed - end of last year (educators)

This latter corpus – made up of the three interviews carried out with educators at the end of the last year of the TTW – consists of 75,068 occurrences, 8,870 forms, and 6,679 lemmas. TAEC classified 1668 ECUs out of 1803 identified ones (92.51%) and divided them into 6 clusters or macro-themes.

**Ed.1 – Using the character to know and express oneself (10.19%).** Firstly, acting and playing characters within the workshop enabled some adolescents to throw off the mask they had built for themselves in their lives, and explore other possibilities. Furthermore, working on gestures and writing their monologues taught them to express and regulate their emotions.

**Ed.2 - Family scripts (16.31%).** Theatrical experience and educational relationship are configured as translational spaces, where one can stage and put into words difficult realities experienced at home. Thus, theatrical experience makes adolescents able to rewrite the inherited family scripts.

**Ed.3 - Group creation and people development in the area (16.01%).** The educational work done with these teenagers led to the creation of a heterogeneous and democratic group, which will still be able to evolve into a group of active citizens – a group of reference adults for generations to come.

**Ed.4 - The relationship with the school (25.30%).** The educators explore the pupils-school relationship (i.e. rejection and re-enrolment in night school) and recount their work of mediation with teachers and support for pupils, and studies. Educators report the difficulty in translating what pupils learned in the workshop into the school context, which has very different characteristics and speaks a different language.

**Ed.5 - The beauty of acting and growing together (13.85%).** Feeling oneself an actor and feeling part of a community not only takes on an important meaning in these adolescents' lives but also in educators' ones since they feel like they are growing together. Art succeeds in conveying beauty, mingling pupils lives and helping them become adults while remaining human.

**Ed.6 - On stage: protagonists and non-protagonists (18.35%).** The roles played by pupils over the years allow educators to trace a path, in a developmental perspective of change. There are those who, against all expectations, managed to play leading roles, or even their own monologues, and those who succeeded in moving on to more choral parts, becoming in tune with the group.

## 6. Discussion and conclusions

By defining school dropout as the result of a process of disengagement, disinterest and detachment from school and as a fracture in the bond between the individual, society and school, we can understand how extra-curricular and out-of-school activities play a key role in dropout recovery, as they promote engagement and predict good school results. In particular, art workshops have the power a) to help individuals give their external and internal worlds a sense; b) to provide an enriching emotional experience; c) to offer opportunities for aesthetic enjoyment, play and fun; d) to function as a means through which building social bonds with other members of one's community and think of oneself as part of a community (Lambert et al., 2023). In this study, we focused in particular on the role that Theatre-Education played in the psychic and emotional development of a group of adolescents and the impact it had on their lives, particularly on their bond with school and territory. Thus, both the adolescent pupils' and the educators' points of view were investigated and compared.

The results show that they agree in considering this workshop as a valuable space in which everyone can reclaim their desire to learn and grow. In particular, both educators and pupils emphasise how theatre allowed these young people: a) to value their own life context and events, by experiencing relationships of authenticity and recognition (Ad-T1.3; Ad-T1.4; Ad-T2. 2; Ed-5); b) to learn to recognise, name and regulate as well as embrace one's emotions, by managing anxiety through the support of the group and the mirroring function of the audience (Ad-T1.1; Ad-T2.3; Ed-1); c) to be able to play and have fun, also through the journeys they have made together (Ad-T1.6), and to translate the aesthetic beauty of theatre into one's own life (Ed.5 ); d) to redefine their bond with their territory, by starting from their ties with their families and schools, through regarding their group as a community and training themselves to be active citizens (Ad-T1.4; Ad-T2.1; Ad-T2.3; Ed.3).

In conclusion, a fundamental aspect of the TTW lies in the possibility of building trusting relationships with peers and especially with a group of adults. Educators are considered trustworthy and they transfer to students the confidence that, one way or another, they will be able to face their challenges and build a bright future.

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# HIGHER EDUCATION DIGITALIZATION - FRIEND OR FOE?

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## Abstract

The direction in our university, and indeed in the whole of Finland, regarding the teaching methods in higher education (HE) was rather strongly towards utilization of the digital tools during the first two decades of the new millennia. This translates to creating flexibility for the students to use. Also, whilst working simultaneously with the studies. The digital proficiency of the staff members was constantly under development schemes. The aim of this study is to examine the digitalization in higher education. There are lucrative benefits to be harvested in using digitalization but simultaneously there are significant risks in their use. In this paper these benefits and risks will be studied through practical examples. The results show the need for different pedagogical and didactic approaches in learning events in higher education.

The year 2020 however, with the pandemic, brought the need to alter all at once to the digital mode; lectures for the students were to be held in Teams or in Zoom, the assignments were to be made and presented there too. The change went rather well, we daresay. Seemed that the worst scenario was avoided. Maybe so, but suddenly the news grew ill with various messages proclaiming that the students were feeling ill. Similarly, the university community saw cracks in the traditional institution. The unity of the university was worse than before, the students did not work together as they did before, the staff was driven away from the campus to work from home, i. e. they could not meet with their colleagues and peers to exchange views and pleasantries.

Now, after the ban has been lifted, the university management wishes the return to the campus. However, the staff has witnessed the virtual mode and working from home to be very adequate to say the least and the same applies to the students. An on-campus day was announced, with other similar measures in order to get the staff back on campus together with the students. In addition, the conundrum presented itself, whether to make the on-site learning events obligatory, to stream them, to record them, or a combination of these features. The students, when asked, reported their willingness to take part in the teaching if 'it was worth it'. I. e. the traditional lecturing, with little interaction bore benefits when watched from home. The answer is that there is no silver bullet to solve various issues with one shot, but rather to address the individual questions case-specifically.

*Keywords: Higher education, digitalization, digital tools, learning events.*

## 1. Introduction

Higher education (HE) is more than just lecturing in a theater. At our university curricula there are assignments, written and presented, prepared, and presented in groups or individually. For this there have emerged various tools for both the faculty and the students. Not more than twenty years ago the transparent rolls were a common sight at our university, as were the blackboards filled with more or less clear handwriting of the teacher. Somewhere they still might be. The last couple of years really promoted strongly for the use of newer ways of working, not only in HE but everywhere. Actually, the newer technologies have emerged in the teaching arena already since at least a decade or two before the corona pandemic. However, the problem may be what is seen as digital tool in the HE. In this paper we discuss the role the technologies play in the HE. The technologies, tools, have been developed and evolved to meet the needs of…, of whom? The developers? The university administration? The university teaching staff, the faculty? The question really is not that simple to answer.

It would be nice to think that the teachers would have the tools they need. Logically the same applies to other areas similarly, for example university administration. However, teaching persons able to

pronounce their needs in a form understandable for the developers responsible for producing the systems is not that common. In the early days, the progress was made on terms of the technologies. There were a number of things that just needed to be executed in a certain way. Because the technological advances weren't as far as they are now. The technical specifications needed to be made in the right way. Thus, the older generation systems are children of that age.

For example, during the first decade of the new millennium, a web page was a default information channel for various purposes. This was the case also for the courses at our university. It was rather strictly formulated what and how information was published. Having said that, already then the use of information and communication technologies (ICT) in teaching at the university level were studied and researched (e. g. Virtanen and Helander, 2005). The use of ICT in teaching was of interest to researchers and teachers alike, both theoretically and practically. The research approached the ICT in HE from multiple viewpoints paving the way for the more modern scrutiny we do today. The best practices for ICT usage in education (Duggleby et al., 2004) were studied but also the relationship between the use of modern technology and pedagogy (Watson, 2001), and also how to compare different innovations in education enhanced by the ICT (Law et al., 2005). This is interesting, because we may find ourselves still pondering similar, if not the same themes.

During the early days the teachers maintained their 'own' pages on the university's server. A teacher might have had an application up and running on the university's server which s/he used in the teaching. Soon thereafter the enrollment onto a university course was also to be executed by using a web application. Since these days gone past, the toolset has grown and become more sophisticated. Already well before the pandemic we moved our examination system to a system. The teacher prepares the exam, the form and the questions, into the system and publishes the exam to the students. The students can enroll to take the exam in the period defined by the teacher on a day and time that suits them individually. The night owls may take the exam in the late hours whereas the other options are obviously around the clock. The lectures may be decided to be delivered solely on-line, or on-premises. Obviously, the question remains whether the lectures are recorded or not and should this be later or simultaneously accessible to the students. And so on, the possibilities are many how to use the technologies in our disposal. These are some of the questions we discuss in this paper to illuminate further the problematics related to the use of digitalization in higher education.

The next chapter describes the more theoretical settings for the area of this paper. Chapter three presents the background from which we have gathered material for our study. Chapter four presents' findings and practical examples found in our university. Chapter five discusses and summarizes the findings.

## 2. Digitalization

Digitalization is a word commonly and frequently used nowadays. It is quite freely used and often without specifically defining what is exactly meant by it. According to one of the more simple definitions digitalization translates to 'create and execute changes associated with the application of digital technology in all aspects of human society' (Stolterman and Fors, 2004, p. 23). In our case, it is rather obvious that the spectrum is wide; some see digitalization to mean merely using electronic means to ease or accomplish tasks whereas some have rethought their work processes anew along the lines of the newer ways of working. Should we like to broaden our horizon, Gupta and Bose (2022) clarify digitalization as a change from designing information systems and designing IT-enabled businesses to designing business models for digitally provided services. The mentioned study observes business environment, but still the exemplary force is there. The university operation may be observed similarly, at least to a degree. Either way, it is possible to use digitalization to aid the initiatives to make the organization and the operation more effective and efficient, perhaps also more streamlined (Hartl, 2019). It is still advised to keep in mind that as all organizations are case-specific structures of men and machines, the actual proceedings are to be studied accordingly.

The area in question and under observation, digitalization, may be further studied and assessed in various ways. One possibility is to divide the developments in addition to the features presented into three categories according to the reference to the time frame: digitization – digitalization – datafication (or digital transformation) (Leonardi and Treem, 2020). Digitization may be understood as a the starting point, when the information was transformed from the analog to the digital form, since the beginning of the computerized age (Bloomberg, 2018). First technologies starting the development were perhaps crude, but they paved the way. Since the nineteen eighties new processes in digitalization emerged as newer approaches to use and utilize technologies. Using newer technologies, the information created, gathered, and stored of and around the organization become more versatile to be used, thus creating more value for the organization as it was also, eventually, more accessible and usable. As this happened, the concept of

digitization turned into digitalization. (Vrana and Singh, 2021) Self-evidently, technologies develop constantly and inevitably. A consequence of the developments is the way technologies are being used as the ways of working develop. This means that many novel things are within the scope of possible innovations. The next step to follow, digital transformation, takes into consideration the well-being of individual people and various qualitative issues, such as whole areas using technologies and information in order to develop the operating models towards more user-centric and user-friendly approach, perhaps even towards more intuitive user experience (Leonardi and Treem, 2020; Zhao et al., 2020). The developments depicted here require not only the technological advances but also developing mindsets of people concerning the way technology is developed, accepted, and utilized.

Yet another approach to investigate digitalization is by studying the interaction it allows and provides, sometimes also demands. In the prior stages the physical object, depiction of reality, was formed into a digital object by hand. There was no virtual linking connection between the two as the mode of operation is offline. The comparison between the digital object and the actual real-life target was formed only by using manual means. This particular mode is typically to be found in the design or planning phase in an operation. (Lattanzi et al., 2021). The following step from the digital modeling is the digital shadow. Digital shadow describes a situation where the digital object automatically gets data from the physical one, but not the other way round. Thus, the feedback the true environment gets, the return loop, is still omitted. This way of executing the operation is most often found in service and maintenance stage. The most refined form of the digitalization is the digital twin. Digital twin means that the data flows back and forth between the physical entities and their virtual counterparts automatically. (Bergs et al. 2021; Sepasgozar 2021) This last form of approach is seen best suited for activities amongst production planning and quality management (Coito et al. 2022; Lopes et al. 2020). The use of the more advanced digital approaches demands a broad know-how and adequate resources from the organization in question aiming to implement these. For example, the use of digital twin type of solution one needs to connect various data sources, operational procedures and processes, and decision-making (Moretti et al. 2022). It seems to be actually rather dependent on well-functioning information management. According to Choo (2002), the goal of information management is to use information resources and capabilities so that the organization may learn from and adapt to its constantly changing environment.

## 3. Background

Tampere University community is a merger formed by the previous Tampere University of Technology, University of Tampere, and the Tampere University of Applied Sciences. The merger of the two previously mentioned universities became effective from the beginning of 2019, simultaneously the ownership of the University of Applied Sciences was handed over from the city of Tampere to this newly formed Tampere University. The individual universities were founded in the sixties whereas the origins of the University of Applied Science go farther back in time. The newly formed university entails nearly all internationally recognized fields of study. The university's spearheads are research and education in technology, health and society. Tampere University is one of the most multidisciplinary universities in the country. The university community has some 32000 students and over 5000 staff members divided into seven faculties. The operation happens on three main campuses in the city of Tampere, third largest city in Finland. In addition there are three university centers in other cities (Lahti, Pori, and Seinäjoki) addressing the more localized needs of those areas. In this paper we concentrate on the teaching taking place in the Hervanta campus where the previous University of Technology mainly operates. Having said that, it is a noteworthy fact that the university has put a big effort to ensuring the uniformity of the operation on all the campuses. Thus, the observations made in this paper are likely to apply on teaching also in other parts of our university.

More often than not the daily routines of the teaching staff members cover also many research related tasks. There are few individuals that are able to focus solely on one area. The pedagogical and didactic know-how of the staff varies, as there are also many individuals teaching with their background in the research. Similarly, the technical prowess of the staff members varies. There are people for whom the technical tools mean making the lectured material to power points and onward to pdfs, but also individuals who are fluent with using the more sophisticated features of the learning platforms. The actual tasks may be categorized roughly to cover teaching (in the center of this paper), research, and administrative duties. The last one is somewhat ambiguous as it may or may not be in connection to the previous two categories.

## 4. Findings

One of the more ground-laying tasks in teaching is that of founding a course. Or should a course be 'inherited' from existing curriculum, maintaining and upkeeping the course. There are options for this. We, for example, have two independent systems for this. Firstly the actual system for building the curriculum, aptly named Sisu, as it requires quite a bit *sisu*[1] to soldier through the necessary steps for a course be ready for the students to start enrolling. One issue with the systems seems to be the fact that the systems is meant to cater for the needs of administration, students, and teachers alike. A person with experience in information systems sees immediately that such multitasking requirement needs compromising or a multitude of various settings and views to the system. There has to be a curriculum, a structure, in the system, with individual courses, before the teacher is able to fill in the details of his/her 'own' course, such as the learning goals and possible prerequisites. Similarly the lecture times and teaching spaces are to booked through an integrated system. Should a person have the routine, this set of tools surely has its benefits to offer. However, if a teacher needs to address these issues rarely, e.g. a couple of times a year at the maximum, there is little chance s/he will be able to get routinized in doing so. Need for a support becomes self-evident. The question remains, how the support is offered. Via the intranet, or is there a support function available? Both require resources, and adequate know-how in their execution.

Students use the same system to find out about the courses as well as to enroll onto them. In addition to the previous the students also need to build their own study contents into the system, according to the requirements of the programme they are registered in. Should a person be interested in a course not directly linked to his/her programme, it may be the case that s/he will not be accepted. In this case a closer scrutiny may alleviate the situation, but not automatically. A byproduct of such procedure is obviously some amount of communication between the student, the student counselor, and the teacher. In the older way of working the previous was handled often in co-operation between the mentioned parties. One obvious benefit seems to be in the end of the studies when the control of the required versus achieved accomplishments is easier to execute.

Another system related to the founding and upkeeping a course or an implementation of it is the learning platform. Our university uses the Moodle. Moodle is a versatile platform on which at least the basic informing about the course practicalities takes place. Depending on the individual capabilities, the teachers may also apply some features from the vast toolset offered by the system. Features may include the publishing of the lecture slides and the lecture recordings, group building, handing in the assignments, but also more sophisticated possibilities like peer reviewing and home exams, to name but a few. The students needed to enroll also in the Moodle, but recently there has been an update so that the Sisu system automatically enrolls student in the Moodle after s/he has enrolled onto a course in Sisu, which is an improvement.

Should we scrutinize teaching more closely, one clear benefit digitalization has brought, is concerning the guest lectures. There was recently a guest lecturer based in a foreign country giving a lecture over the Teams-tool and discussing with student on premises. Both audio and video worked fine between the countries. The lecture was facilitated by the responsible teacher in the class room who also monitored the chat in the system presenting the comments/questions to the lecturer thus enabling the interaction between the lecturer abroad and the students at their home university. When asked, the students responded with having enjoyed a very professional lecture with a Q&A[2]-part with no complaints about the mode of execution. Similarly, regarding the lecturing, the recordings thereof look like a viable development. This is very well liked among the students, who tend to claim that this way they are able to 'attend' the lectures when they are best fitted for it, in case there are other simultaneous things requiring their attention. Also, the recording enable the following of the teaching in parts or repeatedly. The downside of this approach may be the lack of interaction. The previously mentioned guest lecture was for a class of less than twenty students. If there are more students the possibility for interaction and discussions in the 'room' are limited. On top of that there is reportedly the possibility for those distance learners to do something else at the same time, thus not paying their full attention to the teaching.

The students tell that their (group) work habits have changed too. Now a member of a team may be even permanently in a other city and still be a part of the functioning team. This is enabled by the use of the technological tools. This, we feel, raises the question about network building and similar aspects of more social nature which also are a part of student life, how do these fit into the picture? Same type of issue, without the drawback, is the examination system. As described in the introduction of this paper, the Exam system enables the exams to be taken regardless of the hour or the date in a defined period of time, also in various cities in the country, as long as their universities are members in that particular network.

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[1]a Finnish word describing determination, grit, perseverance, guts, etc.
[2]Questions and answers

The teachers are able, and obliged, to mark the papers in a given timeframe which starts when the exam is in the system. After that part they inform the students about their success even with possible individual feedback, if their resources allow this kind of approach.

## 5. Summary

Higher education (HE) is indeed more than just lecturing in a theater. There are the actual teaching, lectured or 'flipped', there are oftentimes assignments, written and presented, prepared and presented in groups or individually. There is a number of tools that the developing technological advances have brought upon us. These tools are to be skillfully and appropriately used by the faculty and the students. The younger generation is sometimes described as more 'savvy' on the technological issues but in HE there is always the pedagogical side to it to be considered. And also, the university's strategy, regulation, and aspirations to be kept in mind, making the entity multifaceted and complex by its very nature. Having said that, it seems, that whichever tools one decides to go on with, the main thing that there is a sound plan, and justification, behind the actions. The approach needs to be planned and organized. Obviously, the newer technological solutions need to be prepared and learned by their users.

The digitalization is a good tool but it must not be permitted to take the charge over the actual pedagogical side, how the things are done. This requires the teachers to be aware of the possibilities the tools bear within and that in turn requires education and training for the educators.

The findings are gathered in one university from a limited numbers of students and colleagues, more rigid research would bring more reliability to the theme of this paper which now merely discusses the issue. Similarly, it would be highly interesting to learn whether these findings appear in other countries in the same manner or are there national differences and features.

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# ASSISTING LEARNERS WITH HOMEWORK: PARENTAL ATTITUDES AND CULTURE, SOUTH AFRICAN CONTEXT

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## Abstract

This study examined the attitudes of parents in assisting their school-going children with their homework. Participants were a purposive sample of 50 parents (Female=27, Male= 23, Black=100%, Rural=100%) with age range 27 to 60 years old. Data on homework assistance were collected using semi-structured individual interviews. The data were thematically analysed. The results showed that parents believed that assisting with homework is the responsibility of educators. South African parents expressed the most discomfort in assisting with homework, indicating that they are in most cases unfamiliar with the contents of homework. Some parents indicated that they are illiterate, and therefore unable to assist their children. Henceforth, parents need resourcing by education department on how to provide homework assistance to their children.

*Keywords: Homework, parents, assistance, culture.*

## 1. Introduction

Some parents to-date still believe that school homework given to their school-going children are the responsibility of teachers. They (parents) in most cases have attitudes and cultural beliefs and as a result reluctant to help their children with their homework. A lot has been researched about homework, but this study explores mainly on the attitude and cultural beliefs of parents around school homework given to their children. It is further believed by some researchers that learners from low-income households are likely to benefit less from homework, than those from higher-income households. Further-more, the educational level of parents may have an impact on the attitude and cultural beliefs, such as educated parents are more likely to be prepared to help their children, while those who are not that educated may still believe that it is the teachers' responsibility. Some parents who still believe and do things the traditional ways, are likely not to help their children with the belief that teachers are solely hired to do such duties. More-over, some parents may not even try to help their children, and indicate some reasons, which this study will strive to find out.

## 2. The concept 'homework' in school environment

Homework is the fundamental stanchion of the education system globally. It may be out of favour with some school-going children, and most defended by teachers. Teachers are indicating that it (homework) serves as a reinforcement of classroom teaching and learning, thus creates discipline and good work habits as well as helping in concentration coupled with memory. However, homework is the sole responsibility of school-going children (referred to as learners), but parents are only expected to play a role of supporting, monitoring and ensuring that their children complete homework. Parents are expected to never do homework for their children, rather assist with it where necessary. More-over, parents should see themselves as the coaches (e.g., soccer coaches), wherein a coach does not kick the ball with the players during a soccer match but advises where needs arise. During the homework doing in a Black society, some parents still have attitudes and cultural beliefs, e.g., attitudes like 'it is the responsibility of teachers to help their children', forgetting that homework is to be completed at home, and some also have a cultural belief that says 'helping their children will make them weaklings'. These above-mentioned (attitude and cultural beliefs) in most cases generates a lot of tension between children and parents. Cooper (1989) postulated that homework is a group of tasks assigned to school-going children by teachers that are meant to be carried out during non-school hours (implying after school and at home).

### 3. Ethical considerations

Struwig & Stead (2001) stated that conducting research is perceived as an ethical enterprise. It is imperative that moral behaviour should be considered upon conducting research. The researcher was granted ethical clearance approval by the University of Technology Ethics Committee of the Faculty of Humanities to conduct the study. The researcher indicated that at no stage will his participants be known to any person. Further-more, the researcher indicated that participants' rights and privacy will be considered and protected, and hence they will have an option of disclosure or non-disclosure of their identification. Of importance, participants were made aware that, should they feel offended at any point, they are free to discontinue with the research, as they took part willingly. Over and above, adhering to principles of voluntary participation and informed consent, participants were also guaranteed confidentiality of their responses and anonymity of their identities.

### 4. Data analysis

Burns & Grove (2009) posited that data analysis is a process conducted to reduce, organise, and give meaning to data. The Statistical Package for the Social Science (SPSS) version 19 was used to perform the analysis of the data. Data were summarised and presented.

### 5. The impact of social class in helping children with homework

It has been found by research that social class plays a role in helping school-going children with their homework. Robinson & Harris (2014) posited that parental involvement in school activities, such as homework, increase with social class. Cooper et al. (2000) maintained that middle-class parents are more likely than poorer parents to provide necessary support and guidance for their children' autonomy in their homework. On the other hand, working-class parents are likely to face some structural barriers (such as lack of human capital) to helping school-going children with their homework. However, Coleman (1988) posited that family background could impact children's achievement through financial capital, social capital, and human capital. Parents through advising and supporting their school-going children in their homework, serves as a means of activating social capital within a family. Further-more, parents with high levels of human capital may pass their skills through homework help.

### 6. Data and fieldwork methodology

This study on parental attitudes and culture in helping school-going children with homework has been quantitative. For this quantitative study, Black parents living in rural areas were interviewed at random about their feelings in helping their school-going children with homework. These parents were from different social classes. Parents were asked the interview questions in busy streets in different towns in the Free State Province, South Africa. Fifty (50) parents were interviewed, with the goal of randomly selecting them from different social classes. 22 parents were from middle class and 28 were from the working class. In the interviews with parents, there were questions such as' who should help children with homework?', 'how parents feel about helping their children with their homework'? 'What type of help are they providing, if any?'. Follow-up questions and probes on how parents are involved in helping their school-going children with homework, what their expectations are, what attitudes do they have, and what are cultural beliefs around homework.

### 7. Parents versus school homework

It must be mentioned that this issue has been in discussion for a long time. Many parents are on the fence about homework. Some believe that it does little for their children's total achievement at the end of the academic year. Whatever the parents' views, it is known that there are gains in learner achievements, but it depends on how much time a learner spends in doing homework. Parents, therefore, have a role to play in their children's homework. It is vital for parents to be made to understand the importance of homework, its purpose as well as the amount that is assigned and the consequences thereof if their children do not complete their homework. Parents may explain to their children that homework is extremely important and valued at home by providing an appropriate place for it. They (parents) as a sign of support to their children are to provide needed resources (e.g., scientific calculator for both Mathematics and Accounting) They must show interest in what their children are doing and be actively involved. Further-more, parents are also to monitor their children's homework completion. Of high importance, parents should refrain from doing homework for their children, rather provide support and guidance.

## 8. Results

These results are based on the responses provided by interviewed parents, in responding to the interview questions.

### 8.1. What is your view on homework given by teachers to your child?

60% of the interviewed parents believed that homework is for children to do, and parents have no knowledge of the subject or content. As a result, they are not able to assist their children. They still maintain that teachers are specifically hired to help in this regard. A quote from one respondent in Sesotho *"Ke nahana hore botitjhere ba batla re ba etsetse mosebetsi, nna ke tswile sekolong ke bala sehlopha sa botshelela, empa ba batla ke thuse ngwanaka a sehlopheng sa leshome/ kgerateng ya leshome le metso e mmedi"*. A translated version into English reads as follows: *"I believe teachers want us to do their job, and I have only gone to school up to the former Standard 6 and how will I be able to help my Grade 12 child"*. Some of these parents believed that it is against their culture, as in their culture children are taught to do things for themselves in order not to depend on other people once they become parents. Further-more, these parents still hang on to the idea that says 'if you do things for yourself, you learn faster'; as a result, they want their children to learn faster. Most working parents in this group believes that they are tired at night after coming from work and literally do not have time to do teachers' work. Some even suggested that homework are to be completed at school where teachers can help. It must be noted that these parents are mainly for children attending school in the townships. They (parents) maintained that their respective School Governing Bodies (SGBs) did not encourage nor indicate to them that they need to help their children with homework.

The 40% of the interviewed parents believed that homework believed that it is proper to help their children with homework. Most of them are middle-class and maintained that it is their parental involvement that encourages them to help their children with homework. Further-more, they indicated that helping their children will help them support, maintain healthy relationship between them and their children, as well as to be able to monitor their children's progress at school. One parent was firm in providing some reasons why it is important for him to help his child with homework; he said, *"homework explicitly require parents, it is very good when your child get from school and you monitor him doing his homework, and if something is not unclear to him, he asks me, I gladly take the opportunity to help"*. One parent said the following in response to the question in Sesotho *"Ke thusa ngwanaka hore a tsebe ho pasa a tlo itshebeletsa"*. A translated version into English reads as follows: *"I am helping my child with homework so that he/she can pass and become a better person who can work for herself"*. It was evident that parents falling in this group maintained that it is an obligation to help their children with homework.

### 8.2. Do you have attitude (negative or positive) towards helping your child with school homework? Can you elaborate?

53% of the interviewed parents indicated that they have a **negative attitude** towards helping their children with homework. They responded as follows:

- I need my space after work as I am tired
- I am not a learner, as a result I don't have to do any schoolwork
- I am paying school fees for teachers to help my child with homework
- I have no idea of what these nowadays school homework requires
- Unfortunately, I can read and write, hence I cannot help
- I have a feeling that I may mislead my child and fail the task
- I am not relevant to the content, meaning I am clueless
- Teachers must do the work they are paid for (work of helping learners complete their homework
- Unable to distinguish between class work and homework, and believe all the works must be completed at school
- My parents did not help me do my homework

These above-mentioned responses indicate that some parents still do not want to take part in the education of their children. Parental involvement is non-existent in their vocabularies. They still cannot believe that even if they are not that much educated, they can help by simply monitoring that homework are completed. These responses show an element of being "*selfish*" not being supportive in the educational journey of their children.

47% of the interviewed parents indicated that they have a **positive attitude** towards helping their children with homework. They responded as follows:

- I want to be part of my child's preparation for the future
- I want to follow my child's progress at school

- I need to be a responsible parent
- I want to create a good and healthy relationship with my child
- Helping my child is a sign of love to him
- I want to do what my parents did not do to me, helping with his homework
- I need to provide encouragement and be a supportive parent
- I must be exemplary to my child
- I want to positively contribute to the success of my child

These above-mentioned responses indicate that some parents still do want to take part in the education of their children. Some in this group indicated that they are SGB members in the schools of their children, and thus saw a need to help in the completion of their children's homework. These responses are the signs of commitment from these parents.

## 8.3. Does helping your child with school homework temper with your cultural beliefs?

Some parents still believe that helping their children with their homework temper with their cultural beliefs. This becomes evident whereby one male parent indicated that he cannot sit closer to his daughter, as it is against his cultural beliefs. As a result, this parent does not help his daughter. Some cultural beliefs separate the closeness between women and man, it is more evident when they attend circumcision schools.

## 8.4. Provide any comment about parents helping their children with their homework

Generally, parents differed in this section wherein they go to opposite sides, one side said they do not like doing homework for their children, whilst the other side were not having any problem in helping their children with their homework. Some parents boldly indicated that they hate homework, as it takes their time when they come from work, they wanted just to rest. Those who were interested in helping their children also highlighted that there should be a limited homework per day. They complained that too much homework made them lose focus and at times help their children by providing incorrect responses. Some parents enjoyed homework in Sesotho and English because they could easily understand and help with activities.

## 9. Discussion

In maximising the benefit of homework to parents, parents are expected to know their role in helping their children in completing their homework. According to Chin & Phillips (2004) parents' relationships with homework could take three essential forms, namely **(1)** substantive assistance, **(2)** monitoring assistance, and **(3)** fostering independence. The results as discussed above, reflects these forms, as per discussion to follow.

## 9.1. Substantive assistance

In this form, parents are assisting their children with the actual substance of the homework. The middle-class parents normally provide this form of assistance. Therefore, this suggests that these parents are activating their social capital to pass on their own human capital to their children. These parents do not only help with homework but also the children's preparation for tests, go through the homework. The parents in this form are expected to provide supplementary material, also help with the computer operations. Children in this form, are also expected to ask for help with specific regard to resources he or she may need.

## 9.2. Monitoring assistance

A very small number of parents provide homework assistance through monitoring. As a result, there is no substantive help with homework. Monitoring encompasses making sure that the child completes the homework without engaging in the substance of the work. In this form, parents are only making sure that homework has been completed in the expected format. Children in this form are allowed a greater independence in doing their homework. Parents in this form are only going through the completed homework. Partly, this form has a little bit of an element of parents who have cultural beliefs.

## 9.3. Fostering independence

In this form, parents do not offer substantive help with homework, with the reason being they feel that children have achieved homework independence. Homework independence implies the decision either by children or parents, detailing that a child is now ready to complete his or her homework independent of parental assistance. Some parents believed that they can still offer some help, but children need to be taught

responsibility and accountability at one stage. Most parents can monitor and foster independence, and this found across social class. Fostering homework independence is seen as a process whereby parents ease out of providing substantive help to their children. Children are allowed to take full responsibility for their homework completion on their own. The results of this study suggest that for a child to be homework independent is not entirely under parents' control.

## 10. Implications / recommendations

This study recommends or has the following implications:
- School Governing Bodies are to be empowered through workshop and conferences by the Education Department in encouraging parents to help their children with their homework.
- Schools should have a clear policy on the role of parents with specific reference to school homework given to their children.
- The different roles to be played by parents to be clearly explained to them.
- A flexible contract (around the homework completion) to be entered into between schools and parents of learners.
- All school stakeholders, including learners (in a case of Secondary schools) are to have regular meetings to monitor progress.
- An awareness programme dealing with the importance of homework completion by learners.
- Further-more, parents need to be supported by School Governing Bodies in understanding the importance of helping their children with their homework

## 11. Conclusion

From the results of this study, there is an extensive gap between parents' understanding of helping their children with homework. The results clearly indicate that some parents still adhere to their cultural beliefs, and some still have negative attitudes towards helping their children with homework. To-date, some parents still hate helping their children with their school homework.

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# EXPLORING ALTERNATIVE PEDAGOGICAL SPACES TO SUPPORT 21ST CENTURY SKILLS DEVELOPMENT

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## Abstract

21st century skills include competences for everyday life and work, such as cooperation and teamwork, creativity, critical thinking, and problem-solving skills, which are also developed in the pedagogical space. In the framework of this research, we sought to find out in which pedagogical space alternative schools, which have declared to develop 21st century skills in their pedagogical programme, implement competence development.

***Keywords:*** *Competence development, pedagogical space, autophotography.*

## 1. Introduction

The need for the development of 21st century skills in school education has come to the forefront of professional interest and several attempts have been made to take them into account (Molnár, 2013). Taking into account different approaches, they include competences necessary for everyday life and employment such as cooperation and teamwork, creativity, critical thinking, problem-solving, information literacy, flexibility, adaptability, initiative and self-regulation (Molnár, 2013; Vass, 2020).

The learning environment plays a significant role in the development of learners' skills and competences, including the social and cultural context of teaching and learning, the method of teaching and assessment, the processes of learning organisation, the technical tools, media, materials, programmes, group size and composition, and the physical and online environment of learning at home and at school (Komenczi, 2016, Imms, 2016), i.e. the pedagogical space: School architecture, school space layout, the school's natural and infrastructural environment, classroom design (Hercz & Sántha, 2009). Furthermore, pedagogical space is both a functional and intentional expression of pedagogical thinking, and it influences communication and limits the pedagogical methods that can be applied (Kemnitz, 2001, 2003 cited in Hercz & Sántha, 2009).

## 2. Methods

The aim of our research is to investigate the implementation of program-appropriate pedagogical spaces in alternative schools. The starting point is that the development of 21st century skills presuppose the existence of suitable pedagogical spaces, therefore, in the framework of this research we sought to find out in which pedagogical spaces alternative schools, which have declared their commitment to the development of 21st century skills at the level of the pedagogical programme, implement this. In order to explore this, we analysed the pedagogical programme of the schools in relation to their goals for skills development and the pedagogical space, and we used the method of autophotography to analyse the pedagogical spaces; we used the method of visual content analysis to analyse the photos and qualitative content analysis to analyse the commentaries (Sántha, 2011). The research included 5 alternative schools that were founded 25-30 years ago and, in their case, the pedagogical space was "born out of necessity", i.e. they operate in a traditional school building, and 3 alternative schools that were founded in the last 5 years, so the choice of the "school building" and the design of the pedagogical space was made according to their own ideas.

## 3. Results

In Hungary, the freedom to design pedagogical spaces is limited. The design of spaces is influenced by the building in which it is located, when it was built and what its original function was, and by strict rules on the design of school buildings. "One of the most stable guardians of a school's history is the building, the classroom, the school desk. The traditional school, anchored in concrete, brick and building structure, does not allow change, even if the people inside it all want something different" (AKG Pedagogical Programme, 2009 cited in Hercz & Sántha,2009, AKG Pedagogical Programme 2020), and the mandatory legal requirements for school buildings give us the image of a "well-functioning children's factory, an efficient office" (AKG Pedagogical Programme, 2020). Nevertheless, the mandatory requirements, the environment and the lack of resources are obstacles to the programme-oriented transformation of the educational space, which is why the principles and functions of the layout of the educational space are not part of the educational programme in most schools (cf. AKG Pedagogical Programme 2020)

### 3.1. The original function of the school buildings

The above definition is supported by the fact that, in terms of the original function of the school building, only one of the alternative schools studied was specifically designed for the alternative school, taking into account the main educational objective of the school, namely proximity to nature and environmental education, and therefore, unlike the other schools studied, the school building was built of natural materials (stone, wood) and located on the edge of the forest, in the nature.

The situation of the other alternative schools is less favourable in terms of building. Some of them operate in school buildings that were built as traditional schools decades ago, while others were not originally designed as school buildings but were converted from shops, offices, apartments or family houses for the alternative school. All these factors and the possibilities offered by space also determine and define the space constraints of alternative schools.

### 3.2. Interpreting the learning environment in educational programmes

As already mentioned above, even in the case of alternative schools, there are only a few pedagogical programmes that describe the principles and functions of the pedagogical space, and in our case only four schools make reference to this. The schools that did discuss pedagogical space formulated their own concepts in terms of learning space, school and spatial layout. The results show that the learning environment (Figure 1) is understood as both an internal and an external learning environment. For the internal learning environment, its characteristics were named as open, real-life, extended, mobile, inclusive, diverse, but for the external learning environment, its possible locations: nature, society, online, VR, AR and informal learning settings, he above definition is supported by the fact that.

*Figure 1. Interpreting the learning environment.*
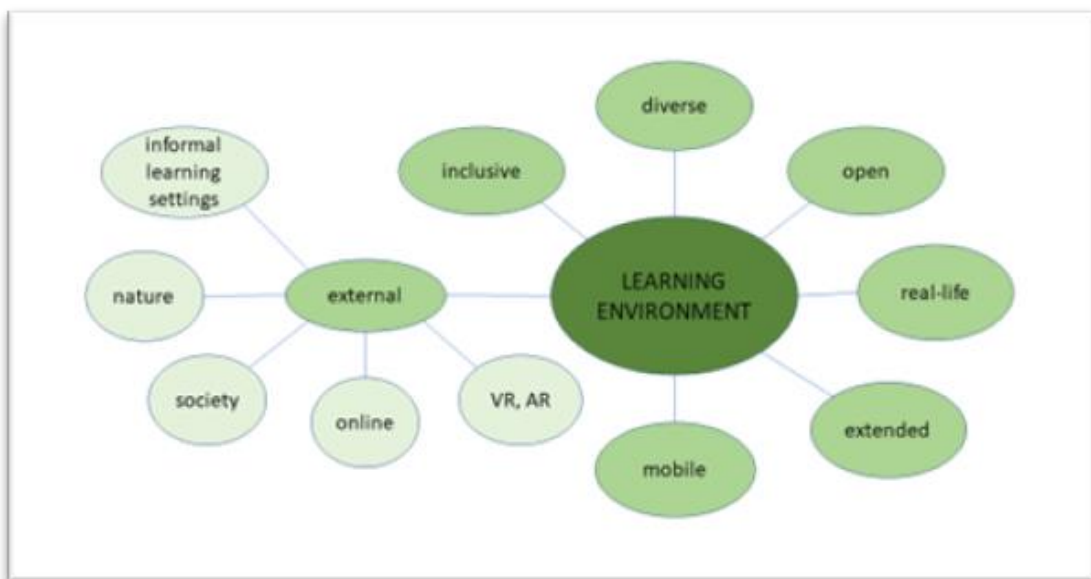
Figure 2 summarises the school's approach. Here again, the emphasis is on the naming of characteristics: familiar, demanding, inspiring, motivating, transparent, providing security, cozy, and, in the case of the adjective open, which is already used for the learning environment, not only the openness of the internal school spaces but also the openness towards the immediate environment of the school, which is in line with the principle of placing the learning environment outside the school.

*Figure 2. Interpreting the school.*
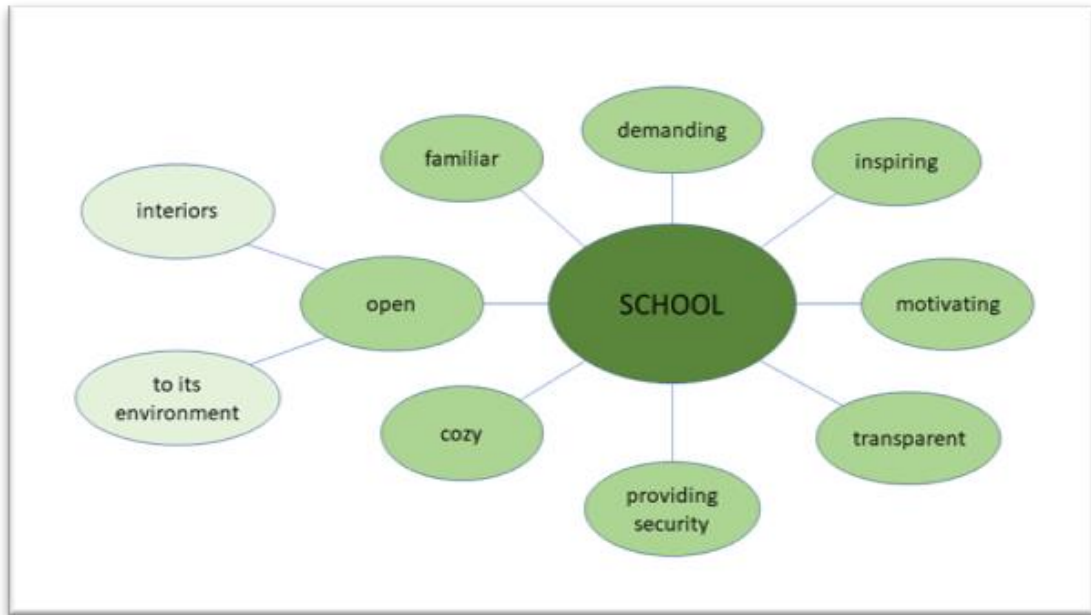


Figure 3 shows the principles for the layout of alternative schools. These include collaborative design, the importance of which has been pointed out by architects and environmental psychologists involved in the design of school buildings (Flutter, 2006; Rauch, 2000; Heylighen, 2015). In addition, emphasis is placed on openness, flexibility, adaptability to the child, accessibility, transparency and differentiation, that allow for varied learning organization, versatile communication and opportunity for retreat.

*Figure 3. Principles for the layout of alternative schools.*
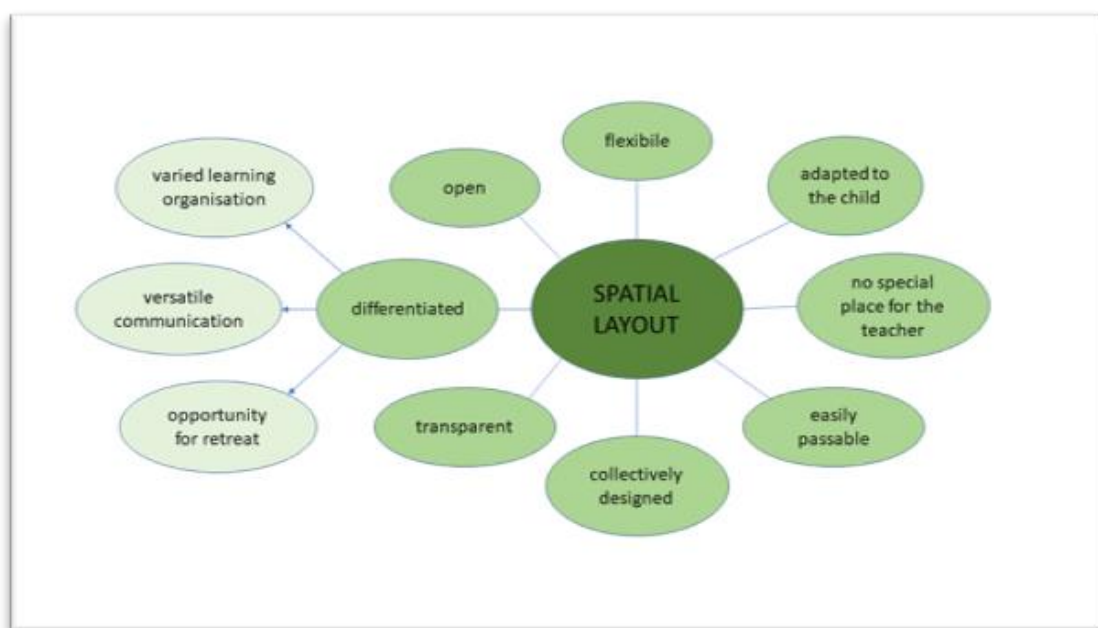
### 3.3. Space design models

The photos of the schools were compared with Imms' (2016) models of learning spaces and it was found that all of the possible configurations of learning spaces (Figure 4) were identifiable.

*Figure 4. Typology the learning spaces (Imms, 2016).*
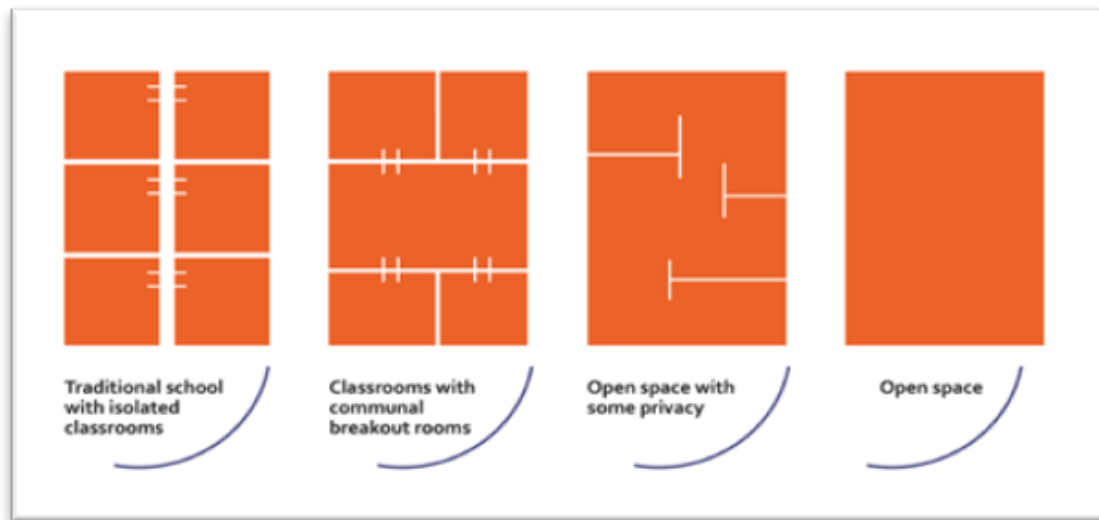


In alternative schools that found a place in a traditional school building and could not afford a major conversion, the traditional isolated classroom layout with a corridor was retained. In these schools, the interior design and layout of classrooms and corridors and common spaces are being adapted to make the pedagogical space suitable for the development of 21st century competences. The schools that have undertaken the conversion of old school buildings have been able to implement the concept of the 'tenement school', in which individual small schools, made up of several classes, are given independent housing as communities (cf. Classroom with communal breakout rooms). This includes classrooms, free-use communal space, a changing room and locker area, a study room, restrooms and a kitchen. In addition, as far as the building allows, there will be open spaces for free communication and personal space for students.

Newly established alternative schools also strive to create classrooms with communal spaces or, where possible, open learning spaces, taking into account the building used for the school. One of the new alternative schools has deviated from this approach and has developed a specific solution for the layout of its spaces. The school is made up of a network of independent, spatially separated 'micro-schools'. Therefore, the heterogeneous age composition of the groups that make up each micro-school is not confined to a single building, but is scattered throughout the city or in several cities, and the micro-school is often located in a family house, flat or office. In these micro-schools, open learning spaces are preferred, but there is only one group of pupils per learning space and the groups are not connected.

The results were also compared with effective school models such as "school outside the city", "school of encounters", "school on an island", "school in the city", " school closures", "life space school", "castle school" and "ring school" using the circular architecture solution (Hercz & Sántha, 2009). Of these, the 'school outside the city' model was clearly identified for one school, while for the other schools, regardless of the school building, the 'life space school' and the 'school of encounters' models were identified, which differ significantly from the design of pedagogical spaces in the majority of schools.

## 4. Conclusion

Summarizing the results of the research, it can be said that the external and internal environment, functional spaces and spaces of pedagogical action of the schools studied are suitable for the application of methods supporting the development of 21st century skills, due to their openness, flexibility, transparency and interoperability. Even alternative schools operating in traditional school buildings have shown a number of specific solutions that suggest that, while respecting the legislation on school buildings, alternative school spaces can be adapted to mainstream school spaces.

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# THE EVOLUTION OF TEACHING EVOLUTION

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## Abstract

Like many other scientific theories, teaching biological evolution involves two fundamental challenges. First, the theoretical conceptualization is complex and includes many mathematical and genetic models. Second, timeframes required by biological models to demonstrate evolutionary processes make it challenging to visualize and understand them, especially in the context of introductory courses (e.g., high school, first-year undergraduates). Typical approaches to this challenge include simple narratives of events and evidence to get the students to grasp the basic idea that evolution exists. Alternatively, the evolution class is included later in the programs when students have been more exposed to natural sciences and biology information. Unfortunately, this late arrival of evolutionary theory study may leave some students to rely on intuition and even ideas unsupported by scientific evidence. As an alternative, game-based learning allows for a different approach to engage students of any level. However, game-based strategies may be stigmatized as tools to learn scientific theories under the assumption of a trivialized version of complex phenomena. Here, I propose strategies involving play and experimentation to achieve the appropriation of concepts with a learning-by-doing approach. These strategies rely on accessible material, becoming easy to implement in any school or university around the globe. This work collects more than 15 years of experience using games to bring students closer to theoretical concepts challenging to acquire from evolutionary theories (e.g., natural selection, genetic drift, or phylogeny). Notably, while focusing on students majoring in natural sciences (biology and earth system sciences), I also include experiences with a student from other disciplines. The systematization of this process includes interviews with students who inquired about crucial concepts before and after the experience and with participants that subsequently used these concepts in their advanced courses in biology or other natural sciences. The research indicates that the implemented games fostered an understanding of the theory developed general thinking skills, and are efficient tools for learning complex topics such as vicariance or evolutionary convergence. Remarkably, these results have proven to be replicable and support a central role of gamification to address issues in genetics, ecology, or socio-ecological systems, without compromising the rigor with which scientific theories support them should be addressed.

*Keywords: Biological evolution, game-based learning, science games, student engagement.*

## 1. Introduction

Evolution is considered the basic theory of biology (Dobzhasky, 1973). Since the publication of The origin of species through natural selection (Darwin, 1859), the theory of evolution has been strengthened and has been changing. One of the most decisive changes was called The modern synthesis, where discoveries in genetics, both organismic and population, are added to Darwinian theory and articulated with systematics and new discoveries in paleontology (e.g., Fisher, 1930; Haldane, 1932; Simpson, 1944). After this, evolutionary processes have been articulated in The Neutral Theory (Kimura, 1983), Sociobiology (Wilson, 1975), and Evolutionary developmental biology (Carroll, 2008), among many other areas of biology and genetics. It makes evolution a science with a high content of mathematical modeling, especially in the population component. For this reason, it is usually taught superficially in high school and, generally, is not taught in the first undergraduate semesters because it is considered that students do not know enough genetics and mathematics (Mead et al., 2017). Because of this, more emphasis is placed on the history of evolutionary biology than on the evolutionary processes or the mechanisms that allow species to adapt to their environments, leading students to be unclear about the accepted model for science and to confuse the postulates presented by pre-Darwinian authors with those presented in the theory of evolution by natural selection.

Consequently, the student builds responses and routes intuitively, trying to explain biological phenomena without the key concepts to explain them. It leads to inadequate responses from a scientific point of view (Tidon & Lewontin, 2004; Andrews et al., 2012). Many of them reinforce common errors such as linearity in evolution, the search for perfection or adaptation as a response to necessity, or even affect the understanding of other areas of biology, such as ecology (Tolman et al., 2021). Despite this, there are few efforts to ensure that students at these levels, high school and first semesters of undergraduate, receive evolution courses, even though it has been shown that in the cases in which this is done, the understanding of biological phenomena becomes simpler (Jördens et al., 2016) as a consequence of having greater clarity in the basic theory of the discipline.

In this article, we show the impact of teaching evolution using game-based strategies to first-semester students of natural sciences majors in two groups of students: students who were studying the class that semester and professionals and natural science students whom they had seen the class at least two years earlier.

## 2. Presentation of the experience

The question of how to teach evolution without using a robust mathematical foundation first arose in 2002 when the challenge of how to teach the basics of evolutionary theory to elementary school teachers so that they could replicate the experience with their students arose. In Colombia, primary school teachers (children between the ages of 5 and 11) receive specific training in pedagogy and didactics, but their disciplinary knowledge is introductory. In most cases, a single teacher is responsible for teaching children concepts and skill development in literacy, mathematics, natural sciences, and social sciences, so their specific knowledge in subjects such as biology is minimal. One answer was through a game that would allow the interaction between predator and prey to be evaluated in a straightforward way; thus, it could be explained how there are no perfect solutions for this interaction. This game involves two fundamental elements: silverware, which are the predators, and buttons, which are the prey. The buttons are placed on a flat surface, and then each player chooses an item to be a predator and, for a specified time, "eats" as much as possible. After each round, simple statistics are performed to identify population changes. As a result of participating in the game, the teachers learned that diversity in populations is part of their success and that each individual can perform better or worse depending on environmental conditions, competition, and their own abilities, a reflection of their genetics and interaction with the environment.

Between 2004 and 2013, while I was teaching biology courses for students from different health sciences majors, the challenge of teaching evolution reappeared as the theory allowed us to explain phenomena such as bacterial resistance to antibiotics or the problems that occur in populations due to inbreeding. It led to expanding the game using buttons with similar physical characteristics (size, weight) that show the possibility of survival of a fundamental character (color) over the generations depending on the rules with which the reproductive processes are generated. This version also shows the effect of mutation, genetic drift, and gene flow on populations.

In 2014 the Universidad del Rosario created the major in Biology. There, I had the opportunity to design and offer a first-semester general biology course called Evolution of Life, whose purpose is for students to understand, from the beginning of their undergraduate, how evolution is behind all biological phenomena, from cell diversity to ecosystem interactions. Once again, the challenge is that the students do not know enough mathematics or biology, and their knowledge of genetics is, in the best of cases, simple Mendelian inheritance. In this course, the laboratory space is used to build new experiences and new games, such as allopatric speciation and vicariance, using colored pencils and paper cards; reconstruction of kinship relationships using shoes; or showing students that science is not unambiguous and a problem can have several valid solutions from a scientific point of view, using colored geometric figures. In this already matured educational experience, two questions arise: did they really learn and adequately manage the concepts presented? Especially those considered difficult such as genetic drift or vicariance; did the skills and concepts developed through these types of games serve them in their subsequent classes?

## 3. Strategy evaluation

To evaluate the experience, two different strategies were designed: Concept management evaluation before and after the experience with active students in the class and retrospective evaluation of the appropriation of concepts by former students of the course.

### 3.1. Evaluation of active students in the course
During the year 2022, I collected information before and after the activities with student volunteers to whom, through interviews, I asked about concepts that were going to be developed or to be deepened in

the activity and verified understanding. I also asked about how these concepts could be used in biological contexts, no longer in simulated systems such as pieces of colored paper or shoes. After the activity, in some cases immediately after and others the following week, I asked again about the concepts and their use in biology. These data made it possible to show how precise the conceptual management and the application of these concepts were before and after. The data were qualified and quantified to facilitate their analysis. Sixteen different concepts were evaluated (How to read a tree, Homology and convergence, Phylogeny, Gene drift, Gene flow, Mutation, Bottleneck, Natural selection, Phenotypic diversity, Adaptation, Sexual selection, Sexual vs. natural selection, Allopatric speciation, Vicariance, Coevolution, and Biogeography) which are consolidated in 10 different games, each of them developed in a three-hour session, in groups of 3 or 4 students. The compared distribution for the 16 concepts before and after the activity in the first and second semesters of 2022 (Graph 1) shows that in all cases, more significant learning of the concepts was demonstrated after carrying out the activity.

In the first semester of 2022, the most significant difference was found in the conceptual management of bottleneck (7), biogeography (16), and how a mutation persists differentially in large or small populations (6). For the second semester of 2022, the most significant learning was evidenced in the conceptual management of the impact of gene flow on large and small populations (5), homology (2), and, again, bottleneck (7). The minor differences were, in all cases, obtained in topics where there was a high number of students with good conceptual management prior to the activity, such as natural selection (8) or allopatric speciation (13), which shows that the activities are more effective in cases where students did not have a good grasp of the concepts prior to the game.

*Graph 1. Management of basic concepts in biological evolution, pre- and post-experience,*
*by first-semester students of Biology and Earth System Sciences.*
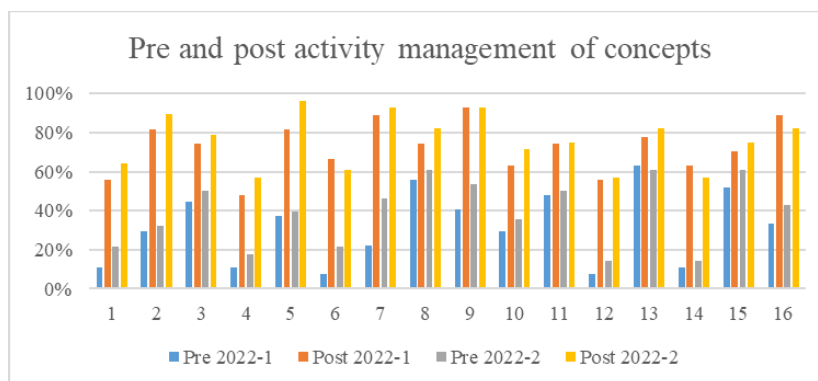


The topics with the slightest understanding prior to the activity are those that involve complex relationships between variables, such as genetic drift and its impact on populations of different sizes (4), vicariance (14), or the relationship between natural selection and sexual selection (12), all topics that traditionally are not covered in introductory biology courses. In general terms, students are improving their understanding of evolutionary concepts with the activities, as can be seen in the average difference before and after the experience –first semester 31% vs. 72%, and the second semester 40% vs. 76% – statistically significant differences in both cases (Student's t test, $p > 0.0001$).

At the end of the course, the students were asked about the space or activity they had learned the most. All the students mentioned activities or spaces that corresponded to the theoretical activities. None of them did mention games as learning spaces.

## 3.2. Evaluation of former students in the course

To assess the level of recall and learning of the concepts in students who had completed the course, a survey was carried out with the following open questions: what did they remember about the course, what had they learned very well, what things they learned in that course had served them later, and what things they learned in the course besides biology. The survey was answered by 53 students who saw the course between 2015 and 2020. In order to build word clouds, and considering that the data was collected in Spanish and through open questions, they were categorized. For example, The card game, Color cards, Vicariance, The islands and Allopatric speciation were all named Vicariance.

Given the first question (Figure 1), what do you remember about the course? Most students used the word Game in their answer (10 students), followed by learning (5 students).

*Figure 1. Word cloud is built with what former students remember the most from the course.*



Talking about the learning of the course in general (Figure 2), 16 participants said they had learned what natural selection is, followed by the concept of gene drift, which was mentioned by 15 of them, and by evolutionary mechanisms (i.e., gene drift, gene flow, mutation, and natural selection). Some of the former students mentioned more than one learning.

*Figure 2. Word cloud is built with the concepts that former students remember as learning.*
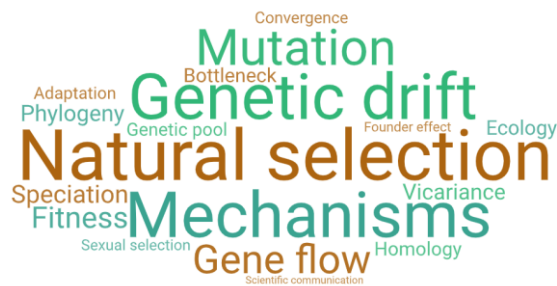


Participants were asked for the practice with which they learned the most. Thirty-one students mentioned button practice (evolutionary mechanisms), eight phylogeny, and six vicariance. When asking former students for the concepts they found most helpful in their subsequent courses (Figure 3), evolutionary mechanisms (25) are highlighted, followed by phylogeny (12).

*Figure 3. Word cloud of the concepts that former students identify as the most useful in later courses.*
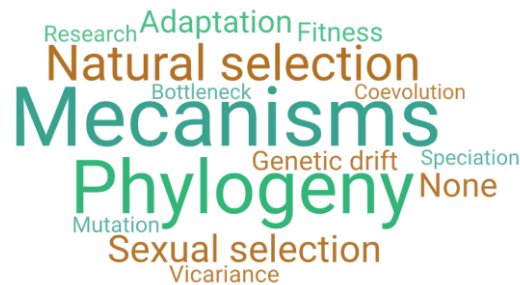


Asking participants about other things they learned in the course, in addition to biology (Figure 4), critical thinking and communication (each with ten mentions) and creativity and reading (with eight mentions each) stand out. Only one of the students who answered the survey did not remember any activities or work carried out in the course.

*Figure 4. Cloud of words shows other things former students recognize as learning in the course.*

## 4. Lessons learned from experience

The data presented in this article is not conclusive due to the low number of students and former students surveyed; however, it does show a trend worth considering. In all cases, the participants are reaffirming concepts related to biology and evolution, and learning of particularly complex concepts such as genetic drift, vicariance, or the relationship between sexual selection and natural selection is evident, topics that are not usually included in most basic courses because it is assumed that without advanced mathematics and genetics, students are incapable of learning these concepts.

The collected data from the former students is exciting in several aspects. First, most of them remember the course experience as fun and pleasant, and they highlight the use of games as a learning strategy. When asked about their learning and subsequent use, they indicate the use of complex concepts such as phylogeny or the mechanisms that drive the evolutionary change. In addition to the concepts related to biology and evolution, it is noteworthy that former students identify the class as a space for developing communication and research skills. Several refer to soft skills that allow them to perform better in diverse groups, such as active listening, creativity, and appreciation of diversity.

It is crucial to consider that this approach of using games to appropriate concepts in evolution is a process under construction since groups and strategies also evolve. For example, in 2015, I used caminalcules for tree and phylogeny activities. These animal-like shapes had the drawback that students spent much time trying to match their structures to the structures of real animals. It was solved when the caminalcules were replaced by shoes. At that point, the discussion stopped being whether or not a stain was an eye and became what the characteristics that define a specific group of footwear were. It is essential to keep this in mind because the students are changing, and in the same way, the games cannot remain static over time. The primary tool to improve the games is the improvements that the students propose when using them. The data obtained before and after the games clearly show that the students consolidate their knowledge during the practices, although they are not being aware of this. It is striking that games are much more critical for students who took the course at least two years ago than for those who are taking it. It may be due to the need of first-semester students to say what they think the teacher expects, while former students do not have these restrictions, and therefore their opinions are more explicit.

Finally, these data confirm two fundamental aspects. The first is that it is possible to teach evolution, including complex concepts, to students who do not have advanced genetics or mathematics knowledge, getting them to learn. Second, early learning of evolution, its mechanisms, and its impact on biodiversity allow students to use these concepts in later courses and their research processes.

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# A CASE STUDY OF PSYCHOEDUCATIONAL INTERVENTION FOR LANGUAGE LEARNING

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## Abstract

This paper presents a case study focused on psychoeducational intervention for supporting language learning. It concerns a child that lost about 80% of hearing functioning at 11 months age, caused by an occlusive otitis. Despite successful surgery, the child didn't learn to talk. The paper's objective is to briefly describe the psychoeducational intervention used. This was based on inclusive practices aimed to develop language skills, and carried out by an interdisciplinary team in collaboration with primary school teachers. The methodology used for describing the case study consisted of a naturalistic observation that allowed collecting information on changes as result of the intervention. This permitted the analysis of the insights generated through practical experiences, and to find evidence in research on language learning. Also, the results emerged through the observation of this case study provided useful elements for encouraging the exploration of psychoeducational intervention's potentiality, and inspire future trajectories of research.

*Keywords: Case study, Auditory Processing Disorder, psychoeducational intervention, language learning, inclusive practices.*

## 1. Introduction

The language has specific characteristics such as creativity, structure, content (e.g. morphology, grammar, emotion). Also, speech recognition requires high performance of the auditory system. Some pathological processes can interfere in its understanding or production. For example, the form and content of language can be altered by lesions of central or cortical structures, aphasia as well as sensorineural deafness or psychiatric pathologies. Regular and universally widespread stages in language learning have been observed in different cultures. What is unclear is whether language learning derives from specific and dedicated nervous structures or from general cognitive abilities (Mayeux, 2001). This article analyzes the interference of a pathological event and how psychoeducational intervention can provide useful elements for rehabilitation and creation of an inclusive environment facilitating the development of communication and expressive skills.

## 2. Background

This paper presents the case of a child who became temporarily deaf due to an occlusive otitis that caused the loss of about 80% of hearing functioning. It happened from 11 months to 2nd year of age, an important phase for language development. Initially, the family noted many differences in relationship and behavior if compared to his twin brother. In fact, this child developed closures and stereotypies that compromised his relational and cognitive development.

After some surgical interventions, the follow-up tests (such as impedancemetry, auditory evoked potentials, cortical magnetic resonance, etc.) confirmed a normal typical structure. Despite this, at the age of 3 years the child did not speak, had no eye contact, demonstrated mannerisms and motor stereotypes, as well as developed marked hyperacusis, screams and cries. In addition, he usually played alone (as stereotypical behavior), did not respond to verbal stimuli, was attracted by distant noises rather than the nearby ones, and did not produce any words (only stereotyped vowel sounds).

At the age of 40 months, the family requested the support of an interdisciplinary team composed of neuropsychiatrist, psychomotor therapist, speech therapist, music therapist, psychologist, and pedagogist. The request focused on motor and sensory rehabilitation as well as support the inclusion in the school environment.

## 3. Methodology

The methodology used in this paper consists of a naturalistic observation that allows to collect information on changes as result of the intervention (Furlong, 2010; Morgan et al., 2017). The adoption of this methodology has permitted us to analyze the insights generated through practical experiences and find evidence in study and research on the topic of language learning. Also, an action-research approach was used for defining a functioning profile in order to understand the child's auditory processing disorder, and how the brain processes auditory information. Through the application of the psychoeducational intervention a diagnosis of APD was defined – a neurodevelopmental disorder involving the processing of auditory information by the brain that occurs even if individuals with APD don't have impairments at outer, middle, and inner level of ear structure and function. The observation showed how sensory processing disorders lead to stereotypes and behavioral dysfunction that can benefit from an inclusive approach aimed to improve communication and social skills, as well as provide sensory rehabilitation. The elements gathered through the observation of this case study and the evidence emerged through the literature analysis on this theme, led to define the strengths of the psychoeducational approach when applied to address difficulties due to language learning.

## 4. Description of the psychoeducational intervention

The intervention began with a music therapist, who proposed eight psychophonic sessions for the re-education in sounds' recognition. At the end of sessions the child correctly imitated single sounds and rhythmic sequences. Also, the music therapist suggested using the Tomatis Auditory Stimulation method, which is performed by listening to music (Mozart and Gregorian Chants), mother's voice recording and other voices through an active vocal work, processed and filtered through an electronic device. Once the music therapist's intervention was concluded, different games were planned and implemented at home, in order to further develop the relationship with his brother and family members, and reduce the situations of isolation and stereotypy behaviors. The home intervention lasted two months, once a week. From clinical observations emerged that he interacted with his brother using eye contact, contextual smiles and consistent behavioral responses. In the domestic environment, he looked for games of movement (somersaults, being lifted high), or structured games such as exchanging toy cars, pushing the train. After this intervention, the Picture Exchange Communication System (PECS) was introduced at home and school, in order to allow the child to express his needs and choices. Concurrently, stereotypies and undesired behaviors significantly reduced, eye contacts increased, and the intentional use of communication appeared through the utilization of pictograms and the deictic gestures.

## 5. Results

After three months of intervention, the child started to express a form of intentional communication and consequently perceived his difficulties in communicating. This caused anger crisis with various problem behaviors. These behaviors were interpreted as a way to show his needs. Therefore, the interdisciplinary team decided to introduce as speech therapy the use of the Alternative Augmentative Communication (AAC), for promoting reciprocity in the communication with peers and adults, as well as complex communication structures. Through AAC the child started using basic symbols. The first symbol represented the meaning "again". This symbol allowed the child to express and generalize his own preference (for example about games, activities and foods). The second symbol learnt was "enough", used to express the willingness to end an activity or action. Other symbols used represented bathroom, ball, bubbles, crackers, biscuits, water. Initially the child had some difficulties in indicating the symbols chosen. This difficulty was reduced when the team suggested limiting the choice of symbols to two pictograms (binary choice) and providing physical gestures for helping his choice. Following the intervention the child learnt to express different words with a well-defined vocalization as "water", "mom", "dad". Also, vocalizations started to be composed of sounds he imitated when expressed by adults. In addition, he started to use deictic gestures for making requests (e.g. open hand), and sporadically expressing the "hello". Concerning the interactions with others, he started to accept the relationship with peers, teachers, parents, family members including his twin brother. And to accept teacher's proposals of different activities, such as coloring within borders, decoding and coupling of images, manipulation activities with objects (e.g. Lego). Moreover, he started to move in a functional way, respecting the spaces of others and accepting the presence of peers (e.g. on the same work table), sharing materials and exploring autonomously the school building, identifying places through PECS as classroom, gym, bathroom.

## 6. Discussion

During the observation of the psychoeducational intervention the communication ability improved, especially after the application of specific methods such as music-therapy, psychomotor games and augmentative alternative communication, demonstrating their effectiveness. Moreover, the adoption of the psychoeducational approach allowed the interdisciplinary team to focus on the functioning profile rather than the diagnosis. This profile, elaborated using the International Classification of Functioning (ICF) model has allowed to highlight needs, translate these into educational objectives to be achieved through the involvement of different actors (e.g. peers, teachers and family members) and the use of facilitating environmental factors (e.g. living environment and classroom setting). When the child has started to attend the primary school a new education program with new objectives to reach and competences to be acquired has been designed in order to improve the communication abilities. The activities proposed were psychophony using the Tomatis method, speech therapy and AAC. These activities allowed the identification of new communication needs and stereotypes to be addressed. Also, the first attempts to use and shape language allowed the development of relationships with teachers and peers.

## 7. Trajectory of future research

Future study could explore the effects of the intervention in other countries (this intervention was developed in Italy), since the topography of language skills for mastering communication can vary across cultures and locations. Therefore, it could be useful to further study the features of the psychoeducational approach that allowed the child to build the abilities for intentional communication with peers and adults. And in particular the combined effects of Tomatis method and speech therapy, that need to be further observed and investigated because there is a paucity of qualitative studies on this issue (Kuhl, 2007).

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# TEACHERS' PERCEPTIONS ON INTERNATIONAL ONLINE TEAMWORK AND HOW IT CAN BE IMPROVED

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## Abstract

In-service and preservice teachers were invited through an online platform (VALIANT) to participate in six to seven-week free online teacher development 20-hour courses with the aim to test the feasibility of a teacher development model that not only reunites novice and experienced teachers, but also promotes peer learning among them on concrete situations that happen in their classroom and their own teaching experience. This study focuses on one such course on Diversity and Inclusion in Primary Classrooms that brought together teachers from several European countries to develop their knowledge and competence on how to deal with diversity and inclusion issues through cooperative learning. At the conclusion of the VE editions of the course, nine participating teachers volunteered to be interviewed online. The main gains pointed out by the interviewed teachers are connected to the development of intercultural competence and learning; the ability to look at their and others' classrooms and education in general from different perspectives; the perusal of digital solutions they could reuse in their classrooms; and the development of social interaction and bonding with other teachers as essential for peer learning. The main challenges experienced when working in a team online were related to distributing and keeping deadlines; equal commitment to tasks, time management; and engaging with one another effectively despite only knowing each other virtually. Interviewees suggested several strategies to cope with the challenges of online teamwork that impact course design and the facilitators' and participants' roles. The main conclusion is that increased scaffolding is needed for team leadership and shared leadership to help virtual teams collaborate more effectively and cohesively across cultures.

*Keywords: Teacher development, online teamwork, virtual team, digital collaboration, shared leadership.*

## 1. Introduction

VALIANT - Virtual Innovation and Support Networks for Teachers is a EU-funded policy experimentation for the period 2021-24 which aims at supporting in-service teachers, student teachers, teacher trainers and educational experts in collaborating online and networking to innovate their practices, enhance their motivation, and improve their teaching resources through facilitated Virtual Exchanges. Virtual Exchanges (VE) are defined as educational approaches to connect people from different cultural backgrounds in online collaborative learning. Helm & O'Dowd (2020) highlight them as a tool for promoting 21st century skills that are critical for the workplace, such as digital literacy and intercultural competence (Helm & O'Dowd, 2020). Sauro et al (2020, p. 4) also describe them as a "rich approach to fostering collaborative communities of practice among in-service teachers, which can support not only teachers' professional development but also their motivation and need for professional networks". As such VEs constitute a powerful tool for teacher education.

VALIANT adhered to VEs to mitigate several identified problems in initial teacher education and in-service teacher professional development in research studies and official reports by the EU (OECD 2019; European Commission 2013; 2016; 2017a; 2017b; 2017c; 2018; 2019; 2020; European Commission/EACEA/Eurydice 2015; 2021), namely isolation of teachers due to teaching in a rural isolated area where access to professional development and peer support is difficult; difficulty identified by teachers in gaining access to professional development courses that promote international collaboration with other teachers to engage their students in authentic collaborations around the world; lack of motivation and support of young teachers that shakes their intention to pursue a career in teaching; and "professional isolation caused by lack of networking and collaboration opportunities with other colleagues and experts" (Sauro et al 2021) in the framework of international and European collaboration.

As a policy experimentation, VALIANT aims to "test the efficiency of Virtual Innovation and Support Networks as an approach which will contribute to overcoming teachers' sense of isolation and low motivation in rural areas and isolated contexts and also to developing teachers' ability to operate effectively in online international networks of professional collaboration" (Sundqvist & O'Dowd 2022, p. 1). Another aim is to test "the efficiency of this form of Virtual Exchange for providing students of Initial Teacher Education with access to the realities of the teaching profession through regular interaction with in-service teachers integrated into their study programme" (ibid.). Through several rounds of 6 to 7-week long courses on several topics, VALIANT creates virtual innovation support networks of teachers in Europe and other parts of the world, who come together for approximately 20 contact hours to collaborate in international teams, learn and design educational solutions for problems they encounter in their educational contexts, which they can directly implement in their classrooms, and to develop professionally.

There are several modalities for VALIANT VE courses. Some bring together pre-service and in-service teachers who act as mentors of the former (teachers as mentors); others join in-service and pre-service teachers with expert teachers to learn about specific topics (teachers as sources of experience); still other courses congregate in-service teachers who collaboratively learn about a concrete problem from their classrooms (teachers as co-learners); or courses that guide in-service teachers on how to run international projects (teachers as international collaborators). All these modalities of virtual exchange follow a common design. They run on a virtual platform (Moodle) and they are exclusively online, with online video conferencing synchronous weekly sessions of 1-2 hours (Zoom) combined with asynchronous sessions during which participants are expected to collaborate with one another as a team using online apps and tools at their discretion. However, rather than approaching the overall results for the project objectives, this paper will specifically address teachers' perceptions on international teamwork to perform collaborative tasks. While VEs in general promote positive collegial interaction, the success of a VE seems to be ultimately dependent on effective organization of online teamwork.

This study focuses on one particular VE on the topic of *Diversity and Inclusion in Our Classrooms* that brought together teachers from several European countries to develop their competence on how to deal with diversity and inclusion issues through cooperative solution finding for concrete classroom problems. To the exception of one pre-service teacher, all participants were in-service teachers and the modality of VE used was 'teacher as co-learner'. The facilitators were several teacher educators who worked either alone or as a team. This free online VE had 4 editions: two parallel editions in the Winter semester 2021 (one for primary teachers, facilitated by 4 teacher educators, and the other for secondary teachers, facilitated by 1 teacher educator); one edition in the Spring 2022, facilitated by 4 teacher educators; and the fourth edition in the Winter semester 2022, facilitated by 2 teacher educators. The teachers enrolled in the VE through the VALIANT platform on the VALIANT webpage. Table 1 shows numbers of participants per VE edition to a total of 49 and the number of interviewees from each edition involved in the present study.

*Table 1. Numbers of participants and interviewees in the editions of the VALIANT VE.*

| 1st VE edition primary | 1st VE edition secondary | 2nd VE edition | 3rd VE edition |
|---|---|---|---|
| 18/5 interviewees | 6/0 interviewees | 9/2 interviewees | 16/2 interviewees |

## 2. Objectives and methods

During the VE, there were several activities that required team building online. During the first synchronous online session, teams were assembled according to interests manifested by participating teachers on which topic of Diversity and Inclusion they would like to collaboratively work on. The facilitators distributed themselves among the teams so as to support understanding of tasks and deadlines. In subsequent sessions over the 7 weeks, teams were gradually granted more autonomy from facilitators in synchronous sessions. In two asynchronous sessions, teams were expected to organize their work autonomously, and facilitators did not participate. In the last two synchronous sessions, participants were invited to build new teams ("interest groups") and new topics to develop collaboratively on their own.

The objectives of this study were to find out 1) what challenges VE participants experienced during their international teamwork online and 2) what improvement strategies and suggestions they propose. Altogether nine interviews with participating teachers were conducted face to face online using video conferencing. The interviewees received the questions beforehand so they could carefully consider their impressions and perceptions on gains and challenges related to the course as well as prepare recommendations to course developers. Two interview protocols were used: one for the first VE round which had a specific question dedicated to online teamwork and another protocol for the 2nd and 3rd round

interviews with broader questions. The interviews were voluntary, they were conducted 1-3 weeks after the completion of the respective VE round, and they lasted for 30-60 minutes each.

The interview data was transcribed and then analysed through a qualitative content and thematic analysis process (Nowell et al., 2017; Merriam & Tisdell, 2016; Guest et al., 2012) consisting of these steps: 1) organizing the data by focusing on teachers' perceptions on international online teamwork, 2) coding the data according to key trends and themes, and 3) interpreting and summarizing the main results with focus on identified challenges and strategies for improvement. To improve the reliability of data analysis and widen the impact of the study's key results, there were two researchers involved in analysing and interpreting the VE experience: one facilitator from VALIANT and one observer from Erasmus+ KA2 project LEARN&CHANGE – Collaborative Digital Storytelling for Sustainable Change, focused on digital collaboration and innovation across cultures.

## 3. Results

According to the interviews, learning to work together online as an international virtual team presents challenges with team building and digital and cross-cultural communication.

### 3.1. Challenges and strategies in building a virtual international team online

**Building a team online:** Virtual and online team building is more stressful than in-person collaboration at the outset of a teacher development course**,** because participants do not know each other's strengths and weaknesses. Distributing roles and choosing a team leader created feelings of awkwardness since getting to know each other online requires more time than in face-to-face in-person contexts. For some participants working in a virtual team was difficult essentially because they did not know the other team members well.

**Breaking the ice online**: Teachers reported a need to experiment with ways of knowing each other better. They felt they needed some time online in breakout rooms to get better acquainted and find points in common from which to establish a rapport. Several participants highlighted the importance of informal chatting time (about personal things) to develop a feeling of belonging with the group: "having that time just for chatting, you know, because that breaks the ice, because we are from different countries, different cultures" (R1I2).

**Team size:** Participants felt that keeping the team small (up to 5 participants) was key to success. Some participants highlighted how working in a team of 3 was easy because it allowed team members to connect and it developed a sense of familiarity: "it was like sitting at our desks in the teacher's room and having a chat" (R1I2). Bigger teams were more likely to cause apprehension because starting a conversation becomes more difficult and building team cohesion takes more time.

**Task distribution and management:** Several problems were identified in distributing tasks and working together online such as: procrastination; leaving everything at the last minute; or finding the motivation. When working online, participants felt uncertain of the tasks they needed to accomplish: "I wasn't sure if I was actually meant to be doing something about that" (R1I4). Another problem identified was that when working as a team in breakout rooms, team members had difficulty focusing on the task and diverged into small talk. Some participants also felt they had taken on too much responsibility for tasks that should have been shared with other team members.

**The role of the team leader:** A leader was recognised as important in the team as the one who initiates emails, sends instructions, and encourages the team to move forward. Choosing a leader for the team was found particularly hard and decisions were not always based on voluntary proposals to become the team leader. "I was chosen by them because I guess they didn't feel confident about doing that role when they didn't have time" (R1I5). The role of leader in a virtual team is difficult to take on if participants know each other only superficially. Some leaders had problems in leading the team to accomplish all tasks, while others had problems with cross-cultural communication. Leaders were all seen to be overburdened and having to juggle familiar and private duties with leading an international virtual team. They also had trouble in inspiring all team members to participate on an equal footing.

**Team building strategies:** Interviewees suggested that dedicated team building activities be planned into the VE to facilitate sharing experiences and resources among team members. The following strategies were mentioned: being open to one another and chatty (in several languages); being humble to learn from others and combine expertise; focusing on what each team member has to do to ensure that all tasks fit together; agreeing on tasks beforehand and monitoring task development; creating a list of team roles to agree on; and learning to collaborate effectively online using several tools and platforms.

**Leadership strategies**: The team leader should act less as a content developer in the team and more as helper and encourager who inspires people to agree on and share tasks and reminds them of deadlines and agreements made. The team leader should have access to guidelines of what the team needs

to achieve in order to be prepared to steer the team in the right direction. Furthermore, the team leader should have relevant background information on other team members, so having detailed introductions of each team member at the beginning of the VE project is of utmost importance.

**Affinity of interests, ideas, and goals to build cohesion:** According to the interviews, defining a shared purpose and committing to common goals will keep the team cohesive and collaborative. Social skills required for good teamwork mentioned by the participants included the following: showing friendliness; negotiating and jointly agreeing on tasks; sharing responsibility and helping each other out; sharing knowledge; openness to new ideas and differences in viewpoints; willingness to participate in the team and dedicate time to the tasks in hand.

## 3.2. Challenges and strategies in digital and cross-cultural communication

**Time management across cultures**: Teachers participating in the VE rounds were on different time zones and their teaching schedules were very disparate thus creating difficulties for finding a common time to meet. Meeting online had to be juggled with participants' professional and private schedules. Time management to keep deadlines also constituted a problem for some teams, as they wanted to focus more on sharing experiences and relegated deadlines and tasks to the background.

**Barriers to digital and cross-cultural communication:** Some participants claimed that synchronous sessions on a video conferencing platform were preferable to asynchronous collaboration because team members could talk to one another and get an immediate answer, while by emailing they would get an answer several days later. Not having a facial reaction was mentioned as an additional difficulty to ascertain emotions in team communication, so video conferencing helped in that sense as well ("[one needs to] have a face to react to" [R1I6]). Interviewees also mentioned barriers due to cultural differences and challenges in using English to communicate. Furthermore, digital knowhow sometimes constituted a barrier, as discrepancies between team members' technological expertise caused problems for team organization ("because some are more skilled digitally and others not so skilled we sometimes lose time organizing ourselves" [R2I8]).

**Time-management, digital collaboration, and language strategies:** One of the time-management solutions interviewees proposed was that instead of working entirely asynchronously, it is useful to schedule regular synchronous sessions. They also recommended using email to remind each other of tasks and deadlines. Language barriers were best overcome by making use of all team members' linguistic repertoires. Sharing the expertise of more digitally advanced team members was regarded as important to guide and support the rest of the team. Interviewees also reported feeling reassured by the presence of VE facilitators to provide support if needed. VE participants appreciated that facilitators were "available in case we had any problems" (R1I4).

## 4. Conclusion

Two researchers from two digital innovation projects joined forces to interview teacher participants of VE implementations and to analyze their considerations and feedback to develop virtual team collaboration. The main conclusion drawn from the interviews was that increased scaffolding is needed for team leadership and shared leadership to help virtual teams collaborate more effectively and cohesively across cultures. This is in line with Wu and Cormican (2021), who claim that shared leadership in project teams increases team effectiveness, and team leaders should have knowledge and skills to encourage the sharing of leadership roles and tasks among team members right from the start of the team decision-making process. Recent studies have also underlined the importance of effective leadership for online collaborative learning, pointing out the usefulness of shared, emergent, and distributed leadership over assigned leadership to positively influence collaborative learning in virtual teams (Luo et al., 2022; Morrison-Smith & Ruiz, 2020). In business contexts, transformational leadership style has been found fruitful to inspire engagement and effectiveness in virtual teams (Sedrine et al., 2021; Mysirlaki & Paraskeva, 2020). Extant research also shows that careful advance planning of a VE course is needed "especially if it is intended to be collaborative" (Zak, 2021, p. 75). We therefore recommend that VE developers design distinctive support for collaborative leadership to address the specific challenges, identified in this study and many others, that affect successful team building, organization, and performance in online learning environments.

*Disclaimer*

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# INCLUSIVE PROJECTS IN SCIENCE AND TECHNOLOGY TO SECONDARY AND HIGHER EDUCATION

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## Abstract

The purpose of this work is to bring science and technology and its applicability closer to secondary school and university students through the development of cooperative projects with people with functional and cognitive diversity. Through a teaching and learning methodology based on inclusive projects, professors from Higher Education aim to promote scientific and technological vocations and involve people with diversity in the advances in science and technology while making their condition visible to young people. This work shows both qualitative and quantitative indicators that allow us to evaluate the impact of those proposals. The degree of satisfaction of all the agents involved is very high, not only with the teaching and learning but also with the quality of the solutions developed to meet the needs of those people with diversity. The incorporation of projects based on both socially inclusive technological challenges and fairs increases motivation, participation and interest in science and technology, as we will demonstrate from obtained results. In addition, we would like to point out that these proposals mainly achieve three different sustainable development goals: number 4 (quality education), number 10 (reduction of inequalities) and number 12 (responsible consumption and production).

*Keywords: Secondary education, higher education, science and technology education, new learning and teaching models, inclusive education.*

## 1. Introduction

The development of transversal competencies requires education in citizenship and the inclusion in teaching of activities aimed at the mastery of basic social skills (Sá & Serpa, 2018), such as effective communication, respect, social inclusion or assertiveness. However, there are very few subjects in our Secondary and Higher Education systems in which collaborative learning activities with solidarity objectives are developed, especially in those of a technological nature. Advances in science and technology have had a major impact on the daily lives of citizens. In particular, progress in the field of Information and Communication Technologies (ICT) has revolutionized lifestyles and the way of "doing" in today's society (Vial, 2021). Technological evolution has also brought about positive changes in ICT accessibility; however, this progress has been less than that developed for citizens in general. Thus, the phenomenon known as the "technology gap" continues to exist, which has a negative impact on equal opportunities for people in vulnerable situations, such as people with disabilities.

On the one hand, in many cases, the lack of knowledge of the developers of technological tools and of the citizens themselves about the capabilities and needs of people with disabilities, implies the absence of participation of these people in the processes of design, development and validation of technology. On the other hand, most of these technologies do not meet the requirements of universal design and, therefore, people with disabilities cannot participate on equal terms in current technological progress. Responsible production and consumption is also not encouraged, making sustainable technology a challenge for both producers and consumers.

Service-learning is an innovative teaching methodology that seeks the acquisition of not only academic competences, but also those transversal sills, through a service to the community, generally in their immediate environment (Castro et al, 2020; Conway et al, 2009; Tapia, 2000; Tejada, 2013). In an economic situation like the current one, solidarity and awareness of the needs and problems of others is

even more important (Tapia, 2000; Tapia & Peregalli, 2020), trying to reduce the digital gap to counteract the social distancing it causes (Waldner et al., 2012).

In this paper, we present two inclusive experiences based on micro-projects of science and technology that response to needs of people with diversity to provide them with solutions through works developed by secondary and higher students, respectively. The main objective of both proposals is to increase the knowledge and skills in the field of science and technology of non-university students (secondary, high school and vocational training), and also of university students, promoting Science, Technology, Engineering and Mathematics (STEM) vocations through active and collaborative participation in the development of technological solutions for people with diversity. In this way, the traditional education methodologies are transformed into learning and service, thus promoting a new model focused not only on contents but also on values. On the other hand, since fairs or other similar events constitute a didactic resource with which, in a playful way, we can increase the motivation and participation of the attending public (García-Molina, 2011; FECYT, 2018), both proposals contemplate the participation or realization of any event of this type, with the purpose of bringing science and technology closer to these disadvantaged groups. In this way, we want to favour their integration in a digital world that often excludes them while promoting the acquisition of those transversal competences in our students.

This paper is organized as follows. This section introduces the need of incorporating inclusive projects in science and technology to Secondary and Higher Education. Section 2 details the most important design aspects of both experiences. Section 3 shows the goals of both proposals and the methodology to achieve them. Section 4 shows the main results obtained from these inclusive projects and Section 5 includes the conclusions drawn from the work done.

## 2. Design

This paper shows two experiences developed in the 2021/2022 academic year in which, through micro-projects, we answer to needs of users with functional and/or cognitive diversity in both contexts of the Secondary and Higher Education.

The experience in Secondary Education runs from November 2021 to June 2021. It is based on the realization of projects by secondary students. These technological challenges (we will referred to them in the following as micro-projects) are posed to promote opportunities and learning related to science (hypothesis, observation, problem solving and overcoming challenges), innovation in technology (experimentation with different technologies, creativity, development of technological solutions) and the social utility of science (adaptation and resolution of challenges according to the capabilities and needs of people with diversity and obtaining technology that has a direct impact on the quality of life of this population). This collaborative experience is proposed between the University of A Coruña (through the Centre for Information and Communications Technology Research-CITIC- and its Social Council), the "Asociación de Padres de Personal con Parálisis Cerebral" of A Coruña (ASPACE Coruña) and secondary schools in the area. Nearly 200 secondary students and 26 people with cerebral palsy served by professionals from that local organization were participating in these micro-projects supervised by about 15 higher researchers and funded by the national project "Talentos inclusivos" (Inclusive talents, ref. FCT-20-16226).

The experience in Higher Education runs from October 2021 to March 2022. It is developed in the context of the Technology subject for teachers of Compulsory Secondary Education (ESO) of the University Master's Degree in Secondary Education Teaching, of the Technology itinerary. The learning outcomes of this course are the knowledge of the contents of Technology, object of teaching and learning in ESO and of the situations of the environment suitable for the application of these contents. The teaching group is made up of 19 students with a technical profile (engineers, architects, mathematics graduates) and two professors. The collaborating entity, to which the service is destined, is a non-profit association of our environment, the "Asociación de Padres de Personas con Trastorno de Espectro Autista" (ASPANAES), dedicated to the care of people with this disorder and their families. This entity serves more than 500 family units and its reach in social networks is more than 250,000 users. Seventeen users of this entity, accompanied by their professionals, attend in person the final event of the experience, a technology fair, although, not in person, all users of the entity who were interested in it received through those professionals a description of the micro-projects and the materials needed to carry them out.

## 3. Objectives and methodology

In this section we will show the objectives of both proposals, together with methods and materials necessary for achieving those objectives. First of all, we must highlight the enormous social

coverage of both experiences, since the projects involve to teachers belonging to secondary schools; people with disabilities and especially with cerebral palsy and autism, specifically, users of ASPACE Coruña and ASPANAES; technical professionals of ASPACE Coruña and ASPANAES; members of CITIC who act as tutors of the participatory groups, and society in general.

The main objective of both proposals is to increase the knowledge and skills in the field of science and technology of non-university students (secondary, high school and vocational training) and university students, promoting STEM vocations through active and collaborative participation in the development of technological solutions for people with functional and cognitive diversity. In addition, during all the activities that we will show below, we will achieve: encourage scientific-technological vocations among students from different educational levels; supporting education through the promotion of scientific and technological literacy; promote knowledge about the social utility of science; to bring the daily reality of people with disabilities closer to young people and the need for them to be proactive actors in the future in order to involve people with disabilities in the advances in science, technology and innovation; improve accessibility to ICT and the development of low-cost technological solutions based on the requirements of universal design and sustainability for people with disabilities with usefulness for their daily lives, and generate equal learning opportunities to reduce the gender gap and visualize the advantages of an inclusive technology where all the capabilities of potential users are taken into consideration.

About materials for achieving such objectives, realise that it depends on the type of micro-project to be developed and existing resources in each centre, but in general we can identify the following needs: computers; webcams; Micro:bit, Arduino or similar boards; Raspberry Pi kits; home automation systems; sensors and actuators; voice assistants; drones and robots; low cost boards, with Wi-Fi and Bluetooth, and components, and so on. At the beginning of the activities, consent for participation and image dissemination was obtained from all the involved agents, except the image dissemination for ASPANAES users.

The work methodology to be followed in both experiences can be divided into these six activities of Table 1:

*Table 1. Project methodology.*

| Activity | Procedure |
|---|---|
| Selection of the participating secondary schools and entities | *Open call and by interviews, e-mails and phone calls, respectively* |
| Formation of the student working groups in Secondary and Higher Education | *Voluntary, free size or in pairs, respectively* |
| Definition of technological micro-projects | *Identification of technological needs and preferences of users by entities*<br><br>Projects with ASPACE Coruña and students of Secondary Education: *They were grouped into 9 categories: support products and 3D printing; access to computer, mobile and communication systems; home environment control and ASPACE; rehabilitation; alarms; work accessibility; augmentative and alternative communication systems; sensor environment control, and leisure*<br>Projects with ASPANAES and students of Higher Education: *Control, robotics and scientific experiments* |
| Project development | *Each working team chooses the micro-project that best suits its circumstances and interests. Using User-Centred Design, we work collaboratively among all the agents involved (professionals and users of the entities, teaching staff and students) holding virtual meetings and workshops and sharing material and progress through e-mail and a web page in SharePoint. The final objects trying to be sustainable* |
| Work presentation | *Public presentation event and technology fair, in Secondary and Higher Education, respectively* |
| Project assessment | *Service: Self-developed surveys and, in the case of service users, QUEST (© L. Demers, R. Weiss-Lambrou, B. Ska, 2000 - Spanish version by João Guerreiro 2013 (rev. 2020)) is also used*<br><br>*Learning: Self-developed rubrics* |

*Figure 1. Micro-projects in the Secondary Education (up) and Higher Education (down).*
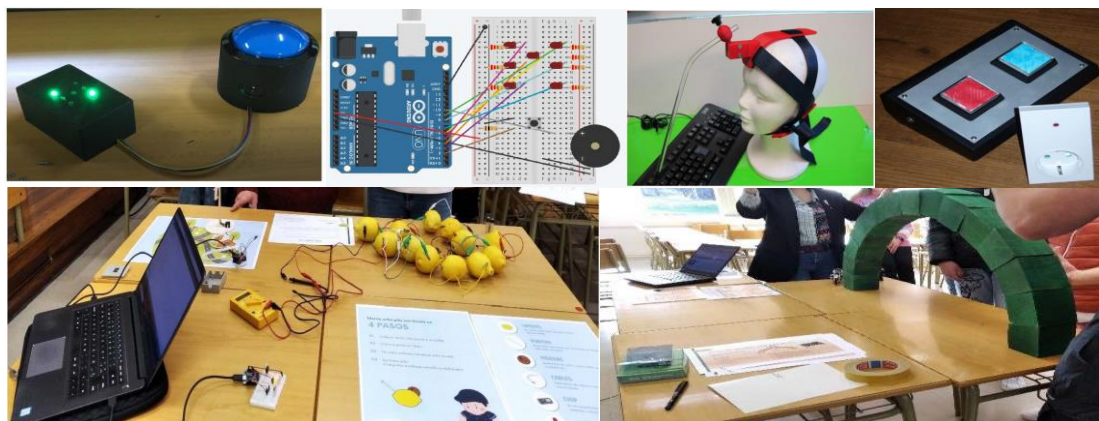


## 4. Results

Figure 1 shows the pictures of some of the micro-projects developed in both experiences.

The assessment mechanisms used were both quantitative and qualitative. The former focused on counting the number of participants and the number of micro-projects carried out. These data were collected during the formation of the student working groups and in the final work presentation activities, in which the collaborative groups publicly presented the solutions finally achieved. The qualitative impact assessment mechanisms focus on the results obtained on a series of scales aimed at the different groups participating in the project: users of both entities, professionals from these entities, secondary school teachers and students, and university professors and students.

Regarding the gender of the participants, women do not reach 40% of the total, being the professionals of the entities the only sector in which women predominate. Other results from the quantitative assessment are shown in Table 2.

*Table 2. Quantitative project assessment.*

| ACADEMIC IMPACT | RESULTS |
|---|---|
| Projects with ASPACE Coruña and students of Secondary Education: | |
| *No. of participating schools* | 10 |
| *No. of participating students* | 193 |
| *No. of participating teachers* | 14 |
| *No. of participating professors (CITIC researchers)* | 15 |
| *No. of ASPACE Coruña participating users* | 26 |
| *No. of ASPACE Coruña participating professionals* | 5 |
| *No. of completed micro-projects* | 24 |
| Projects with ASPANAES and students of Higher Education: | |
| *No. of participating students* | 19 |
| *No. of participating professors (CITIC researchers)* | 2 |
| *No. of ASPANAES participating users* | 17 |
| *No. of ASPANAES participating professionals* | 6 |
| *No. of completed micro-projects* | 9 |
| **ECONOMIC IMPACT** | **RESULTS** |
| *Cost-benefit of solution compared to commercial device* | Saving of at least 85%. |
| **SOCIAL IMPACT** | **RESULTS** |
| *Participation in social networks* | Yes |
| Projects with ASPACE Coruña and students of Secondary Education: | |
| *No. of proposed micro-projects* | 44 |
| *Numerical result of the QUEST scale* | 4.1/5 |
| Projects with ASPANAES and students of Higher Education: | |
| *No. of proposed micro-projects* | 9 |

If we focus on the qualitative results, we have to say that the assessments of all the agents involved have been excellent, always higher than 4 out of 5 on the scales.

## 5. Discussion and conclusions

Taking into account the results of Section 4, we can say that the objectives shown in Section 3 have been achieved. These experiences also contribute to the Sustainable Development Goals (SDG) no. 4, 5, 10, 11, 12 and 17, related to education equality; gender equality; reduced inequality; sustainable cities and communities; responsible consumption and production, and partnership for the goals.

The essence of the project implies an active participation of society, represented by the group of secondary school students and teachers, as well as all those associated with ASPACE Coruña and ASPANAES, CITIC and the University of A Coruña, who have participated either directly or indirectly in the project. Taking into account this wide variety of groups, the number of people involved in the activities in each of them and the large number of people attending the work presentation and the different events and fairs, we can state that this objective has been achieved. Although the participation of women has been strengthened in selection processes and team leadership, it is low specially in the student group, but we have to take into account an important bias, derived from the still scarce presence of girls in STEM subjects. Moreover, one of the main objectives of these experiences has been to promote and awaken technological and scientific vocations among university and non-university students. By posing various technological micro-projects, it has been possible to bring students closer to a new way of doing science and technology, based on exploration and experimentation.

From a learning point of view, students in both educational stages acquire not only the technology contents of these stages, but also a series of transversal competences that will be very useful for their professional and personal development: public speaking, tolerance and respect, ability to work in groups, decision-making, critical thinking, self-learning, initiative, creativity, empathy, responsible consumption, solidarity and knowledge of diversity, always from the perspective of learning to learn, from mistakes and from those who are different.

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# SCHOOL VOLUNTEERING CLUBS: HOW THE SCHOOL CONTEXT AND ORGANISATIONAL SUPPORT SHAPE (UN)SUCCESSFULNESS

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## Abstract

School volunteering clubs (SVC) are a pedagogical innovation in the Croatian education system. Recent national research communicates a high level of networking between SVCs, locally-based institutions and civil society organisations (CSOs). However, the school context in which SVCs take place is not always conducive. SVCs often lack support from the school principals and teachers, as well as financial support (Ćulum Ilić, 2019; Rijavec, Jurčec, and Pavlović, 2019). This paper therefore aims to offer insights in attributes namely school context and organisational support, shaping the (un)successfulness of SVCs.

A qualitative case study (6 SVCs) was conducted to better understand the aforementioned phenomenon. Six focus groups were conducted with 38 secondary student volunteers. We will present findings of the focus groups with an emphasis on the organisational structure, and the school context in which the SVCs take place. The thematic analysis shows that SVCs are categorised in the school curricula as extracurricular activities or short-term projects. Each has coordinators who are either teachers or professional associates, while in some students share the coordinating role. Schools generally support collaboration with external stakeholders and findings of this study correlate, thus revealing a high level of successful collaboration that SVCs nurture with many CSOs. Such collaboration offers opportunities for students to engage meaningfully in addressing many local social issues, which contributes to their sense of belonging to the community.

Analysis of the school context reveals layers of institutional challenges, namely lack of support coming from the 'top', thus leaving the SVCs and its coordinators to be creative and innovative in their bottom-up approach, without the necessary resources. The indifference of those students who do not volunteer is noted, as well as of teachers who don't recognise such engagement as (academically) important nor valuable. In parallel, there is a positive and supportive atmosphere in all the SVCs. Emphasis is placed on democratic relationships among students, among coordinators and students, as well as on the collaborative line between students and CSOs. Students have a less formal and closer relationship with coordinators, which also affects their positive perception of teachers in general.

Many studies suggest that the school context in which educational processes take place affects the quality of these processes. The results of this study show that SVCs can operate successfully despite the lack of a positive school context, but resting solely on the coordinators' enthusiasm. This research contributes to the body of literature emphasising that a nurturing school climate, cooperation, equality within the SVCs members, and students-coordinators positive relationships are crucial for SVCs to succeed.

***Keywords:*** *School volunteering clubs, school context, secondary schools, qualitative case study.*

## 1. Introduction

In societies with a developed democracy, the education system plays an important role in promoting the value of and implementing volunteering in schools. Such societies realise that volunteering organised in schools is an experiential way to educate young people for their future role as agents of social development and positive change. In other words, programmes that aim at empowering young people to actively participate in society are the most reliable way to develop a democratic society (Ćulum & Ledić, 2009). School volunteering programmes are such programmes and represent a pedagogical innovation in the Croatian educational context and are recognised as an integral part of civic education. In this paper, we will refer to school volunteering programmes as "School Volunteering Clubs (SVC)" because that is the way student volunteers refer to them, but the meaning and the definition are the same.

One of the roles of educational institutions is to set an example for students on how to actively participate in the community. Schools have the opportunity to encourage students to behave in a socially responsible manner, but also to provide them with the necessary mechanisms for easier integration into the community. Because volunteering within the formal education system creates such a space where students

can practise the role of active, socially responsible and sustainability citizens, Quentelier (2008) refers to SVCs as schools for democracy.

Since 2001, in the European context, recommendations have been made for the implementation of content and activities in schools that could help young people acquire the competences of active citizens (European Commission, 2001). Various strategic documents and programmes have been adopted at the national level to promote and strengthen volunteering and active citizenship. As a result, an increased number of young volunteers, especially high school students, has been noticed by recent studies. However, in order for youth volunteering to become stronger and sustainable, structural and systemic changes are necessary (Kamenko Mayer et al., 2019). The role of schools in developing youth volunteering is also recognized in the Croatian Law on Volunteering (58/07, 22/13, 84/21) which states that schools should promote and encourage volunteering activities. The National Framework Curriculum (Fuchs, Vican & Milanović, Litre 2017) does not explicitly mention volunteering in school but highlights aspects of engagement that characterise SVC, such as the development of students' positive attitudes towards others and active and responsible participation in the community.

SVC is defined as "a set of different (continuous and/or temporary) volunteer activities carried out by a specific educational institution" (Kamenko Mayer et al., 2019, p. 29) that follows the "principles of tolerance, humanity, solidarity, fairness, inclusiveness, and sustainable development, and contributes to personal development and positive social change" (Medlobi, Friščić, Prgić Znika, Požgaj & Borić, 2021, p. 13). There are four key actors in SVCs, namely: (I) students, (II) SVCs' coordinators, (III) teachers and principals, and (IV) community partners (most often CSOs), and each of them has a significant role. There is a body of literature arguing that young people who volunteer in their school have a greater chance and potential to remain active in society (Hall, McKeown & Roberts, 2001; Planty & Regnier, 2003), because the competencies and behaviours acquired in youth persist into adulthood (Ćulum, Gvozdanović & Baketa, 2016; Quentelier, 2008).

SVCs are usually coordinated by teachers or professional associates (e.g., pedagogues, psychologists, librarians). Coordinators are often enthusiastic individuals who independently initiate and oversee the programme. Their role can be explained by the concept of organisational citizenship behaviour (Bateman & Organ, 1983, as cited in Dipaola & Tschannen-Moran, 2001), i.e., coordinators are individuals who do more than is expected of them.

Schools that implement volunteering programmes partner with numerous community partners, but mostly with CSOs. As Maldobi and associates (2021) emphasise, CSOs in particular are key actors for SVCs as they enable the implementation of a wide range of volunteering activities and ensure the quality of implementation due to their knowledge and experience in conducting volunteer actions with various beneficiaries. As previous studies noted, CSOs engage in a wide range of activities that contribute both in a short and long-term context to the SVCs' sustainability, e.g they organise and conduct training for coordinators, thus contributing to the volunteer management. They also play an important role in implementing SVCs in school curricula.

For SVCs to function smoothly, it is imperative that the school context in which they operate be positive and supportive. Introducing new programmes into the school curriculum requires changes in formal and informal norms, structures, and relationships, and collaboration among all stakeholders is therefore necessary (Baranović, Domović & Štirbić, 2006). Bear and associates (2009, as cited in Popović Ćitić & Đurić, 2018) refer to a positive and productive school climate as such where relationships are supportive, where there are high expectations and clear goals on how to achieve them, where actors plan together, and where parents and community members are engaged as well.

Schools that foster positive climate promote youth development and provide a safe platform for productivity by encouraging peer mentoring, building connections to the local community, and ensuring that students feel socially, emotionally, and physically safe (Cohen, McCabe, Michelli & Pickeral, 2009; DeWitt & Slade, 2014). A positive school climate means that students, their parents and guardians, teachers, professional associates and principals work together and contribute to a shared vision of the school (Cohen et al., 2009). Because school climate also reflects, to a significant extent, the subjective experiences of school actors, this paper focuses on describing the personal experiences of student volunteers - we are interested in how they feel and the importance they place on the SVC and their role as volunteers.

## 2. Methodology

The results presented in this paper are embedded in the project "Formal Education in Service of Sustainable Development - forOR" (2018-2024), funded by the Croatian Science Foundation. The main goal of the qualitative research is to describe and understand the phenomenon of SVCs in high schools and its role in cultivating attributes of sustainability citizenship. The main research question is: What experiences, processes, and activities within SVCs foster high school students' potential to develop

attributes of sustainability citizenship, and how? This paper presents only part of the preliminary findings with a focus on the school context, i.e., school climate and organisational support for SVCs. Qualitative case study was chosen as the prospective research strategy and six cases were selected based on specific criteria[1]. Focus groups took place from April to November 2021 with 38 student volunteers between the ages of 15 and 18. Collected data were transcribed and MAXQDA software was used for data analysis. Thematic analysis was conducted following Braun & Clarke (2006) protocol.

## 3. Analysis and discussion

Results related to the organisational structure, show that SVCs are implemented in school curricula and categorised as extracurricular activities or short-term projects. Each SVC has at least one coordinator, either a teacher or a professional associate. In some cases, student volunteers play the role of the coordinator's "right hand", whose task is to make linkages between the coordinator and other students and to help communicate with external collaborators. These co-coordinators usually are the most active student volunteers that coordinators can rely on. These results bring a certain novelty, as in previous studies the collaborative coordination model has been detected, but only when it comes to co-coordination between several teachers and/or professional associates (Ćulum Ilić, 2019). Some volunteering or humanitarian activities involve the entire school, however there are about 20 to 30 student volunteers across the cases studied that are usually engaged in each volunteering activity. The most common activities include raising donations for various causes, visiting kindergartens, homes for elderly or children's hospitals, as well as improving the school environment, organising and conducting workshops.

In terms of the school context, student volunteers are pleased with being equal with their coordinators. Their relationship is very democratic in terms of planning and organising activities. Students' ideas and their proposed scenarios of delivery are appreciated. SVCs are holding regular meetings that serve as a platform for sharing ideas, suggestions, and decisions, and students are involved in every aspect of the SVC and they share tasks equally. In addition, students are free to choose in which volunteering activities they want to participate in. In schools where there is a positive climate, students are involved in all processes and are less likely to be absent from school (McEvoy & Welker, 2000). Furthermore, one of the recommendations for stirring a positive school climate is precisely to promote student autonomy (DeWitt & Slade, 2014), which is evident in the cases of SVCs, as illustrated by following excerpts from students who participated in focus groups:

> *"The coordinator asks us what we would like to do, if we have ideas, then we propose something and then somehow we all come up with an idea together."*

> *"We do everything very democratically, actually we are all equal and the teachers are equal to us. It's no longer that some teacher is in charge and that you obey him or her. Everyone always has the right to make suggestions, and to raise a veto."*

Most of the responsibility for the SVCs lies on the 'backs' of their coordinators. They must be promoters and organisers of volunteerism, and ideally, be volunteers themselves to motivate students by example. They must have extraordinary communication skills and intrinsic motivation (Medlobi et al., 2021). In addition, results from our study indicate even more, as students portray their SVC coordinators as *"mothers, teachers, and best friends, and all at the same time."* Students are aware of the severity and abundance of the work coordinators do, and at the same time they are aware and appreciate their enthusiasm and commitment, as one student pointed out:

> *"This programme is very good because in a way we perceive teachers as people who don't sleep, don't eat, as someone who is like a robot, you have an image of a teacher who is strict, who evaluates. And through the SVC we make a connection, and then in actual teaching it's much easier, we do not have this fear, we do not have this tension that she's going to evaluate us badly, but we understand that she's just a human being and that it's her job to evaluate me, but I know that I can ask her, I can talk to her, I can make suggestions if it's necessary."*

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[1]Criteria were as follows: (I) Integration of SVC in the school curricula, (II) continuous presence during at least one school year, (III) accessibility to all students, (IV) collaboration with CSOs and other institutions, and (V) SVC content related to the sustainable development.

From the student volunteers' perspective, it's the coordinators who create an informal, friendly, and relaxed atmosphere at SVC, that is highly effective for shared learning and support. Many student' volunteers state that they have made many friends and acquaintances from other classes and schools as well.

> *"Above all, that togetherness is important to me. This support that you have, people you can talk to, who don't judge you because you're different, because you have a problem. It's like a second family, so to speak, and I think that's very important."*

Students generally perceive that the school (headmasters and teachers) supports SVC, however there are examples of eroding behaviour as well. Students from one SVC report that they perceive the headmaster and teachers as uncooperative and that there is a lack of financial support, working space, and basic resources needed for the programme to function effectively. Very similar findings are found in previous research, which also indicates that the institution often withdraws from organising certain volunteering activities or redesigns planned activities to minimise costs due to lacking financial support (Ćulum Ilić, 2019).

> *"Personally, I think our headmaster thinks that SVC is not important, that we only volunteer to avoid classes, that this is the only reason we do it. If we were a club of mathematicians, she would see us in a very different light."*

In some cases, students also feel disappointed because most teachers have a negative attitude towards volunteering in general, don't recognise such engagement as (academically) important nor valuable, and they have no trust in student volunteers. So, one of the many tasks of the coordinators is to use their communication skills and assure those teachers of the benefits of volunteering so that the students can participate in the volunteer activities. Study from Tarter & Hoy (1988, as cited in Baranović et al., 2006) points out that if there is no trust between all actors in the school, there cannot be a positive school climate. Learning by volunteering is one way to break teachers' biases against volunteering. In this way, teachers, coordinators, and student volunteers could work together to find a way to connect subject content with actual volunteering activities (Kamenko Mayer et al., 2019), and therefore showcase the meaning of experiential learning. Moreover, most students feel that their non-volunteer peers don't appreciate their role as volunteers. At best, non-volunteers are indifferent to SVC, but sadly some of them view volunteering as a "waste of time". Fortunately, volunteer students aren't swayed by the negative attitudes of their peers, as suggested by one of the students: *"Well, it's stupid to give up volunteering when it's soooo interesting, just because it bothers someone else."*

However, most students report that they are supported by headmasters and teachers. In one school, students report that their headmaster gets involved in many activities. In most schools, teachers also help in some way to organise and implement volunteering activities. In these schools, teachers recognise student volunteers as responsible and mature and build a positive relationship with them, both inside and outside the classroom, as illustrated by the following excerpt: *"It's like we get along a little better with the teachers because you can joke with them a little bit, and be more relaxed."*

As for the collaboration with CSOs and other institutions, student volunteers have experienced working with various external stakeholders and there were only gratifying and pleasant experiences. Students from vocational schools made a special bond with external collaborators because they feel that they learn much more about their profession from them than they do in school, calling it *"the real school for life."* Students describe the external collaborators as cheerful, enthusiastic, open, knowledgeable, dedicated, helpful, and loving what they do. Students feel accepted and appreciated, and it is this feeling that makes these young people long-term volunteers as they have learnt to be a meaningful part of their communities - *"I think we feel more a part of this community because we can really do something, for example, when we paint a fence, we know that we have done something for this community."*

## 4. Conclusion

The results of this study show that in most cases a positive school climate prevails. Students reveal positive, democratic, and equal relationships between students and coordinators; they have the opportunity to be involved in every aspect of planning, organising and delivering volunteering activities; they feel connected with school and their (local) community. There is a positive collaboration among all actors from school and their local community, as well as mutual trust. However, there are also examples of unsupportive behaviour from headmasters, teachers, and other student non-volunteers. Results show that SVCs can

operate successfully despite the lack of a positive school context, but only if there are very enthusiastic, creative and capable coordinators. This research contributes to the body of literature emphasising that a nurturing school climate is critical to the sustainable success of SVCs. SVCs have been shown as a training and learning ground for practising the role of the sustainability citizen, as a safe platform where student volunteers are equals, and engaged in every aspect of the programme. In addition to the students, the teachers can also benefit from the positive school climate - they are more satisfied with their role and have greater chances to be more creative. Lastly, the organisational structure is very important for the smooth functioning of SVCs - such as a strong structure, careful planning, and financial support from "the top".

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# DOES IDENTIFYING AND ADDRESSING ACADEMIC DIFFICULTIES EARLY ON CONTRIBUTE TO ENHANCED STUDENT SUCCESS AND HIGHER RETENTION RATES FOR A DISTANCE LEARNING COURSE?

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## Abstract

In UK universities there is a problem with academic under-performance, failure and dropout of students enrolled on programming-based courses such as computer science & software development. One way to address the issue of high dropout rates in these courses is to implement targeted interventions for students who are at risk of failing or dropping out. By providing timely interventions to students who are struggling, it is possible to improve academic performance and decrease dropout rates. This requires the ability to quickly and accurately identify these students and provide them with the support they need.

One challenge with current approaches for identifying students at risk of academic failure or dropout is that they often do not identify these students until it is too late to provide meaningful interventions. To improve the effectiveness of interventions and support for at-risk students, it may be necessary to consider additional sources of data and to implement interventions earlier in the academic process.

When working with students in a distance learning programme the problem is more complex than when working with those enrolled on campus-based programmes. The nature of distance delivery means that academic staff are often denied the opportunity to regularly observe a student's performance in a classroom or computer laboratory setting. Furthermore, the literal remoteness of a distance teaching modes often stands between an academic and a struggling student and often blocks the possibility of a quick and informal chat where the student might have outlined their academic difficulties. These are both classic examples of on-campus triggers for intervention that could help to support a student; in a distance learning setting these triggers are much less likely to happen.

Our approach to identifying students at risk of academic failure or dropout involves using a wide range of data sources, including pre-matriculation socio-demographic data, aptitude test scores, assessment results, attendance data, and Learning Management System (LMS) activity data. This diverse range of inputs can provide a more comprehensive and accurate picture of a student's academic performance and risk of struggling in their studies. We frequently recalculate the prediction of likely academic success for each student, which helps to avoid the issue of "staleness" by using the most up-to-date data available. This can help to ensure that interventions are timely and tailored to the needs of each student.

*Keywords: Academic success, retention rates, distance learning, intervention, predictive learning analysis.*

## 1. Introduction

The design and deployment of an automated system for predicting academic success and intervening with students is something that must be carefully considered. There are several areas that require special attention.

First, with the vast amount of data collected on each student at matriculation and as they progress through their academic journey, it may be tempting to use some or all of this data to trigger interventions for struggling students. However, we must consider whether it is appropriate to use data originally collected for purposes other than predicting academic success, such as demographic information collected during matriculation. We must also determine whether certain sources of data, such as aptitude test results, which may only be relevant at the start of the course, should be replaced or supplemented with fresh performance indicators like results from weekly formative assessments.

Second, we must decide on a sensible trigger for interventions. If interventions are triggered too soon, students and academics may become overwhelmed. If they are triggered too late, we may miss the opportunity to provide help and support to a student when they need it most.

Lastly, we must design a student-centred approach to intervention. While an automatically triggered alert is easy to implement, it may be viewed as impersonal by students or, worse, incite fear or worry in a struggling student. It is important that we strike the right balance between a system that is manageable and one that provides the personal encouragement a student in academic difficulties requires.

The purpose of this paper is to present an overview of the key areas that we need to take into account when designing our pilot study.

## 2. Understanding data sources for predicting student success

Our approach can make use of a wide range of data sources to predict academic success. We discuss five possible data sources here.

### 2.1. Socio-demographic data

Nawa et al. (2020) conducted a statistical analysis of the associations between demographic factors and the academic trajectories of medical students at a university in Japan. They used a multinomial logistic regression to determine the association between a student's GPA (Grade Point Average) trajectory group and demographic factors, such as high school type, high school geographical area, admission test type, high school graduation year, whether the student was a biology major, and sex. Their findings revealed that some demographic factors were associated with GPA trajectories. These factors included high school geographical area, type of admission test, high school graduation year, and sex.

While it is common for universities to collect socio-demographic data as part of their pre-matriculation process, it is unlikely that students are asked whether their demographic data can be used to predict their likelihood of academic success. Therefore, our system can only use socio-demographic data if a student has given consent for it to be used in predicting academic success.

### 2.2. Aptitude test scores

The utilization of aptitude testing is a widely accepted method for screening employment and academic applicants (Choi et al., 2018). The nature and extent of these assessments vary, but most focus on evaluating the candidate's capacity to quickly comprehend and analyse information. When considering the use of these tests for academic admission, the primary objective is to forecast student achievement. However, the accuracy and validity of test results are crucial to the success and sustainability of the related academic programmes, and hence, an area of substantial investigation.

Aptitude tests generally measure three fundamental competencies: Information Processing - the ability to use available information using numerical and analytical reasoning; Solution Generation - the ability to solve problems using abstract reasoning, and Decision-Making - the ability to solve problems using critical and logical thinking.

McGowan et al. (2021) found that aptitude tests, when taken as a whole, were able to provide a prediction of score outcomes on a Programming module. Furthermore, Kuncel and Hezlett (2007) determined that standardised (aptitude) tests, in conjunction with prior academic performance, were reliable indicators of success when evaluating candidates for graduate school programmes.

### 2.3. Assessment results

Assessment results are often used as a prompt for intervening with students who are struggling in their studies. Some academic staff may choose to reach out to students who have performed poorly on a regular assessment, such as a weekly formative quiz. However, this type of tracking can be challenging to manage consistently and fairly over time. For instance, it is time consuming to manually track each set of assessment results and then individually contact students. The process is also prone to human error. On the other hand, end-of-module assessment results can serve as a clear trigger for intervention with students who have failed or nearly failed a module. Yet, in this case, it is often too late to provide a meaningful intervention as the module has already been completed.

In our system, we will consider using the LMS API to programmatically access assessment results for every student as soon as they are posted. This will allow us to automatically contact students to offer help, advice and support.

## 2.4. Attendance data

Attendance data for lectures can be a useful way to indirectly measure student performance because it provides an insight into a student's engagement and participation in their course. Regular attendance is generally associated with higher levels of academic achievement, as it suggests that the student is actively involved in the learning process and is motivated to learn. Gump (2005) conducted a study on attendance data and academic success for 300 undergraduates enrolled in a general education course at a large U.S. university. As expected, the study found a strong negative correlation between absences and lower final grades.

When considering distance learning courses, the unique nature of the course delivery must be taken into account. These courses may still offer traditional live lectures, albeit through a video streaming platform like Zoom or Microsoft Teams. Hence, students may not feel the same need to attend the live session as they would in a physical classroom, particularly if a recording of the session is available. In addition, some distance learning courses offer extensive pre-recorded video content that is accessible to students before the live sessions. Due to the flexibility of distance courses, students may not feel obligated to attend a live lecture as they can acquire the same information through other means.

It should be noted that attendance should not be the sole criterion for evaluating student performance, as it is possible for a student to attend all lectures but still struggle academically, or for a student to attend very few live lectures and still complete the course successfully.

## 2.5. Learning Management System data

In our system design, we need to decide when to intervene. While socio-demographic data and aptitude test scores provide us with some information that can be used to predict a student's academic success, the timing of data collection - which takes place before matriculation - means that they do not necessarily reflect a student's academic progress on a week-by-week basis during the programme. Assessment results, lecture attendance data, and LMS activity data can be used to provide a "live" picture of a student's academic progress.

In a previous pilot programme, Cutting et al. (2021) used LMS data as a measure of student engagement. Their Engagement and Alerting Tool (EAT) tracked whether students interacted with learning materials and assessment pages on the LMS. If the tool detected that a student had no LMS engagement for a single module in a set period of time (7- and 14-day periods were both tested), then an automated alert was sent to the module owner. If a student had no LMS engagement with more than one module over the same period of time, then an "escalated" alert was also sent to the student's personal tutor and welfare staff. Their tool could be set to continually monitor student engagement over a full academic year. This means that their tool was able to trigger interventions using "live" data, which is much more agile than using only pre-matriculation data.

In our approach, we will consider using LMS engagement data over both 7- and 14-day periods in a similar way to the EAT pilot.

## 3. Student-centered interventions

In our system design, we need to decide how to intervene with a student identified as being "at risk". We considered sending an automatic email to each student identified as being "at risk" to begin the intervention; however, this approach could be seen as impersonal. CQUniversity in Australia developed a learning analytics system called Early Alert Student Indicators (EASI) (Lawson et al., 2016) to help teaching staff identify those students potentially "at risk" of failure. Their system can be considered to be semi-automated, in that while it automatically identifies which students are "at risk" of failure, a member of staff must personalize the text of the "intervention" email before it is then mail-merged and sent to the student. The use of mail-merge is important because it means the intervention email appears to come from an academic member of staff, rather than an automated email account associated with the EASI system.

Lawson et al. (2016) also undertook lexical analysis of 223,979 emails that academic staff sent to students via the EASI system. They found that the "vast majority" of emails contained customized text that could be considered positive or motivational in tone. For example, they found phrases such as: "Do you need some help?" and "Please contact me to discuss this situation, as I would very much like to help you". However, in a minority of emails, they found text that could be considered demotivational. For example: "If you do not attempt this assessment, you will fail."

A number of important lessons can be learned from the approach taken by CQUniversity with their EASI system. First, their use of mail-merge means that each student "at risk" does not receive an impersonal "alert" from EASI. Instead, each student receives a personalized email (one that they can easily reply to using their email client) from an academic member of staff. Second, unless the options for

personalization of the email text are limited or very stringent rules are set for staff, it is possible that some of the intervention emails will be sent with text that is considered demotivational.

In our approach, we will consider using the Microsoft Graph API to automatically send an email intervention to each student "at risk" on behalf of a member of academic staff. In this scenario, the intervention email will be sent programmatically to the student but will appear with the sender and "reply to" specified as a member of staff. This allows the system to ensure that the email contains motivational text, and still allows the student to reply directly to the member of staff. We will also consider building in a "pre-flight" step that allows staff to prevent an email from being sent if they are already in communication with a student.

## 4. Discussion

We are at the very beginning of a journey, during which will ultimately seek to answer our motivating question: does identifying and addressing academic difficulties early on contribute to enhanced student success and higher retention rates for a distance learning course? In this paper, we have briefly introduced some of the key ideas and concepts that this long-term project will seek to investigate. We have identified and discussed a number of the key data sources available to us to help us measure and predict student success. We have given consideration to what a 'good' student intervention should look like.

In the short term, we plan to develop API integration software that will enable us to access the data sources outlined in this paper in a practical manner. Concurrently, we will investigate the type of student consent required for using each data source to predict academic success. Once the technical integrations are complete and necessary consents obtained, we will conduct a technical training phase during a full academic year to retrieve and store each data stream for each student. We will also record the academic outcome for each student on the programme to establish a benchmark of academic success.

In the subsequent academic year, we will conduct a testing phase that builds on the lessons learned during the technical training phase. This phase will guide us on how to make academic interventions in real-time on a per-student basis. We intend to provide in-progress results at the end of each of these phases.

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# EFFECTS OF INCREASED DISTANCE LEARNING ON EXPECTATIONS OF USING FLEXIBLE TEACHING METHODS IN HIGHER EDUCATION

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## Abstract

Distance learning has made it possible to increase the flexibility in teaching and learning. Flexibility is mentioned as one of the main benefits of distance learning, both from students and teachers. Distance learning has time flexibility, as if the lectures are recorded, they can be watched at any time. Distance learning is not place bound either, which means that students and lectures do not need any time to travel and move into the classroom. On the other hand, digital tools make it possible to organize hybrid teaching, combining both distance and contact teaching.

The aim of this study is to discuss the need of amount of flexibility in teaching methods at the master level courses at the university in future. What is the enough or good level of flexibility offered in education? How much flexibility do we need to offer to students? Distance learning, contact teaching or something between? These are the questions many university teachers and lectures need to consider these days when lecturing the courses and planning the future implementations. The purpose is to describe the students' and teachers' expectations and wishes related to flexibility in higher education. In addition, the benefits and challenges related to flexible teaching methods will be studied. This study is by its nature a case study in the form of survey for students at Tampere University, Finland. The study also analysis the discussions and interviews of students, teachers, and other stakeholders involved in higher education.

As a result, the different aspects of flexibility in teaching and learning will be introduced. Of course, it is in the best interests of the student, if you can choose, if you want to attend in lecture either through online or contact teaching in lecture room. But this can be the case also with other stakeholders. In many courses the representatives of industrial companies are involved as visiting lectures or as case companies in course assignments and it might be easier for them to attend the learning events as well through online. For example, Anyway, hybrid teaching compared just to contact teaching in lecture room requires more resources from teachers.

*Keywords: Higher education, flexibility, flexible learning, teaching methods, distance learning, contact teaching.*

## 1. Introduction

COVID-19 has led to significant changes in the way teachers teach and students engage in higher education (HE). Online and various kinds of blended learning modes were implemented rapidly and globally. With various modes of teaching and learning the social distancing and learners' diverse needs were taken care of, including being in different geographical locations. From the perspective of students, smooth and flexible study opportunities are one of the most important elements of quality in university operations (TAU, 2022). The duties of the teaching staff include supporting and furthering the students' engagement in studying, learning, and academic growth by employing varied teaching methods that consider the skills and abilities of various types of learners (TAU, 2019). The flexibility may be perceived as a value principle in education, like diversity and equality are (Naidu, 2017). The purpose of flexible study opportunities is to promote the smooth running of all students' studies. Moreover, students value the courses offering alternative study methods and teachers who also consider the different life situations and different learning styles.

Distance learning has made it possible to increase the flexibility in teaching and learning in HE. Flexibility has also been identified as one of the main benefits of distance learning, both from students and teachers. Distance learning has temporal flexibility, as if the lectures are recorded, they can be watched at any time. Distance learning is not place bound either, which means that students and lecturers

do not need any time to travel and move into the classroom. On the other hand, different kind of digital tools make it possible to organize hybrid teaching, combining both distance and contact teaching, giving students the opportunity to choose how they want to attend the lecture. In addition, due to increased distance learning, the value and meaning of the lectures has also changed, challenging teachers to develop lectures to be valuable and more than just interesting.

The aim of this study is to discuss the need of amount of flexibility in teaching methods at the master level courses at the university in future. What is the enough or good level of flexibility offered in education? How much flexibility do we need to offer to students? Do we promote distance learning, contact teaching or something between? These are the questions many university teachers and lecturers need to consider these days when lecturing the courses and planning for the future implementations. The purpose is to describe the students' and teachers' expectations and wishes related to flexibility in HE. In addition, the benefits and challenges related to flexible teaching methods will be discussed.

## 2. Flexibility in higher education (HE)

Flexibility has been a focus of attention and efforts in the field of education already for decades (Li & Wong, 2018). These days, the concept of flexibility together with openness are rapidly coming the norm in HE, which has led to the change of the nature of the educational transaction. (Naidu, 2017) Flexible learning has a key idea of being the learner's choice in different aspects of the learning experience (Collis & Moonen, 2002; Li & Wong, 2018). The flexible learning is often associated with the terms 'open learning', 'distance learning' and 'e-learning'. Especially, due to increasing application of information and communication technologies, flexible learning has been closely connected with the concept of e-learning. (Li & Wong, 2018) Al-Mawee et al. (2021) found in their research that students assess both positively and negatively their distance learning experiences. The positive things mentioned in their survey were for example time and location flexibility. The greatest concerns were about lack of social interaction and communication patterns. (Al-Mawee et al. 2021) The emerging technological tools are useful but need the know-how in addition to the mere know-what.

Learning is a complex process in which different learners and learning groups adopt various motivational and cognitive regulation strategies as part of their learning. (Naidu, 2017) Flexibility in learning has been one of the key elements to develop education quality and satisfying various student needs. (Li & Wong, 2018) Flexible learning allows students to combine different areas of their lives (studies, work, leisure) in a way that suit them best (AdvanceHE, 2023). The key is the way the flexible learning is implemented in practice. For example, Hack (2023) states that flexible learning can be a very good tool to promote success for the students, but it must be implemented in a way that it supports the learning environment.

Flexible learning is a state of being in which learning, and teaching is increasingly freed from the limitations of the time, place and pace of study. (AdvanceHE, 2023; Naidu, 2017). For learners, flexible learning may include choices for example in relation to selection of learning activities, assessment tasks. (Naidu, 2017) For the teachers, the flexibility can involve choices in relation to the allocation of their time and the mode and methods of communication with learners as well as the educational institution. Collis & Moonen (2002) highlight that flexible learning is much more than just distance learning. Flexibility in learning and teaching is relevant in any mode of study including campus-based face-to-face education (Naidu, 2017). Improving flexibility in studies can be seen through different components: in locations, in study programs, in types of interactions, in forms of communication, and in study materials. (Collis & Moonen, 2002) The goal of flexible learning is to leverage the benefits of pedagogy and technology to provide an engaging, personalized learning experience that supports students to reach their potential. The flexible learning opportunities can at its best promote successful student engagement and belonging in study community. (Hack, 2023) Thus, it may be proposed that should the means allow the value creation considering the individual needs and wants, the motivation will follow.

Flexible learning consists of four key areas: learner's choice, personal flexibility, institutional agility and balanced pragmatism. (AdvanceHE, 2023) Collis & Moonen (2002) express flexible learning through following four key components: technology, pedagogy, implementation and institution. Technology means the combination of information and communication technologies, pedagogy refers to the knowledge and skills, implementation is about how to apply methods and theories in practice, and institution highlights the institutional framework affecting flexible learning. Choosing to study in flexible ways is not always just about the physical separation, but also students being on campuses like to study in flexible way and prefer distance education. Distance education enables students being able to take on courses which might not have been offered at the time students needed to take them. This also gives opportunity to take on additional courses and this way will speed up the studies. (Naidu, 2017) The important question is that how flexible does flexible learning need to be? And who decides, and what

might be its implications, not only for learners, but also for teachers and institutional resources? Naidu (2017) claims that one size or approach to flexible learning does not, and will not, fit all kinds of learners, teachers, or disciplines. It is clear, that there is a need for different approaches to learning and teaching, with different levels of flexibility, structure and guidance for different cohorts and learning contexts.

## 3. Data and methods

This study is by its nature a case study in the form of survey for university students. The study also analyses the discussions and interviews of students, teachers and other stakeholders involved in HE. The survey was executed in February 2023 at Tampere University, Finland. The survey was launched for in four different ongoing master level courses in the fields of logistics and information, and knowledge management. The authors of this paper are responsible teachers in two of these courses. The survey was constructed using the online survey tool, Google Forms. The survey was made both in Finnish and in English, as two of the four courses were lectured in English. The survey link was sent on 1$^{st}$ of February through Moodle learning environment to students. Students had one week time to answer, and one reminder was sent in between. Through the survey, the students were asked about their opinions related to the flexibility in learning, experiences on expectations of using flexible teaching methods in HE and how increased distance learning has affected on those expectations and their own learning and learning processes. Altogether 52 students answered to the survey (48 responds in Finnish and 4 in English). The database table was created to analyze and categorize the survey results.

## 4. Results

The first question in the survey was about the students' views of the flexible study possibilities: "What does flexible study possibilities mean to you?" The answers covered several approaches. Many answers included the distance learning possibilities, but also other aspects of flexibility in learning were mentioned as well. *"Flexible study opportunities take into account different learners."* Distance learning possibilities were seen vital. Several students mentioned that distance learning gives opportunities for time, place, and pace flexibility. *"I can study wherever and whenever I want, and I am not tied to a specific physical place and time."* Many students also said that due to distance learning, it is easier to combine studies, work, and leisure. One student also mentioned that distance learning offers possibility to follow the course in case of illness.

Some students mentioned that for them the flexibility means ability to plan your own schedule (e.g., having the information about the deadlines in good time). *"The deadlines for the assignments will be informed already at the beginning of the course and the assignments will be published in good time to allow sufficient time for them to be completed."* The students' views about the flexible study possibilities are presented in Table 1. Number of responses of each category are in brackets.

*Table 1. Students' views about the flexible study possibilities.*

| | |
|---|---|
| • Distance learning (17) | • Offering substituting assignments (1) |
| • Alternative study requirements in the course (13) | • Transfering assignment deadlines (1) |
| • Lecture recordings (11) | • Consideration of different learning styles are (1) |
| • Hybrid model (10) | • Intermediate deadlines (1) |
| • Time flexibility (6) | • Possibility to study in different situation in life (1) |
| • Place and pace flexibility (4) | • Offering voluntary tasks, bonus points motivate (1) |
| • Flexible course choices (4) | • Presence flexibility, no obligation (1) |
| • Information about the assignments in good time (3) | • Opportunity to retake the exams (1) |
| | • Project based learning (1) |

Lecture recordings and hybrid model were also stated in answers. *"Providing multiple access points to students, allowing them to learn at their own pace and in their own ways, project-based learning. Also, hybrid model"* Despite of wishes to have different kind of distance learning possibilities, some students also want to remain contact teaching. *"You can participate in scheduled teaching on campus with other people, but you can also do the same things independently in your own time."* Time flexibility was seen very important among students, but again, not everything has to be flexible. *"Study scheduling is flexible; you don't have to be there at the same time each week. You can just choose when you want to watch lectures, for example. However, I do not think that there should be much flexibility in exams and assignment returns. There must be some deadlines, however."* The possibility to follow the teaching in shorter pieces also came up, as did the possibility to repeat the parts.

The next question was about the students' expectations and effects on learning: "How has COVID-19 pandemic and increased distance learning effect on your expectations about the flexible study possibilities (alternative study requirements, flexible teaching models)? What about the effects on your own study and ways of study?" Many students said that due to COVID-19 pandemic the expectations to have flexible study possibilities have increased and many wished the level of flexibility would remain. *"I have started to support flexible study opportunities more. In the past, I might have been in full favor of contact teaching, but flexibility is perfect for my own study and lifestyle."* Expectations to be able to study remotely have increased, as well the use of the hybrid model in lectures. There are also more expectations for the lectures to be recorded. Expectations also depend on the study year. *"The expectations themselves have not changed because I have not studied at university except in 'exceptional circumstances. Now that the situation is 'normalized' I feel that distance learning and streaming is the basic assumption in teaching, like sneakers on a jogging. You can run without it, but it's not comfortable."* On the other hand, some students highlighted that it is vital to have contact teaching as well, and especially now after pandemic, there is increased expectations to have more face-to-face activities on campus.

For the question about the effects on studies and ways of study, most of the students answered that effects have been mainly positive. There has been increased flexibility and more study possibilities, more temporal flexibility and due to that faster progress of own studies. *"I noticed that the increase in distance learning was beneficial to me. Flexible study suits good for me, because I can watch the lectures accelerated, pause them and write the notes in the meantime."* Some challenges were also raised. Flexible learning requires more self-discipline and time management. Studying can be less effective, workload of studying has increased, there is less networking and discussions with other students, it is more difficult to ask for help and less memorized learning due to lack of exams. Some students answered that there have been no effects on their studies or learning style. The effects on expectations and studies are presented in Table 2. Number of responses of each category are in brackets.

*Table 2. Effects on expectations about the flexible study possibilities and effects on studies.*

| Increased expectations | Effects on studies | |
|---|---|---|
| • Flexible study opportunities (11)<br>• Distance learning (6)<br>• Hybrid model, streaming (4)<br>• Availability of lecture records (9)<br>• Electric exams (1)<br>• Contact teaching (5)<br>• No change in expectations (1) | • Positive effects (8)<br>• Increased study possibilities (7)<br>• Easier scheduling, time flexibility (6)<br>• Faster progress of studies (2)<br>• More difficult to separate study and leisure (2)<br>• Less networking (2) | • Less memorized learning (1)<br>• Less effective studying (1)<br>• Increased study workload (1)<br>• More self-discipline needed (1)<br>• More difficult to ask for help (1)<br>• No effects (1) |

When asking, if students have asked any flexibility in their studies from the responsible teachers during the autumn 2022, 77,1% of students said that they have not. The rest 22,9% answered that they have asked some. Most of the students think that enabling remote participation to face-to-face learning events is supportable (83,3%), only 2,1% said it is not and rest 14,6% said it is not relevant to their studies. From different alternative study requirements, most of the students would like to have exams (54,2%). Group work was the second-best option (47,9%), learning diary third (43,8%) and individual assignment fourth (41,7%). Related to mode of the exam, the students would prefer to do the exam at home (41,2%). 35,3% would like to have an electric exam in classroom, 7,8% handwritten exam in a classroom and 15,7% would like to the do an exam in a classroom made with own laptop.

The several discussions with the students reflect similar results with the survey. Students prefer to have possibilities to distance learning, especially the lecture recordings are very much liked. Anyway, students would like to keep the possibility to attend the contact teaching as well. Time and place flexibility are usually mentioned as main positive things of remote teaching, but lack of meeting other students is perceived as a main negative effect of the remote teaching. Some students also feel that it is easier to focus and learn when you attend contact teaching. Based on the discussions with the teachers, it seems, that most of the teachers would prefer to have contact teaching, because they feel that in contact teaching you can teach better also other important working life skills, like interaction and performing skills. Teachers also feel that they get to know students better in contact teaching compared to remote teaching. Remote teaching can also have some flexible possibilities for the teachers and other stakeholders involved in teaching. For example, guest lecturers from industry and companies seem to favor remote lectures due to lesser time needed. However, some guest lecturers still think that it is vital to meet the students face to face.

## 5. Discussion and conclusions

This paper studied the effects of increased distance learning on expectations and wishes of using flexible teaching methods in HE. The study shows that students' expectations of using flexible teaching methods has clearly increased. The students are expecting possibilities for distance learning, but also for other flexible teaching and learning modes, like alternative study requirements and possibility to choose courses freely. Expectation and wishes for using hybrid models in lectures have also increased. Distance learning also seems to be something that students have got used to in course implementations and it is seen almost as a default in teaching and learning. Naidu (2017) had same kind of thoughts and underlined that the concept of flexibility is rapidly coming the norm in HE. It is also good to be aware, that now due to pandemic, we are also having many university students, who have only studied under conditions of pandemic. Based on this study, students appreciate especially time, place, and pace flexibility and at best, the distance learning can give you all these. The three elements are also identified to be the key benefits of flexible learning among researchers (see e.g., Collis & Moonen, 2002; Naidu 2017; Zaborava et al. 2017) Be as it may, the supporting voices for contact teaching are still there. Students would like to have the possibility to attend contact teaching as well. Especially, after pandemic, some students are eager to network and see other students.

As conclusion, it is clear, that we are all having different kind of learning styles and there is no one solution for all needs. Some students like distance learning, while others prefer contact teaching. Some like to write learning diaries, others traditional exams, etc. From the students' point of view the best would be that students can decide by themselves how, when and where they are studying. All in all, various flexible teaching and learning methods are something students are expecting these days and on the other hand, today's technology and digital tools also give opportunities for flexible teaching methods. But what is enough or good level of flexibility offered in HE? How much flexibility do we need to offer to students? These questions challenge the teachers and there are no clear answers. Of course, if you want to engage your students in their studies, you need to use several flexible learning and teaching methods. The use of flexible teaching methods highly depends on the resources available to and competences of the teachers, but also teachers can benefit from flexible learning.

This study delivers information about the meaning of flexible learning and teaching methods for students and students' expectations of using flexible teaching methods in HE. In terms of practical implications, the results of this study can be used as a guiding information and base when planning the future course implementations. In future, the more detailed follow-up study should be carried out. It would be interesting to conduct this kind of study in other universities as well, to get more information and compare the results. The comparison between different countries would be also informative. In addition, a study concentrating on the requirements and the thoughts of the teachers would increase the understanding of the situation even more shedding lighter on the big picture.

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# CRITICAL THINKING TO EMBED SUSTAINABILITY IN ENGINEERING COURSES ACTIVITIES. A SYSTEMATIC LITERATURE REVIEW

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## Abstract

This contribution presents the results of a systematic literature review, which tries to explore the current trend in engineering studies to include Sustainable Development (SD) in the curricula with the support of Critical Thinking Skills (CTS).

As future technical problem solvers, critical thinking (CT) development is considered essential for engineering students. Beside UNESCO announces CT as one of the key transversal competencies to insert SD into academic curricula, among others as, systems thinking, collaboration, normative competence, anticipation, self-awareness, strategy and problem solving. However, the way to embed sustainability in engineering education is uneven, and each academic institution or lecturer designs its own model for including sustainability in teaching.

After some years embedding SD in engineering curriculum, arises the need to know if lecturers actually implement models that contribute to inserting SD supported by the so demanded CTS according to UNESCO, and, if so, how are the adopted didactic designs. All it, with the aim to obtain a model to design effective training activities to insert SD in the engineering classroom through this key competence for engineering students. This work is considered an interesting study that combines the much-demanded need on the part of evaluation agencies to include SD and CT in engineering studies to train socially committed professionals according to the challenges and scenario of the 21st century.

The literature review was carried out systematically, according to the standards of the specialized bibliography. Nearly 40 articles obtained from the Scopus, WOS, and IEEE Xplore databases were analyzed. Its mains results show that there are fewer activities working on sustainability through critical thinking. In most cases, SD related PBL activities are carried out, and critical thinking is one of the ingredients needed for PBL process, which is developed transversally. Nevertheless, also interesting design has been found.

This paper shows the detailed results of the review, that is, the role of CT in analyzed papers and the description of teaching methodology used to embed both SD and CT. In addition, possible orientation is proposed to work critical thinking with sustainability activities for future lines of work are proposed.

***Keywords:*** *Critical Thinking, sustainable development, engineering education, literature review.*

## 1. Introduction

UNESCO (2017) defines Education for Sustainable Development (EDS) as a transformative action to empower and motivate learners to become active sustainability citizens who are capable of critical thinking and able to participate in shaping a sustainable future.

According to this vision, among the learning objectives for achieving sustainable Development Goals (SDGs), UNESCO includes, in the aforementioned document, the Critical Thinking competence, as "the ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse" (UNESCO, 2017, p.10).

Otherwise, CT is one of the principal competences for engineering graduates according to employers (Ahern, Dominguez, McNally, O'Sullivan & Pedrosa, 2019) that aid engineers in problem solving processes, especially in an increasingly rapid changing world (Adair & Jaeger, 2016).

About the need to insert CT and SD in engineering curriculums much has been written, below there is a brief summary of the most relevant highlighted ideas for the purposes of this research work.

### 1.1. Critical Thinking in engineering education

According to Lai (2011) the skills of CT consist principally in analyzing arguments, drawing inferences, judging or evaluating and taking decisions, with the object of guiding problem-solving; Ennis (1989) also includes metacognition among these elements. Besides Bezanilla-Albisua, Poblete-Ruiz,

Fernández-Nogueira, Arranz-Turnes, and Campo-Carrasco (2018) go beyond, and include in the third domain level of CT skills, the action to transform the reality. Which fits with UNESCO vision of CT skills for SD.

In engineering education, where problem solving is one of the main activities, the CT skills acquisition seems essential; seen CT as a systematic thinking process transferable to different situations. Thus, in the criteria list of the most important engineering programs accreditation agencies, there are items clearly related to CT. They were analyses and classified by Malheiro, Guedes, Silva and Ferreira (2019) and some of them arouses and were classified as CT related skills. See Table 1.

*Table 1. CT skills in Accreditation agencies criteria.*

| Competency | Body | Desired professional skill |
|---|---|---|
| **Critical Thinking and Problem solving** | ABET | Ability to understand the impact of engineering solutions (critical thinking)<br>Ability to identify, formulate and solve engineering problems<br>Ability to recognize the need for and engage in life-long learning |
| | EA | Ability to undertake problem solving, design and project work<br>Ability to display critical reflection<br>Capacity for lifelong learning and professional development |
| | UKEC | Ability to critically evaluate, make judgements, and frame appropriate questions to achieve a solution to a problem<br>Ability to manage their own learning |
| | ENAEE | Ability to do judgements, identify, formulate and solve engineering problems as well as to manage complex technical or professional activities<br>Ability to engage independent life-long learning |

Source: adapted from (Malheiro et al., 2019, Table 1); ABET (Accreditation Board for Engineering and Technology): USA; EA (Engineers Australia): Australia; UKEC (Engineering Council):UK; ENAEE (European Network for Accreditation of Engineering Education): Europe.

Nevertheless, in a literature review about CT in engineering education, Ahern et al. (2019) concluded that in general, there is not ensured that CT training is embedded across engineering programs; the activities to learn CT skills are isolated and short, and mainly are centered in problem-solving and real-world situations. They also stated that in the majority of papers CT aspect could be inferenced, although there is not specified the CT framework or definition.

## 1.2. Sustainability for engineering students

According to SD, currently, there is a global process for the holistic insertion of SD in higher education institutions, which includes also action plans to insert ESD into their academic curricula (Lozano et al., 2014). This is happening too in engineering syllabus with the inclusion of sustainability competencies (Sanchez-Carracedo et al., 2021). In this EDS inclusion context, engineering programs are special for some institutions which see engineering as "vital" change actor, and claim the necessity to form future engineers to address the mitigation and adaptation to climate change and the reduction of poverty (Walk, 2010; Engineering Council, 2021).

According to Duarte et al. (2020) engineers must be trained in the practice and awareness of sustainability. That is, students must take awareness about how their profession impacts the environment and the society and must know that they would have to actuate toward sustainability in their future career.

The accreditation organizations identify among others some aspect of sustainable development that must be address in engineering education courses. Duarte et al. (2020) made a comparative analysis between worldwide accreditation agencies to show how sustainability is present in the accreditation requirements of ENAEE, ABET, or NAE (National Academy of Engineering) an also for UNESCO. The result are summarized in Table 2.

*Table 2. Sustainability related skills.*

| Organization | Strong technical scientific background | Interdisciplinary | Work in complex teams | Improve the quality of life for all | Rational usage of global resources | Social Responsibility | Environmental Responsibility | Develop Sustainable Societies | Environmentally friendly technologies | Cultural Responsibility |
|---|---|---|---|---|---|---|---|---|---|---|
| UNESCO | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| ENAEE | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| ABET | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| NAE | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Source: Duarte et al. (2020)

In the described scenario, it looks interesting to include SD in engineering education with the support of CT; not only to include sustainability driven activities but to achieve EDS transformative objective in engineering graduates. Thus, with the aim to know what is going on currently on pedagogical interventions in engineering education that combine SD and CT, a systematic literature review has been

conducted. The main research question of this work is: What are the teaching activities in engineering education supported by CT to embed ESD in the syllabus? And the pretended objective is to detect good practices to include SD in engineering education with a transformational perspective aided by CT.

## 2. Methodology

The systematic review of English language literature was conducted according to the method designed by Ahern et al. (2019), who analyzed CT in engineering education. Ahern's procedure is an adaptation of the general method proposed by Borrego, Foster and Froid (2014) for systematics reviews in engineering education. Considering the porpoises of this research, the procedure established by Ahern et al. suited perfectly in this research, so the methodology was replicated. Nevertheless, not having this research a quantitative analysis, instead of five, only four steps were conducted (see figure 1).

### 2.1. Phase 1: Identification of relevant literature

The search was limited to articles published from 2017 (year of the publication of UNESCO report linking CT skills and ESD) in SCOPUS, WOS and IEEE Xplore.

The keywords were:

Critical Thinking, Critical Thinking Skills
Sustainable development, sustainability, sustainable developments, sustainable development goals, SDG, SD
Engineering education, engineering.

The search algorithm was: (critical thinking" OR "critical thinking skills") AND ("sustainable development" OR "Sustainability" OR "sustainable education" OR "sustainable development goals" OR "SDG" OR "SD") AND ("engineering education" OR "engineering").

### 2.2. Phase 2: screening the title and abstract

Potential 61 papers were identified, and 20 duplicated papers were eliminated. Finally, the abstract and titles of 41 paper were reviewed.

To be included in the study the papers had to describe applied activities in engineering courses (in higher education) were sustainability and critical thinking were developed. After this first screening, 18 papers passed to the following step.

### 2.3. Phase 3: screening methods CT and SD

18 full tests were reviewed. Only were accepted finally those that described the followed methodology to develop in the classroom scenarios or activities related to sustainable development that make explicit the intention to develop Critical Thinking skills and Sustainable Development. Five were removed for not achieve the admission criteria.

*Figure 1. Research procedure.*
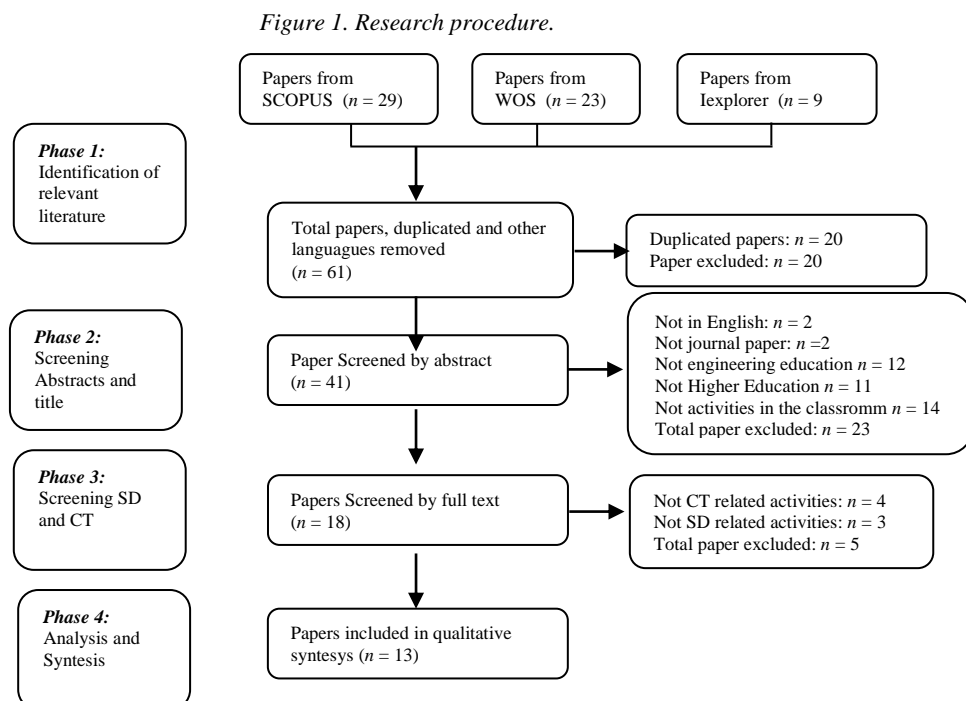
## 2.4. Phase 4: review process, data extraction and analysis

In this phase data extraction of 13 full tests was done, de obtained information was about: (a) engineering courses and level; (b) intervention length; (c) applied approach or methodology; (d) way to integrate SD; (e) way to integrate CT; (f) assessment method of SD; (g) assessment method of CT.

One paper was removed, because the same intervention was described in two papers. The 12 analyzed papers are listed in table 3 with their identifiers.

*Table 3. Finally analyzed papers.*

| ID | Reference |
|---|---|
| ID_5 | Hoople, G. D., Chen, D. A., Lord, S. M., Gelles, L. A., Bilow, F., & Mejia, J. A. (2020). An integrated approach to energy education in engineering. *Sustainability*, 12(21), 9145. |
| ID_7 | Membrillo-Hernández, J., J Ramírez-Cadena, M., Martínez-Acosta, M., Cruz-Gómez, E., Muñoz-Díaz, E., & Elizalde, H. (2019). Challenge based learning: the importance of world-leading companies as training partners. *IJIDM*, 13, 1103-1113. |
| ID_9 | Gupta, C. (2022). The Impact and Measurement of Today's Learning Technologies in Teaching Software Engineering Course Using Design-Based Learning and Project-Based Learning. *IEEE Transactions on Education*, 65(4), 703-712. |
| ID_15 | Pradhananga, P., & ElZomor, M. (2023). Developing Social Sustainability Knowledge and Cultural Proficiency among the Future Construction Workforce. *Journal of Civil Engineering Education*, 149(2), 04022011. |
| ID_19 | Ocampo-López, C., Castrillón-Hernández, F., & Alzate-Gil, H. (2022). Implementation of Integrative Projects as a Contribution to the Major Design Experience in Chemical Engineering. *Sustainability*, 14(10), 6230. |
| ID_23 | Rodriguez-Dono, A., & Hernández-Fernández, A. (2021). Fostering Sustainability and Critical Thinking through Debate—A Case Study. *Sustainability*, 13(11), 6397. |
| ID_29 | Colmenares-Quintero, R. F., Rojas, N., Kerr, S., & Caicedo-Concha, D. M. (2020). Industry and academia partnership for aquatic renewable energy development in Colombia: A knowledge-education transfer model from the United Kingdom to Colombia. *Cogent Engineering*, 7(1), 1829805. |
| ID_30 | Khandakar, A., Chowdhury, M. E. H., Gonzales, A. J. S. P., Touati, F., Emadi, N. A., & Ayari, M. A. (2020). Case study to analyze the impact of multi-course project-based learning approach on education for sustainable development. *Sustainability*, 12(2), 480. |
| ID_33 | Malheiro, B., Guedes, P., Silva, M. F., & Ferreira, P. (2019). Fostering professional competencies in engineering undergraduates with EPS@ ISEP. *Education Sciences*, 9(2), 119. |
| ID_34 | Gatti, L., Ulrich, M., & Seele, P. (2019). Education for sustainable development through business simulation games: An exploratory study of sustainability gamification and its effects on students' learning ouCTomes. *Journal of cleaner production*, 207, 667-678. |
| ID_35 | Baillie, C., & Male, S. A. (2019). Assisting engineering students along a liminal pathway and assessing their progress. *Australasian Journal of Engineering Education*, 24(1), 25-34. |
| ID_38 | Gallego-Schmid, A., Schmidt Rivera, X. C., & Stamford, L. (2018). Introduction of life cycle assessment and sustainability concepts in chemical engineering curricula. *International Journal of Sustainability in Higher Education*, 19(3), 442-458. |

## 3. Results and discussion

The duration of intervention is declared in seven papers, all of them are short, only one (ID_15) was two semesters long; all interventions are isolated interventions in the curriculum, consistent with Ahern et al. (2019). Some of them are designed to be developed in more of one course (ID_15 and ID_19), and others have students of more than one engineering degree or master (ID_7, ID_9, ID_33, ID_38). According to the course type, three interventions are developed in sustainability related courses or modules (ID_34, ID_35, ID_38) and the rest are interventions in ordinary courses, or capstone project (ID_19, ID_33).

Adopted approaches in most of the cases (ID_7, ID_9, ID_19, ID_29, ID_30, ID_33) are challenge, project, problem or design-based learning approaches (CBL, PjBL, PBL, DBL) or their combinations; with open solution, real world and complex problem, project or challenges. However, in a good design it should be taken into account that as indicated Duarte et al (2020) a sustainability project is not only driven by sustainability, but to the achievement of the UN Sustainable Development Goals. Mainly, the declared aim of the adopted scenario is to develop SD and CT skills within a favorable environment, while a sustainability related problem is solved. Nevertheless, it is not the only option. In ID_23, ID_35 and ID_38 debates are raised, in ID_35 gamification and in ID_35 a service-learning activity.

Two insertions type of SD are differentiated. In ID_19, ID_29 and ID_30 interventions, students work on a SD related case, and it is considered that in this way sustainability competencies are already developed, indeed SD skills are not even evaluated. However, in the others, students work also on a SD issue to acquire SD skills. Which are evaluated separately through evidence from student's productions, or exams.

For the CT, something similar should be pointed out, in interventions ID_30 and ID_34 it is understood that the active method used develops CT skills, and CT is not evaluated. In the others, specific activities are designed or identified to develop CT and it is evaluated in all of them but in ID_38.

The activities that are specifically designed to develop the CT are mainly: reflective readings (in almost all of intervention); analysis/synthesis of issues related to SD from various approaches (in ID_5, ID_15, ID_38); debates (in ID_23, ID_35 and ID_38) and games (in ID_34). In those last cases, CT is evaluated by analyzing the documentation provided by the students, stands out a reflective diary (in ID_35), used with a transformational objective.

For the purposes of this study, the articles ID_35 and ID_23 stand out. In both cases, the CT is used to achieve EDS transformative objective.

## 4. Conclusions

The most adopted approaches are problem and project-based learning with sustainability related issues to solve, but they must be oriented towards the achievement of the UN Sustainable Development Goals.

The literature review conducted has been useful for the intended purpose: detect activities that serve to use the CT to achieve SD skills in engineering education.

It seems that intended designed activities to promote CT like debates, or reflective journals among others, can create the desired EDS transformative in engineering education.

Therefore, it seems that to achieve a transformation towards ESD in engineering, the way forward is as follows: create an active and trustworthy learning environment; design or agree with a social agent or company a sustainability problem to be solved; and design, make explicit and evaluate highly level critical thinking activities oriented to achieve SD skills.

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# MOTIVATION, LEARNING AND EMOTIONS: ENGAGING STUDENTS WITH SCIENCE FLIPPED CLASSROOM

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## Abstract

Motivation is an important construct in the teaching and learning process. A low-motivated student is uncommitted, with little engagement in the learning process, is not available to focus on learning tasks or processes and has low relatedness/belonging with the school environment. Motivation and resilience are two facilitators of science's teaching and learning process. In this context knowing teaching methodologies that promote school motivation is very important for physics and chemistry teachers. In a Portuguese upper secondary school class in the science field, an action research project was planned and implemented during a school year. The aim was to decrease apathy and disinterest in learning chemistry and physics, after confinement, improve study habits, and develop facilitators of the learning process. The intervention consisted of using active learning methodologies centred on students: an inverted classroom, accompanied by practical work with laboratory stations. These two methodologies allow a student-centred class and very diverse tasks to be performed during the teaching and learning process. So, throughout the research time, during the school year, the implementation of the intervention (the active methodology applied to it) was the focus of the research. This research, with the characteristics of quantitative research, followed the methodology of action research. The data were collected, through a questionnaire (already validated for the Portuguese population) at the beginning (after two months of intervention) and end of the school years (after the intervention). The questionnaire, containing statements, is structured as a self-response, with a Likert scale, ranging from totally true (5) to totally false (1). It is based on the achievement goal theory, self-regulation model, and instrumentally, and collects data regarding learning strategies applied by students. The results revealed that these methodologies allowed the students' motivation maintenance throughout the school year and that teachers as a relevant role in preserving the students' motivation.

*Keywords: Motivation, science field, active methodology, flipped classroom, laboratory stations.*

## 1. Introduction

The pandemic occurred in 2019, and the confinement during long periods left scratches on students, especially young people. The sense of belonging to a group became tenuous and school experiences began to occur via mobile phones or computers. The teacher and student interactions were mediated by mobile phones or computers (when students have them). The students' study habits and schoolwork organization were lost over time and, at the end of two years of confinement, students were poorly motivated to resume their studies. Gaps in learning and emotional levels had to be minimized and some schools proposed projects in this regard. This research project emerges in this context.

Motivation is fundamental to human agency and volitional behaviour and is determined by a complex interplay of internal and external factors. Motivation offers the reason/ trigger for individuals to behave in certain ways and to take action to achieve a goal or to fulfil a need or expectation. (Gopalan, Bakar, Zulkifli, Alwi, & Mat, 2017). All motivations have underlain three basic psychological needs: autonomy, relatedness (sense of belonging to a group) and competence.

Self-determination theory (SDT) is a macro-theory of motivation, emotion, and personality in social contexts (Deci & Ryan, 2000). SDT defines three categories of motivation: Amotivation (a complete lack of intent to do something), Extrinsic motivation (the behaviour is triggered because it will lead to an outcome which is separate from the self) and intrinsic motivation (the behaviour is carried out because it is inherently interesting or enjoyable. All motivation has underlain by three basic psychological needs (relatedness, autonomy and competence), the fulfilment of which affects one's level of motivation and psychological well-being. Six mini theories emerge from SDT, explain human behaviour in terms of psychological needs (Ryan & Deci, 2017).: cognitive evaluation theory (CET), organismic integration theory (OIT), causality orientations theory (COT), basic psychological needs theory (BPNT), goal contents theory (GCT), and relationships motivation theory (RMT).

## 1.1. Achievement Goal Theory

Motivation has been related to the achievement of goals. The construct of competence as being central to the Achievement Goal Theory (AGT). According to AGT, achievement goals are personal (internal goals), and characterized by being future-oriented and viewed as cognitive representations of future outcomes (Hulleman, Schrager, Bodmann & Harackiewicz, 2010). These internal goals depend on how personal competence is perceived and are context-dependent (Hulleman, Barron, Kosovich & Lazowski, 2016).

Mastery goals (or learning goals) are related to personal needs of increasing competence, whereas performance goals are related to demonstrating competence to others (Elliot, 1999). Both types of goals help students focus on approaching or moving toward success. Students having a learning goal were aiming to improve over time and develop skills. In contrast, students holding a performance goal we are pursuing outperform and demonstrate a skill to others.

Students who advocate prominent levels of performance-approach goals tend to attribute success to unmanageable factors (Seifert, 1995) such as innate abilities or intelligence rather than due to effort or persistence. They usually adopt shallow cognitive strategies as rehearsal (Ho & Hau, 2008), demonstrate a reluctance to seek help (Butler, 2006), experience increased negative achievement emotions (Huang, 2011), and have low perceptions of success (Daniels, Haynes, Stupnisky, Perry, Newall & Pekrun, 2008). Students who advocate mastery-approach goals usually hold a mindset that is based on believes that their ability to learn can be improved through work and persistence (Buluş, 2011; Grant & Dweck, 2003). ("Achievement Goal Theory Review: An Application to School Psychology")

## 1.2. Organismic Integration Theory

Many times, individuals perform a task because they must do it (is a duty) without being involved with it. It means that it is not a requirement to have an intrinsic motivation to do a task, but extrinsic motivation is enough to engage in it. In this context emerge the organismic integration theory (OIT) of SDT, which addresses people's extrinsic motivation (EM) and perceived locus of causality (Ryan & Deci, 2017). Organismic Integration Theory is a sub-theory of SDT which presents four subtypes of extrinsic motivation, each with a different perceived locus of causality: external regulation; introjected regulation; identified regulation and Integrated regulation. (Ryan & Deci, 2017).

Extrinsic motivation is an external regulation with the lowest levels of autonomy. In this case, the behaviours conduct to satisfy external demands or to obtain external rewards and have an external perceived locus of causality. The second least autonomous form of external motivation implies introjected regulation behaviours conducted to avoid guilt or anxiety or to enhance self-esteem. Here we can find to some extent external perceived locus of causality. The identified regulation behaviours are carried out once a person has consciously identified the personal importance of doing the task (for instance, studying the content which, has relevance to one's desired career, but that is not enjoyable), having a slightly internal perceived locus of causality. The most autonomous form of external motivation is integrated regulation, which implies behaviours that were assimilated into the self. These behaviours have been internalised through self-examination and are congruent with one's needs and values. Persons with integrated regulation are engaged in willingly being self-determined but still performing for a separable outcome. In this case, the locus of causality is perceived as internal.

Has Ryan and Deci (2017) referred, fulfilling the needs of autonomy, competence, and relatedness helps to further internalise extrinsically mediated behaviours. So, a person can pass from a behaviour conducted as an obligation (external regulation) to an integrated regulation behaviour that emerges as a personal need. The greater the internalization, the more likely people are to persist in the task, perform efficiently, and enjoy doing it, which increases well-being (Ryan & Deci, 2017).

## 1.3. Active learning strategies: flipped classroom and laboratory station methodologies

In flipped classroom teacher use teaching strategies like visualization and technology. Students receive the information, by watching, reading, writing, to hearing through visual means (videos, text, images, flow charts, graphic organizers, concept maps and Venn diagrams) allows students to grasp information more effectively through visual memory, they are more able to retain both the previous learning and new information for a longer time. In a flipped classroom, students led classrooms, not only because they access contents when and where they want, but also because in the presential classroom, all activities are programmed to be students centred. To facilitate student-led instructions, teachers encourage students to see the materials made available by teachers before face-to-face classes. Students are encouraged to think critically regarding new content and, in the presential (face-to-face) classroom pose questions, to allow more effective feedback. Teachers encourage students to perform their studies at home and bring their learning outcomes to the classroom. Reading & writing technics are used during the teacher's visualization of the materials prose, as students must write their notes, read text or textbooks, and note-taking (Ribau, 2020 and 2022).

In the classroom, technology is used as a tool for active learning strategies. The use of simulations and modulation programs, and programmes for acquiring and analysing data are some of the applications of technologies. Technologies are also used to perform regular assessments, allow more allowed more captivating and interesting classes, and diversify the proposed activities in the classroom. This promoted a more inclusive and effective learning environment that improves inquisitiveness and collaboration among the students and allows teachers to collect data on student performance.

In the practical classes, laboratory stations are based on teamwork namely collaborative work and hands-on and minds-on activities. This methodology allows the implementation in classes of 4 or 5 different tasks, that explore the same theme/content using a different approach, for instance: one task uses the computer to do simulation/modulation, the other two tasks are practical work, and another is an exercise resolution based on real data. Studies reveal that group assignments improve teamwork and help students to succeed (Rita, Lopes, Esperto & Ribau, 2019). As in laboratory station models students handle, and manipulate materials and equipment (simple as rulers or more complex as sensors) and work in groups, allowing kinaesthetic Learning (or embodied cognition). The fact that students are moving through the islands/laboratory stations permits greater involvement of students in activities. The tasks are students centred and the teacher during the classes follows the progress of the accomplishment of activities, gives students support when passes through the groups and clarifies their doubts.

## 2. Methods

This research was designed as an exploratory and descriptive case study, with a methodology based on self-response questionnaires in a convenient experimental population of the 10th grade (26 students (15 and 16 years old) in the upper secondary school in the Lisbon metropolitan area. The research goal was to perceive the impact of, the flipped classroom with laboratory stations, on their motivation. The students that were the object of study are in the same class and were chosen randomly among other classes. The intervention (the methodology of the laboratory stations model and flipped classroom) was implemented between September 2021 and June 2022.

### 2.1. Research design

Regarding the intervention (flipped classroom with laboratory station), the data collection occurred in November, and June. During the school year (32 weeks), students performed seventeen experimental classes at laboratory stations. They also experienced the flipped classroom throughout the school year.

The teacher informed students that, the survey was anonymous, as the instrument was for research purposes only, and, that the main goal of the research was to understand the impact of the laboratory station classes and the flipped room on their motivation. The intervention process began in September 2021 and finish in June 2022.

The scholar motivation questionnaire (SMQ) validated for the Portuguese population (Cordeiro, 2010; Cordeiro, Figueira, da Silva & Matos, 2012) is a multidimensional questionnaire, consisting of 87 closed questions, that evaluates, from the student's point of view, their motivational processes, the objective structure promoted by the teacher in the classroom, the teacher's motivational style, the differential use of learning strategies, and their school performance. SMQ scales are quoted using a five-point Likert scale. Students respond to each item by opting for an alternative, on a 5-point scale. (1: If you think the phrase is totally false; 2: If you think the phrase is false; 3: If you think the phrase is truer than false; 4: If you think the phrase is true; 5: If you think the phrase is totally true). The students used the five response possibilities to evaluate the items. The quotation of the items corresponds to the numerical value suggested in each response.

## 3. Discussion

The research regarding Goal Achievement is reflected in two dimensions: "A. Perception of the orientation of the teacher's objectives" and "Guiding students' goals" (Table 1). In both dimensions, the learning (mastery)-oriented objectives and performance-oriented goals, were analyzed. The data presented allow us to conclude that the Orientation goals perceived as promoted by the teacher are related to the student guidance goals. The performance-oriented goals are related to external regulation and introjected regulation. The mastery goals can be related to identified and Integrated.

*Table 1. Specific Comparison of average score between the two moments of collecting data.*

| Dimensions | Scale | November 2022 average scores | June 2023 average scores |
|---|---|---|---|
| Perception of the orientation of the teacher's goals | A1. Learning (Learning-oriented objectives) | 3.91 | 3.94 |
| | A2. Performance (Performance-Oriented Goals) | 2.91 | 2.90 |
| Guiding students' goals | D1. Learning (Learning-oriented objectives) | 4.18 | 4.05 |
| | D2. Performance (Performance-Oriented Goals) | 3.73 | 2.43 |

Meta-analyses performed by Huang (2012) and Hulleman and collaborators show positive associations between performance-approach goals and academic achievement (Huang, 2012; Hulleman et al., 2010). But students that present performance-oriented goals, can simultaneously experience negative cognitions and emotions, which are not good for their well-being (Daniels, Haynes, Stupnisky, Perry, Newall & Pekrun, 2008). Learning goals are associated with accomplishing an activity and feeling continuously engaged in it (Senko & Harackiewicz, 2005), and experiencing enjoyment and fewer negative emotions (Huang, 2011). It should be acknowledged that the relationship between learning (mastery) goals and grades tend to be indirect (Mouratidis, Michou, Demircioğlu & Sayil, 2018).

As one aim of the intervention was to promote students' autonomy and self-regulation, it is possible to conclude that this goal was achieved for most of the students in this class. This can be assigned also in data presented in Table 2, which shows that students' perception regarding classroom climate (promoted by the teacher) implies a greater value of students' autonomy and rather control. And this perception has a slight increase during the school year.

*Table 2. Specific Comparison of average score between the two moments of collecting data.*

| Dimensions | Scale | November 2022 average scores | une 2023 average scores |
|---|---|---|---|
| C. Perception of classroom climate | C1. Autonomy vs. Control (Teacher as the promoter of autonomy versus controller) | 3.38 | 3.45 |

The learning strategies scale assesses the use of it by students according to a structure of twenty-nine items organized in five scales: the rehearsal strategies scale (F1); the elaboration strategies scale (F2); the organization strategies scale (F3); the critical thinking scale (F4); and the metacognitive strategies scale (F5), Table 3.

*Table 3. Specific Comparison of average score between the two moments of collecting data.*

| Dimensions | Scale | November 2022 average scores | June 2023 average scores |
|---|---|---|---|
| F. Learning Strategies | F1. Rehearsal | 3.67 | 3.56 |
| | F2. Elaboration | 3.78 | 3.76 |
| | F3. Organization | 3.75 | 3.82 |
| | F4. Critical thinking | 3.55 | 3.51 |
| | F5. Metacognitive self-regulation | 3.83 | 3.76 |
| | Average | 3.72 | 3.68 |

It is possible to see that there was a slight decrease in the use of learning strategies from the first to the second data moment collection. Being the rehearsal the learning strategies with a higher decrease. It also should be noted that "Organization" was the learning strategy that had a higher increase. This result can be related to the teacher promoting learning (mastery) goals and has been corroborated by other research work (Dawe, 2020). It is also important to emphasise aimed of increasing study habits, and the intervention used in this study allowed it.

It should be noted that researchers found that students with mastery-approach goals tend to use effective cognitive strategies as metacognition, that help them comprehend deeper insight into a subject/content and retain knowledge/skills (Huang, 2011). These students are better equipped to apply their learning to new situations as opposed to students who privilege memorization of a task that is quickly forgotten and are difficult to apply to new settings.

## 4. Conclusions

The main goal of this project was to develop students' autonomy, improve their study habits and simultaneously increase motivation to engage in school activities and develop learning process facilitators

in chemistry and physics. To achieve these goals, active strategies were used, and classroom environments were modulated to allow students centred classroom, and student-centred learning process. From the data collected, it is possible to perceive those strategies used, promote not only, autonomy, and learning goals, as it was possible to maintain good levels of motivation during the school year. Students enjoy the laboratory classes and the classroom activities.

This study's limitation is related to the small sample (26 students) and the implementation time (one school year).

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# INNOVATIVE WRITING PRACTICES AS LEARNING OPPORTUNITIES IN A VULNERABLE SCHOOL CONTEXT. A SOCIAL DESIGN INQUIRY TITLE

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## Abstract

The contribution presents an innovative social design research (Gutiérrez and Jurow, 2016) carried out in a vulnerable school context, to contrast students' school exclusion and underachievement. The project unfolded in a 10-hour group activity, consisting in the working out a collaborative written text (Thompson, 2014) about the social consequences of hostile communication among peers and the value of friendship, a sensitive topic of students' lives. This was considered a step to connect the students' repertoires of writing practices, developed in their everyday lives, to the academic register (Gee, 2004).

The aim of the contribution is to present the learning opportunities that emerged in the collaborative writing processes in promoting relational and cognitive competences in students, in particular cohesive conversation, and reflective skills.

*Keywords: Social design research, learning opportunities, collaborative writing processes, vulnerable students.*

## 1. Introduction: theoretical framework

Literacy is a pivotal competence to be promoted in classrooms to contrast school failure, since educational activities are strongly based on writing and reading processes. Students are required to read textbooks and other sources of information; they are expected to express their reasonings in written expository texts. However, texts in schools are organized according to a specific literate genre: they are closed systems, in which all the relevant information can be inferred by reference to other explicit information; they differ from popular texts that are open artefacts, further developed and incremented by the reader's knowledge (Olson, 1991; Cook-Gumperz, 1986; Heath, 1986). According to Olson, writing systems create specialized categories of thinking and communication, rather than simply transcribing speech (Olson, 1991).

Freebody and Luke (1990) consider textual production as the integration of 4 dimensions (called "4 Resources Model"):

- Syntactic: the expressive rendition of the intended meaning of the text; it requires competence on the linguistic code, the correct use of pronouns, the selection of the information to be made explicit and the connection of different aspects into a consistent whole.

- Semantic: the intended meaning, characterized by a core idea and the related information; the appropriate lexicon to highlight different aspects of the meaning.

- Pragmatic: the social objective the author intends to provoke in the community (to inform, to convince, to call for an action, to request, …);

- Affective: how to express feelings; how to provoke emotions in the community.

Traditional schooling tends to overlook the practical competencies people develop in their reading and writing activities in their everyday lives and tend to introduce students into literacy practices that are based on a western/schooled used of texts, at the expenses of different approaches to literacy.

The idea is to offer the students more opportunities to learn (Greeno and Gresalfi, 2008), based on the recognition of their writing repertoires they have developed in their out-of-school activities, on valuing their personal and social experiences and through the mediation of collaboration among peers.

## 2. Methodology

21 students attending the second year of a professional school in North-Eastern Italy (21 females; age M=16,5; SD= 0.28) participated in the project. The composition of the class was

complex: 6 foreign students with low knowledge of Italian language, 9 were repeating the year, 6 present special educational needs.

The context in which the professional institute is located present a high rate of immigration, especially from Bangladesh; it is a phenomenon linked to the development of the shipbuilding industry that characterize the economy of the town.

The school has a high percentage of non-Italian-speaking students, most of them coming from culturally and economically disadvantaged situations. The school organization provides for an Intercultural Commission "with specific tasks for welcoming and for planning personalized interventions" and a Working Group for Inclusion. Every school year then Italian L2 courses are activated both as initial literacy and as a language suitable for study.

In the school practice, the classroom communication is based on students sitting individually in front of the teacher, who frames the topic and the pace of the lessons, although they are encouraged to put questions, ask for clarifications, and express their views; students have little opportunities to work together in developing topics. Consequently, they have little opportunities to be engaged in complex competencies such as working out complex ideas, recognizing the main ideas of a topic, relating it to the contextual information, designing and producing the text, respecting the formal rules of production.

The social design research we proposed in one group of students departed from that established classroom organization and we proposed small group activities in which the students are invited to jointly reflect and write a text as a commentary on a meaningful and authentic theme for them. To construct a positive students' attitude towards school literacy, a perspective based on their existing repertoires of writing is proposed[1].

## 2.1. The framework of the classroom activities

The students responded to a small questionnaire about their literary practices in their everyday lives and were invited to collaboratively write a text as a commentary to the Manifesto of non-hostile communication, published by the 'Parole O_stili' association[2]. The Manifesto can be considered an appropriate choice, since it refers to meaningful experiences in the lives of the adolescents (i.e. hostility; microaggressions, misunderstandings, deception); they have an affective tone that should be communicated and require a composition both at the semantic as well at the syntactic planes. The tool has stimulated students to reflect on the communication styles adopted by young people, the possible consequences of the use of non-empathic language, and on the importance of considering the point of view of the other.

They were free to choose the genre (expository or narrative), modality (written or graphic text), and then to integrate the texts in an artefact that could circulate, be discussed, and further integrated. The proposed perspective is consistent with the 4 resources model by Freebody and Luke (1990).

The activity was organized in 6 lessons oriented to changing the practice of writing through the mediation of collaborative processes. Students work together in the production of a text: collaboration allows students to connect personal ideas and work out a text, to make explicit different writing functions (planning, execution, revision), assessing relevance (what to make explicit on the background of presuppositions); by sharing ideas on an interpersonal plane, students may develop metalinguistic awareness.

We adopted the micro-ethnography observations on the writing situations, in order to highlight the opportunities to learn emerging during collaborative writing.

## 2.2. Results

### Questionnaire: Writing as a practice

The students' answers to a short questionnaire highlight they use writing in their daily lives for pragmatic reasons: some use writing as a support for homework, some express pleasure in writing (" it is a way to blow off tensions" (answer 16); "I like to write at home, where I am quite and more inspired" (answer 21); "It is an opportunity to escape reality" (answer 19); "Writing makes me understand better what happens to me" (answer 15); "I write my daydreams" "In writing I throw out my bad feelings"; "Writing helps me to understand homework" to a dislike "Because it is like at school" (answer 4); (Table 1).

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[2]The manifesto is available on the site of the Parole O_stili association: https://paroleostili.it/manifesto/; it is made up of a 10-sentence handbook, which identify the fundamental principles of a positive, respectful, empathetic and responsible speech.

*Table 1. Questionnaire: Writing as a practice.*

| *Question 2: why do you write?* | | *Question 3: Whom do you write to?* | | *Question 4: Which are your preferred topics?* | |
|---|---|---|---|---|---|
| To overcome my difficulties to express orally my thoughts | 01 | Just write down | 04 | No | 09 |
| In conducting some activities | 05 | To myself | 02 | Everyday facts | 03 |
| To Imagine, to think | 06 | Messages | 01 | Schooling | 01 |
| Dialogue | 04 | Friends and relatives | 08 | My dreams | 01 |
| No answers | 05 | No answers | 06 | What it emerges | 02 |

**Micro-ethnographic observations: Analysis of the process of writing**

The collaborative writing activity is an opportunity to develop a relevant unit of analysis of the process of learning literacy (Greeno and Gresalfi, 2008). In our micro-ethnographic observations, we gathered data on:
- the organization of the setting,
- the interactions among students, each with her/his personal writing experiences and repertoires,
- the material and informational resources they use,
- the rules of the activity and the evolving talk in interaction. Talk is not only a means to express ideas, but more crucially is a means to construct ideas together (Mercer, 2000).

The products of two groups are selected to highlight both the students' expressive potentialities and their difficulties in managing the four dimensions of formal writing.

In the first group three students (Alessia, Giada and Veronica) worked out collaboratively on the Manifesto and co-constructed the final text:

[5] Giada: what can be done?
[6] Alessia: if I talk to someone about a concern of mine, but she doesn't listen to me
[7] Alessia (dictates to Veronica): if I have a concern, the other has to listen to me =
[8] Giada: =anyway, not that she has to=
[9] Alessia: =then (0.4)
[10] Giada: I expect her to give me an advice, not making comments (0.3) uhm (0.3) talking about her concerns:
[11] Alessia: comparing her problems to mine
[12] Giada (looks at Veronica who is writing what the peers are saying and proposes): without the comma (after 'comments') I mean=

In this extract, Alessia introduces one rule of kindness and friendship [6], on which Giada further elaborates [10], meanwhile supports Veronica in her writing effort [7]; also Giada helps Veronica in correcting her syntax [12].

Veronica writes down the text of the discussion; she is joined by Alessia who takes the role of the revisor: "If I have a concern, the other person should listen to me and give me advice, without interrupting me or comparing her concerns to mine. Do not give a comment on something you don't know. Before attacking someone, reflect and understand her". The girls worked out collaboratively the ideas by interpreting rude and hostile social acts in terms of consequences in the states of mind of the others (humiliation, vulnerability, confusion, …); the group decides to give itself the name of "Listening is above anything else".

Finally, the definitive text is the following:

A says (angrily): you tripped me!
B: No, you are wrong
C: you are quarrelsome
B: No, you are unfair, you lie
C: if you give a gift, you cannot ask it back
B: she had pushed me
the moral of the story is "You take part to a quarrel, without even knowing why"

In the text, the students introduce different layers of meaning: The girl C takes part in favor of A, on the basis of what A said her about a previous situation in which C didn't take part. However, A was

unfair in her report to C, and therefore C does not know some relevant information of the situation that made B angry (A was rude to B).

The students used all the dimensions of writing as they are proposed by Freebody and Luke (1990):

- Syntactical: the girls were able to support each other. Other girls took the role of attentive listening (looking at the talking peer, smiling at jokes, offering postural hints of agreement about the unfolding of the activity). They silently participated and their peers never perceived their presence as an obstacle, an opposition or as a condition needing an explanation.

- Semantic: they try to introduce different levels of complexity, that is the different frames of understanding each character is following (A: knowing the situation but having said only a partial truth to B; B. knowing only a part of the situation; C knowing the situation but not knowing what B knows). However, the group was not able to manage all that complexity and did not make the relevant information explicit in the text, and therefore a reader loose its complexity.

- Pragmatic: they rely on a very rhythmic dramatic genre to show the consequences of deception on others.

- Affective: they are interested in deception, lie, misunderstanding.

Students' collaboration creates opportunities to learn elements of writing (working out the semantic aspects of the situation: Alessia and Giada jointly elaborate the consequences of lack of close listening [utterances 7, 10, 11]; furthermore, Veronica receives help in her syntactic competence. However, they are not yet able to compose an effective text. Many elements of the intended situation are left implicit and a reader faces many difficulties to understand which is the correct frame of reference and therefore to attribute the correct meaning to the characters' utterances.

The second group called "Kaliumbapé" works out a text based on the joint analysis of the concept of "embarrassment":

*"We have learned that in given situation, embarrassment is normal; in other ones, it produces uneasiness (in other people). There are different types of embarrassment: when two or more people quarrel, embarrassment arises because one person would like to say something, which in turn produces offence in the other; when two people who are not enough close, stay together for a period of time.*

*It could be embarrassing also the situation in which a group is formed by people who do not know each other".*

In their text, the students create a list of different types of "embarrassment". In their text, they use mental verbs which refer to individual mental states as consequences of social situations. Their definitions open up to either the possibility of the reciprocal understanding of people, or to misunderstanding and conflict, if the interpretation of others' embarrassment is failing.

The students are able to write down sophisticated strategies of understanding of the psychological consequences of specific social situations. Dealing directly with their experiences and personal reflections, they were able to elaborate on the 4 dimensions of writing:

- Syntactical: the dimension is developed in terms of a series of definitions of a psychological concept ("embarrassment").

- Semantic: they work out the conceptualization of the different conditions that compose the meaning of "embarrassment".

- Pragmatic: they present a text that can help other to reflect on embarrassment and uneasiness.

- Affective: they make systematic connections between social situations and psychological states.

Their use of the writing process enables the systematicity and organization of their reflections, leading to a structured text. Through their collaborative activity, the students in this group have developed a strategy of joint design of the text. Each student proposed an aspect of "embarrassment" (related to her experience) and together they searched a hypothetical social situation in which embarrassment was a consequence. In the fieldnotes, also other stereotypical situations were considered such as the adults asking adolescents about their boyfriends, or parents urging their children to make visit to grandparents. However, those situations were considered too obvious and discarded.

## 3. Discussion / conclusions

The results highlight that co-designing a collaborative writing activity in a vulnerable school context can be effective if teachers and researchers recognize and value the non-formal writing repertoires that students develop in their everyday lives and connect them to academic writing on relevant topics in students' experiences.

For the students, writing is more an informal practice (directed to oneself, to relatives and friends): they use some writing repertoires to achieve practical goals in their everyday lives; it supports interiority, or deeper understanding of daily experiences.

During the collaborative activity in the classroom, the writing process appeared more difficult; the students reasoned by prototypical scenarios and some relevant elements in the writing were not sufficiently developed. However, they showed a sophisticated analysis of the consequences of hostile communication on others' feelings, self-confidence, and interpersonal relationships: students were able to identify different layers of meaning and introduce different levels of complexity.

The practice promotes the development of expressive repertoires, which may be recognized and encouraged also in school. More educational practice is needed, in order to promote their competence in designing a complex text.

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# EARLY INTERVENTION FOR IMPROVING STUDENT PERFORMANCE BY DETECTING NON-ENGAGEMENT

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## Abstract

During the Covid-19 pandemic, both teachers and students had to face many challenges, especially due to the lack of in-person classes. To address those challenges and to make up for the lack of in-person lectures, teaching modalities had been changed, which yielded unexpected benefits. For example, students started to engage more in online lecture sessions via chats, polls, and quizzes. Online lectures were recorded enabling students to revisit them as a valuable study aid, this was particularly useful for international students where English is not their first language. Post Covid-19 pandemic once the teaching was back on-campus, we decided to go with the blended mode of teaching, where we adopted all the positive things that helped in engaging students during our online teaching such as live quizzes, breakout rooms, polls, making lecture content recorded for online viewing, etc. and tried to implement them in the in-person classroom. Running this mode of teaching and learning for 2022, we have received mixed student feedback and academic results. In this paper we first reflect on the strengths and weaknesses of this approach, highlighting what worked for us and what did not, and then we propose ways to mitigate those weaknesses. Specifically, we propose an approach to tackle the lack of student engagement in the modules by identifying the students who are not engaging in the module and making early interventions either to modify the classroom activities or to motivate those students so that they re-engage. There are some key indicator metrics for identifying the non-engaging students, such as attendance in the practical lab/support sessions, log-in details to the servers where the experiments are being run, and results of classroom interactive activities like quizzes, polls, etc. It would benefit the students if these key metrics are utilised right from the start of the module in order to detect the students who might fall behind and perform poorly.

*Keywords: Student performance, student engagement, teaching delivery, blended learning.*

## 1. Introduction

Teaching during the COVID-19 pandemic was very challenging, and educational institutions had to adapt many approaches to address those challenges, some of those approaches worked beyond expectations, and some of them simply failed. For example, online chats, polls, and quizzes helped in improving student engagement in the online classroom, but at the same time, there were students who became uninterested/demotivated to attend the online lecture sessions due to a number of behavioural, emotional, or social factors such as lack of direct interaction with fellow students, feeling isolated being online, poor internet connection, etc. (Bergdahl, 2022). In this paper, we are referring to student engagement in terms of their attendance in the classroom, and participation in the classroom activities. Post COVID-19 pandemic, once teaching returned on-campus, many institutions started to mix the online delivery of teaching with in-person classroom lecture sessions to get the benefit of both worlds. This specific type of learning approach is often referred to as 'blended learning' (Graham, 2013), which has been widely adopted across higher education well before the COVID-19 pandemic.

Online teaching during COVID-19 gave birth to many new online or internet-based teaching mechanisms and tools as well as increased the use of existing technologies and showcased how some of these can be effective and useful through their extensive usage across various educational institutions ranging from primary schools to big size universities (Khosla, Mittal, Goyal, & Chachra, 2021). This evolution of online teaching has brought a new dimension to blended learning. Here at Queen's University Belfast (QUB) we also decided to go with the blended mode of teaching by adopting all the benefits that we learned from online teaching during the pandemic.

In this paper, we will first highlight the strengths and weaknesses of our approach for blended learning (Section 2) that we conducted in the academic year 2022/23, and then we propose how to deal with the lack of student engagement through analysing data from our online learning platform and providing

intervention to improve overall student academic performance (Section 3). Finally, we will conclude the paper by discussing how effectively our proposed approach can help in improving student performance and what we plan to do next to improve the approach (Section 4).

## 2. Blended learning: a case study

Blended learning is a learning approach where face-to-face lecture sessions are integrated with online interactions (Graham, 2013). Many Higher Education Institutions (HEIs) started to adopt this approach even in the early 2000's and they used to refer to it as the "new traditional model" (Ross & Gage, 2006) or the "new normal" (Lewis & Parsad, 2008) in the delivery of course materials. In 2008, a study was conducted by the U.S. Department of Education to investigate distance learning in the U.S., which found that 35% of HEIs in the U.S. offered blended learning courses (Lewis & Parsad, 2008).

Post COVID-19 the adoption of blended learning is clearly increasing across all sizes of HEIs because of the evolution of online learning mechanisms, technologies, and tools that we have seen during the pandemic (Singh, Steele, & Singh, 2021). Moreover, COVID-19 forced those who would normally resist a change to these modes of delivery to adapt, and in that sense, COVID-19 was a catalyst for a cultural change. A study organized in 2020 found that students' interest towards online learning approaches has increased as they now believe this may be the new normal post COVID-19, and they are now more inclined towards the use of technology in education (Sim, Sim, & Quah, 2020).

However, the question remains: how the students are performing in such a blended learning environment that is equipped with modern technologies and online teaching mechanisms that were revolutionized during the pandemic? We have tried to answer that question by highlighting what worked for us and what did not or could have been better, and then evaluating students' academic performances against their online classroom activities that we have recorded in our approach of blended learning at QUB in the academic year 2022/23.

### 2.1. The case study

For this paper, we have considered a Stage 3 (FHEQ6) (UK Quality Code for Higher Education, 2014) module in Cloud Computing consisting of 241 Computer Science and Software Engineering students, which was delivered in semester 1 of 2022/23 in a blended learning format. This module was chosen for the case study as it had a large cohort of students with mixed capabilities and diverse student engagements. Table 1 shows how the teaching and learning methods were divided between face-to-face and online delivery for this module.

*Table 1. Face-to-face v/s online delivery.*

|  | Face-to-face | Online/ Remote |
|---|---|---|
| Delivery of lecture sessions/materials | Lectures were delivered physically in the classroom (usually 2 hours per week). Lectures were also recorded and posted online on Canvas (Virtual Learning Environment) | Lectures/ demos are also carried out online via MS Teams (usually for 1 hour per week). |
| Lab sessions | Face-to-face lab sessions were provided, but it was optional to attend. | Students had the option to perform their lab work remotely and ask questions online or do the lab work at their own convenient time. |
| Assessment | Students had the option to work in the lab and get in-person support from teaching staff during lab hours. | Students had the option to book online meetings with teaching staff to get support in their assessments. |
| Support sessions | Face-to-face support sessions were allocated on request during the office hours of the module owner. | Online drop-in sessions were available where students could ask questions in a discussion forum in Canvas or the module's Teams channel. |
| Classroom activities | Live Vevox chats, polls, quizzes, etc. were carried out during the face-to-face lecture sessions to keep students engaged. | Live Vevox chats, polls, quizzes, etc. were also carried out in the online sessions. |

Some of the methods that are listed in Table 1 worked well for both the students and staff, but some did not work as expected. We have discussed some of them under strengths and weaknesses as follows.
**Strengths:**
1. **More flexibility in learning**: lecture sessions were delivered physically in the classroom as well as recorded for future viewing. This allowed the students to watch or revisit the recorded videos and learn the subjects whenever they wished to, and the practical labs were designed in such a way that the students

could do all the lab work remotely. The Module Evaluation Questionnaire (MEQ) reflected students' satisfaction regarding this flexible learning approach.

2. **Improved student engagement**: students were always encouraged to chat online with the teaching staff to discuss their queries and they were also motivated to participate in live polls or quizzes. These online activities significantly helped in improving student engagement in terms of students' participation in the classroom as compared to what we used to have before COVID-19.

3. **More options to interact with the instructors:** with the availability of online services, students had more options to interact with their instructors even outside the lecture sessions, for example, students were given the opportunity to book slots for MS Teams video call with their instructors to discuss their issues. This particularly helped the students who were too shy or hesitant to ask questions in front of everyone in the classroom.

**Weaknesses:**

1. **Lack of face-to-face interaction**: it was not mandatory to join the lectures/labs in person, there was no attendance requirement for the module, and so, even though face-to-face lectures/labs were always available, some students preferred watching the lecture videos uploaded online or doing the lab work online remotely. This resulted in losing the benefits of face-to-face interaction in a blended learning approach.

2. **Lack of presence**: students were not required to turn their cameras on during a live lecture session, so, most students used to keep their cameras off while attending the online lecture sessions. This made it hard to realise students' presence in the online classrooms, eventually making it difficult to understand whether the students are following the lectures or not as their facial expressions were not seen.

3. **Students' non-engagement**: although online classroom activities increased student engagement in terms of students' participation in the classroom, some students used to trick their attendance in the online lecture sessions by simply logging in the online sessions, without actually watching the lectures or interacting with any of the class activities, like polls, quizzes, etc. This resulted in the non-identification of inactive/non-engaging students, who could have been provided with necessary support/motivation in the early stage of the module, as opposed to identifying them at the end, when they appeared with their issues in understanding even basic topics, and when there was nothing much that could have been done to help them.

## 2.2. The solution

One of the key solutions to address the weaknesses that are identified in our blended learning approach is to find out the students who are not being active or engaging in the face-to-face classroom or online activities such as watching the recorded lecture videos, joining online polls, quizzes, etc. at the right time, well before it's too late to act upon it. Once those non-engaging students are detected, instructors can either modify the classroom activities to fit them or try to motivate those students so that they engage more in the module. This will eventually help to improve students' overall performances in the module.

Based on our experience of running the CSC3065 module using a blended learning approach, we have identified some key indicator metrics for detecting the non-engaging students, such as, attendance in the practical lab/support sessions, log-in details to the servers where the lab experiments are being run, logs from our online platform (Canvas) covering student page views (on online materials), student participation on online activities such as quizzes, polls, etc. We have mapped these metrics to students' overall performances in Table 2.

*Table 2. Mapping indicator metrics to students' performances.*

| Metrics | Student Performance |
|---|---|
| Attendance in the practical lab/support sessions | - Students who attended in-person practical labs and support sessions usually did well (scored 70% or above) in the final results.<br>- Students who did not attend the in-person labs or booked any support session generally had issues completing the final assessment. They contacted the module owner very late, just a few days before the exam or coursework submission, and those students mostly failed the module. |
| Log-in details to the servers | - Students who used the servers for running their practical lab works/experiments on a regular basis for longer hours, usually scored high marks (scored 70% or above) in the final results.<br>- Students who completed all the lab worksheets in a timely manner by attending the weekly in-person lab sessions performed well. |
| Logs from Canvas | - Students who were active online, viewing the online study materials and participating in the classroom activities such as quizzes, polls, etc. on a regular basis also did well in their final results. |

To understand how the indicator metrics can be mapped to student performance we have analysed the logs (page views and participations) that we have monitored from Canvas for the CSC3065 module (in the academic year 2022/23) and students' overall academic results (total marks). Figure 1 presents the normalized (max-min normalization for comparison between the metrics) and averaged values of the aforementioned metrics in different marking groups.

*Figure 1. Student performance v/s student online activities.*
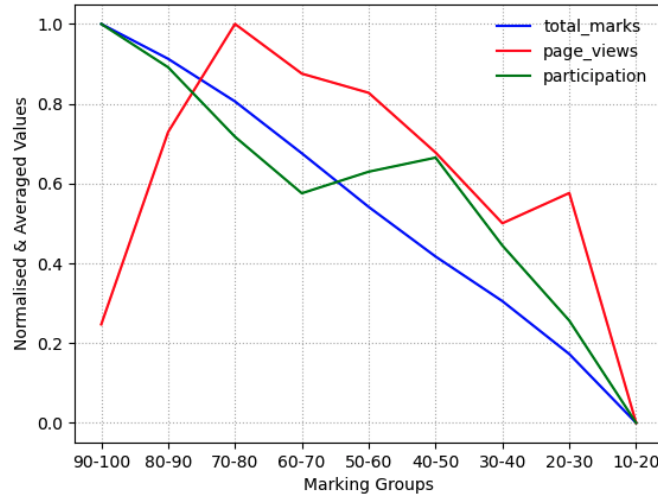


From the figure, we can observe that students' marks drop as their online activities decrease; however, the curves for page views and participation do not smoothly decline along with the marks and there are exceptions for page views for students who scored high marks in the range 80-100. This observation gives us some assurance that Canvas logs on students' online activities can be mapped to their overall academic performances, but definitely in order to get more reliable results we need to analyse more of the indicator metrics as we have identified in Table 2. Analysing the other indicator metrics is considered in future work due to time restrictions.

## 3. Early intervention for improving student performance

To improve students' overall performances or to help students score high marks, as a teaching staff we have to identify the non-engaging students at the right time (e.g., well before the assignment deadline) through the indicator metrics, and then do an early intervention to help students change their approach towards the module and its requirements. Figure 2 shows the weekly online activities (average page views and participation) of a high scoring (89/100) and a low scoring (12/100) student, which are compared against the average online activity counts of all the students in that module.

From the figure we can see that the average page views and participation of the high-scoring students were mostly higher than the average counts of all the students in those weeks, whereas the average page views and participation of the low-scoring students were mostly lower than the average counts of all the students and also, lower than the high scoring student. This observation further supports our proposal to use these indicator metrics and run some statistical analysis in order to identify the non-engaging students even in the early weeks of the module and make the necessary intervention.

*Figure 2. Student weekly online activities: high-scoring student (green) v/s low-scoring student (purple) v/s average activity counts (blue) [the graph is taken from Canvas for the same module that we used in the case study].*
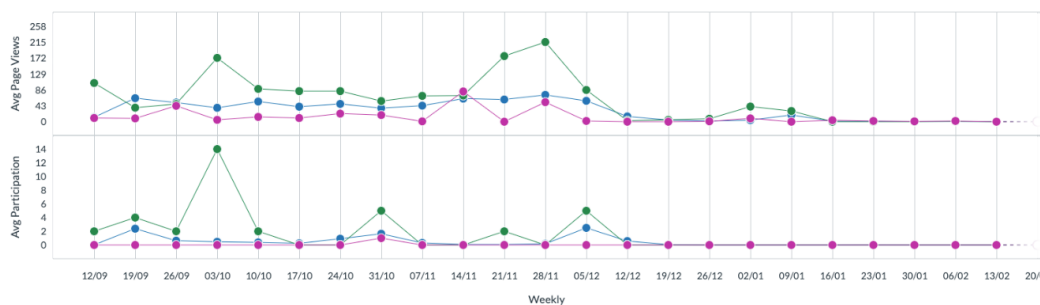
### 3.1. Applying different approaches for early intervention

Once the non-engaging students are detected, we can apply different approaches for early intervention and support the students. A couple of the approaches are highlighted here:

- **Change the teaching approach:** focus more on the non-engaging students, and try to give some extra support to them; for example, ask them questions more regularly, making sure that they are being attentive in the classroom activities. Also, if they do not attend the lectures then send gentle reminders to find out if everything is going well or if there are any issues that they are facing.
- **Modify the module classroom activities:** make the online classroom activities more interactive by bringing new questions, new strategies to ask questions, rearranging polls, quizzes, etc. so that non-engaging students can connect to them.

## 4. Conclusion and future work

In this paper, we have attempted to propose a solution for detecting non-engaging students in a blended learning mode of teaching where a good percentage of learning is carried out online and students still lack of motivation to attend classroom lectures whether it is online or in-person. Our solution is based on the analysis of the online data that we are able to collect from our virtual learning environment, Canvas. We have presented some preliminary analysis results, which show us the potential of using some key indicator metrics such as Canvas page views, participations in online polls, quizzes, total student marks, etc. for detecting non-engaging students. However, the results are based on a limited number of indicator metrics for a single module as a case study. As a future work, we will consider analysing more of the Canvas metrics that can be mapped to the students' academic results from different types of modules, and deploying machine learning algorithms to proactively detect the non-engaging students right at the beginning of the module. Also, we would explore more on how to take the right intervention approach to help students re-engage in the classroom.

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# DATA SCIENCE AND CHANGING ECONOMIC LANDSCAPE AS DRIVING FACTORS IN HIGHER EDUCATION

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## Abstract

University and College education pursue to be viewed as an important financial investment for professional future, and student families play a significant role in terms of paying for it. For the few years in a row, already during the pre-pandemic Academic Year 2018-19, 90% families with a student enrolled in college viewed college was an investment in the student's future, while 80% of families felt positive in terms of paying for higher education pursuits. That did not change significantly during the pandemic Academic Year 2019-20, as well as the post pandemic during the Academic Year 2020-21. At the same time, Universities and Colleges seized the opportunities to reimagine the curricula focusing on Data Analytics, reinvented delivery methods, and re-designed learning spaces. That resulted in significant gains in class participation, ability to focus, Professor feedback opportunities, learning through multiple means, and student appreciation of the value of costs invested in College education.

*Keywords: Data science, economic landscape, higher education.*

## 1. Changes in educational theory and learning

Historically, Thomas Jefferson University (TJU) was an academic medical center with a campus in the center of Philadelphia that has a long history rooted in the graduate health sciences. Philadelphia University was on the city's outer edge has a long history rooted undergraduate education, particularly design, engineering, and business. In 2017 these two universities merged and are now known as Thomas Jefferson University. The East Falls campus, formerly Philadelphia University, has a long history of applied research and had experienced success with a signature pedagogy known as Nexus Learning. Nexus Learning actively engages all learners in a collaborative approach to solving real-world problems and uses a humanistic approach to designing effective solutions (Frisby and Sztandera, 2020).

Educational theories of learning have changed as well. Professors encourage group learning activities following constructivist models. Students work in teams to solve real world problems. Thomas Jefferson University has captured these components and integrated them into Nexus Learning as well as Data Analytics.

## 2. Nexus Learning

Active and engaged learning, along with collaborative inquiry, with the use of real-world problems and experiences, supported by the strong integration of the liberal arts and sciences with professional disciplines, has defined Nexus Learning. As reported before by Frisby and Sztandera (2020), campus learning spaces, including libraries and team meeting places, had to be re-designed to represent innovative rethinking of the classroom space that allowed the learning facilitator to be less encumbered by the physical constraints of space, furniture and technology. Those spaces ultimately enhanced student learning and creative teaching. Example of the team meeting places are depicted in Figure 1 and Figure 2.

For example, Nexus Learning classrooms allowed for seamless transitions to different modes of active and engaged learning. The knowledge hubs also optimized collaborative involvement for all students through movable furniture and appropriate technologies that fosters co-creation and sharing of ideas. Our students self-reported significant gains in class participation, ability to focus, Professor feedback opportunities, learning through multiple means, physical movement, stimulation, and comfort level in Nexus Learning classrooms compared to traditional classrooms on campus.

*Figure 1. Example of a team open meeting place at Thomas Jefferson University.*



*Figure 2. Another example of a team open meeting place at Thomas Jefferson University.*



## 3. Data analytics focus

Following the success of the Nexus Learning classroom we believed it was time to reinforce the use Data Analytics across the undergraduate and graduate curricula. It has been over a decade since the Harvard Business Review declared Data Analytics one of the future top job of the 21st century, and the glamour of that job has indeed not shown any signs of waning since then. The days of easily disrupting businesses and markets with iterations of existing technology are definitely over. So is creating "value" through planned practices, as well as optimized supply chains. Data Analytics is a powerful and essential capability for businesses to be competitive, and Colleges' curricula can support that.

Thomas Jefferson University students are moving beyond the current commercial and financial understanding of innovation as they go through an educational experience that requires break through ideas, approaching industry challenges with an experimental mind frame, as well as compelling insights and a focus on the human element with data written all over it. We have introduced four required Data Analytics courses for all business students regardless of their major. These courses also form Data Analytics Minor that could be taken by any undergraduate student. At the graduate level, an innovation MBA degree with a concentration in Data Analytics is offered.

Thomas Jefferson University Applied Analytics coursework provides students with the cutting-edge knowledge and skills to identify, understand, and deliver insights from large data sets and enable internal and external clients with organizational success and competitive advantages, as well as the skills needed to implement and oversee data-driven decisions, including collecting, managing and describing data sets; making inferences and predictions from data; and preparing optimal and robust decisions.

Data Analytics is a powerful and essential capability for companies and enterprises to be competitive. The quantity, quality, and diversity of available data continue to grow, creating new and significant opportunities for businesses to use data to improve their decisions with respect to both internal resources, as well as external relationships with suppliers and customers.

As a global pandemic has strained global resources in education, innovative approaches like affordable higher education, implementing innovative learning spaces (Mathews and Soistmann, 2016), as well as Data Analytics curricula could provide meaningful support to the teaching and research communities in academia to educate students and prepare them for the job in future. However, for Universities and Colleges, the biggest challenge in the on-line transition was to acknowledge that providing a digital platform during the pandemic, and still charging the same tuition for teaching the class that would be otherwise taught in-person, was simply not enough. Additionally, studio and laboratory teaching provided additional extraordinary obstacles. On-line learning necessitated a complete makeover of the teaching and delivery modes on one hand, and the use of sustainable computer architectures, on the other hand, to satisfy curricular activities as well as students learning objectives. The learning mechanisms for in-person classroom teaching had to be transformed. From the students' learning perspective, there was the need to transfer to students' knowledge acquisition relevant to a particular discipline. Then came the transformation of that knowledge into professional competence by solving case studies. Lastly, students needed to exchange ideas and to participate in discussions to satisfy class learning outcomes.

During the pandemic, in an on-line education, learning mechanisms could not be delivered through a single digital platform. They had to be taught through different tailored delivery modes. Knowledge acquisition and its transfer was realized through live, on-line sessions, using digital platforms such as Zoom, Microsoft Teams, WebEx, Slack, Google Hangouts. Exchanging ideas and participating in discussions was accomplished through semi-synchronous social platforms tools, accurately moderated by professors. That all had to be done to justify no tuition raises during the pandemic, and paved the way to affordable higher education schemes.

## 4. Affordable higher education – financing it all

What makes the cost of a college education feel right or even like a bargain versus overpriced is very much in the eyes of the beholder. In a study conducted by Sallie Mae families rated whether they thought the value of the education the student is receiving compared with the price was (Ipsos, 2020) using a five-point scale: an excellent value, worth every penny; somewhat of a bargain; appropriate for the education they received; somewhat overpriced; and significantly overpriced. In the pre-pandemic time (Academic Year 2018-19), the perceived value by average total cost seemed to be just right for low, medium, as well as high income families.

While families paid less for College education nationwide during the pandemic, they still reportedly (Ipsos, 2020, 2021, 2022) relied on the similar paying mechanisms as pre-pandemic. In particular, families reported paying $26,373 for college in the Academic Year 2020-21, that is, a 12% decrease from Academic Year 2019-20, and that corresponded to the costs reported during the pre-pandemic Academic Year 2018-19. Also, it was indicated that despite uncertainty and changes encountered by many families throughout the post pandemic Academic Year 2020-21, most covered the cost of education in ways similar to those used pre-pandemic.

Parent income and savings covered nearly half of College costs (45%). Funds earned from scholarships and grants covered 25% of the costs, while student borrowing covered 11%. In addition, parent borrowing covered 9%, while student income and savings covered 8% of the costs. The remaining 2% came from relatives and friends' funds.

For the few years in a row, starting during the pre-pandemic Academic Year 2018-19, 90% families with a student enrolled in college viewed college was an investment in the student's future, while 80% of families felt positive in terms of paying for higher education pursuits. That did not change significantly during the pandemic Academic Year 2019-20, as well as the post pandemic during the Academic Year 2020-21 (Ipsos, 2020, 2021, 2022).

## 5. Conclusions

As Universities and Colleges update their classrooms to enable active learning methodologies, adjust their financial aid models, Data Analytics curricula could provide meaningful support to the teaching and research communities in academia to affordably educate students and prepare them for the jobs of the future. Colleges must also build the technological infrastructure to house and converge the massive volume of academic data. Furthermore, they need to invest in the human capital, educating big data scientists and engineers, and computational intelligence experts to further guide us into the exciting frontiers of business and science.

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# COLLABORATIVE LEARNING AND PRACTICAL EXPERIENCES IN ENGINEERING STUDIES: WORKING ON SUSTAINABLE DEVELOPMENT GOALS

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## Abstract

In the present work, we present a learning experience developed within the frame of an interdisciplinary project funded by the University of the Basque Country, UPV/EHU (Campus Bizia Lab Program) in which professors from different departments, students doing their Final Bachelor Degree Project as well as researchers, PhD students and administrative personal work together in a collaborative project. The main goal of this practice has been to widen the practical work related to sustainable development in the curriculum of engineer students and to create actual experiences developed in the close surroundings so that the learning content is closer to the professional practice of the future engineers.

The specific topic of the case was the use of renewable energies in the buildings and installations of the university campuses and, specifically, the supply of biogas produced from organic residues generated in the canteens of the campuses. The project started on September 2021 and, since then preliminary work related to data collecting and processing, statistics and calculations of the energetic potential of the organic waste of several points, as well as logistics issues has been done. The current part of the study is covering the simulation and design of a pilot plant to obtain the biogas and the potential uses that this biofuel could have in the campuses. The development of this project includes the consideration of sustainable development goals, in terms of environmental, social and economic impacts, allowing the insertion of these concepts in the intrinsic studies of engineering.

The experience of working in a multidisciplinary atmosphere, combining different fields of knowledge and working in an actual case, has been positively evaluated by the students, who have indicated their satisfaction with the learning procedure in a final quiz, highlighting the acquired skills, such as initiative, autonomy, working in complex open cases and developing actual installations in situ.

*Keywords: Sustainable development in engineering, collaborative learning, renewable energies, biogas.*

## 1. Introduction

An unstoppable technological development in design and production systems is being demanded by nowadays society. Challenges related to energy supply, logistics, communication tools and many other sectors are requiring new engineering processes, systems, products and technologies (Díaz Lantada, & De María, 2019). This reality should have a direct impact in engineering studies that need to connect to changing industrial environments, evolve in parallel and incorporate new contents and learning strategies, flexible and adaptive to promote innovation, creativity and entrepreneurship (Keinänen & Kairisto-Mertanen, 2019).

The Final Bachelor Degree Project (FBDP) is the learning activity, which better represents the actual professional practice, as it implies the resolution of a complex and often transdisciplinary project. The student will need to apply the acquired fundamental knowledge in different scientific disciplines, and combine and interconnect it in a holistic learning environment. Therefore, it is an optimum moment to

design a learning activity as collaborative and practical as possible, to offer the experience of learning by doing, enhancing autonomy, critical thinking, teamwork, creativity, responsibility, lifelong learning and project management skills. Even if this is probably the most effective way to reach the best learning outcomes, it is also true that organizing collaborative FBDPs is a quite demanding activity in terms of teacher's dedication and material resources.

This paper describes the design, organization, coordination and development of collaborative FBDPs for the Bachelor Degree of Renewable Energies Engineering, of the University of the Basque Country (UPV/EHU).

The collaborative project, that has been developing since September 2021, has been the framework of the FBDPs of 6 students and has been supported by 4 professors from three different departments and fields of knowledge plus 2 quality management technicians. The topic focused on the study of buildings and installations of the university campuses, specifically, through the evaluation of their renewable energy consumption and the possibility of increasing the existing ones or adding another renewable option to the existing energetic mix. The selected technology was anaerobic fermentation to produce biogas from organic residues generated in the canteens of the campuses. Initial research work was directed to the collecting and processing of data related to the energetic potential of the organic waste of several points. Then, the project is covering the simulation and design of an actual pilot plant to obtain the biogas and the most efficient uses for the generated energy.

## 2. Methodology

The methodology for the organization of the FBDPs was structured in three lines:
- Human resources available to articulate the projects: professors from different departments, personnel from administrative services, technicians.
- Material resources available to conduct the practical work and experimental tasks.
- The organization of the students willing to complete their FBDP within the frame of a big, complex collaborative project.

### 2.1. Human resources

It is important to create a solid community of professors from different disciplines willing to take an active role in the design and development of the project. We decided to involve professors working in the same campus to facilitate the coordination, mutual communication and tutoring of the students' FBDPs. Moreover, a big effort was done trying to include professionals from other statements in the university, such as personnel from administrative services or technicians. As the topic of the project was to produce biogas from organic waste generated in the canteens of the university buildings, the Waste and Environmental Quality Manager Technician was a key person who could offer deep knowledge about figures, procedures, management, etc. This information including actual data is not easy to find and it is compulsory to properly define the scale of the system.

Each student was assigned to a team of two professors: one as the reference mentor during the development of the FBDP and the other one from a different field of knowledge that would give the transdisciplinary point of view. Furthermore, a shared platform was created in order to upload all the data and contents as well as to facilitate communication within the group.

Finally, we try as well to enhance interconnections between academia and industry, being in constant communication with the local industrial sector in order to offer to the students the possibility of solving actual entrepreneurial challenges and to facilitate the jump into the work market.

### 2.2. Material resources

Another aspect that we wanted to reinforce was the practical work that the students would develop during their FBDPs. The more experimental tasks in which get involved, the better for the learning process. Thus, a big effort was done trying to simulate, design and create an actual installation to generate the biogas in situ. Two stages were defined, one at laboratory scale and other at pilot scale. The goal was to help the students to create a self-made lab-scale device with a suitable configuration to experimentally generate biogas from the organic residues of the canteens and be able to store it and measure some basic characteristics. Then, the next step would be to move to pilot scale. For this part, the proposal was to find the most suitable commercial plant to process the calculated quantities of organic waste, transform it into biogas, upgrade it (remove some contaminants and increase the percentage in methane) and convert it into electricity. Different photographs of the experimental device to generate biogas at lab scale (Images a and b) as well as the selected commercial model (Biogás Puxin) for the scale up to pilot plant are presented as Figure 1.

*Figure 1. Laboratory device for biogas production (images a and b) and selected
commercial pilot plant from Biogas Puxin (image c).*



| *a)* | *b)* | *c)* |
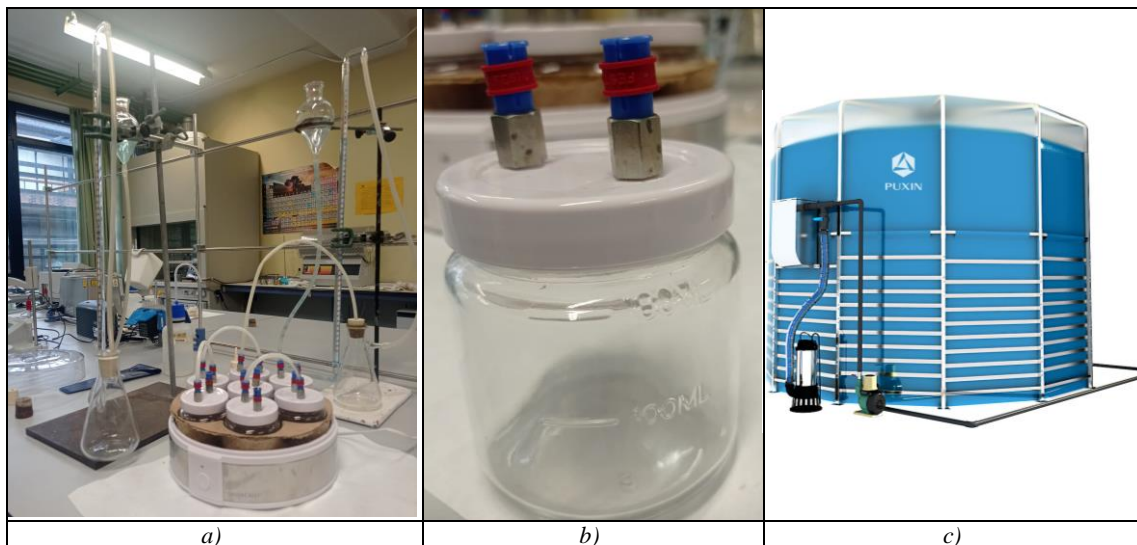
It can be seen how the experimental device at lab scale was specifically designed for this set of measurements and included 7 glass flasks with a tap in which two direct connections were inserted to make it possible to purge the air content once the organic substrate was inside. One flask was used as reference and the other 6 were used to evaluate three different variables (substrate type, concentration, etc.) in duplicate experiments. Then, the generated biogas was conducted through the exiting connections to allow the measurement of the resulting flow to determine the amount of biogas produced. From there, the gas was stored in a sealed plastic bag for gas characterization.

The design of the device is an important part of the learning content because, in order to get proper measurements and data to present as project results, students need to deal with the development of a system that may be simple but needs to cover several specifications and, for this purpose, the theoretical fundamentals need to be well established. Finally, the results obtained at lab scale will be the starting point to design the bigger plant and, therefore, it is a crucial point to check before passing the information to the mate responsible of the scale up.

The definition and installation of a commercial model is a big opportunity to learn transversal skills related to writing proposals to present to competitive calls and earn funding to acquire the required equipment. The location of the plant and its accesses are other factors, which require a deep analysis offering another set of concepts from which learning direct and transversal knowledge.

## 2.3. Students' organization

As mentioned before, a fluid communication and cooperation between all the members of the project was crucial to move forward and not get lost. This was especially sensitive among the involved students as they were continuously incorporating to the project at different moments. Therefore, the mentoring between mates was enhanced so that the ones that had already been working for a while could share the acquired knowledge with the ones that were progressively being incorporated. Even if each of them should prepare an individual work and present it as a final report and oral presentation to cover the requirements of the FBDP, the contents were coordinated to have coherence and the work of the rest of the mates in the project was referenced along the documents prepared by the rest of the team.

In order to reinforce the mentoring system, a mandatory condition for a student to get his/her access to the defence in front of the experts' panel was to have a positive evaluation from the student's peers.

## 3. Results

### 3.1. Academic results

A partial evaluation could be done already, as some of the students have already finished and defended their FBDPs. For the moment, all of them have been positively evaluated by the experts' panel and many of them are still involved with research work related with the learning contents of the project. There were no students leaving the project before finishing the established work, preparing the final report with the discussion of the obtained results and the final presentation to the examination panel.

This is a very positive point in a complex project as, when working with students in individual projects with a high load of experimental work, there is a percentage of them leaving the project and changing the topic to a more theoretical one.

Regarding the evaluation of the experience from the students' point of view, the opinions collected in a final survey were enthusiastic about the extra skills developed when working in a multi-layered transdisciplinary complex project. They were asked about their degree of satisfaction with the project organization, coordination, mentoring, engineer-related and transdisciplinary content, workload and work environment. The feedback of the students was very positive highlighting the collaborative atmosphere as a powerful tool to face and solve actual complex problems.

Team-work was identified as one of the main factors which produced cohesion and identity in relation with the research project. As a group, students felt more capable of reaching optimum solutions for the project-related challenges as well as more confident when facing disciplinary, bureaucratic, or organizational issues. Other authors have reached similar conclusions about the capability of team-work to improve the working environment (Buch and Andersen, 2015).

Another noteworthy aspect was the acquired competences related to sustainable goals in applied engineering projects. Both students and professors agreed that the development of the collaborative FBDP in a topic related with an actual application of renewable energies engineering in the university campus facilitated the implementation of concepts related to sustainable development goals.

## 4. Conclusions

The development of a collaborative, transdisciplinary, multi-layered project organized by a group of professors and technicians with different backgrounds was the context offered to a group of students to develop their FBDP. Special attention was given to the experimental work load and the design and creation of self-made technological devices for the process development. The development of knowledge related to sustainable goals in engineering projects was another key point of the work.

As a main conclusion, both professors and students agreed that team and collaborative work is by no means the closest example to work practices and that the present project was a huge opportunity for the students to move from theoretical concepts to a practical frame. The development of an actual case to be applied in the very university campus was a motivation point for the students and it reached attention from the local industrial partners attracted by the renewables energy sector possibilities. Therefore, the collaboration between researchers, professors, industrial enterprises was favoured, which is a win win experience for the students.

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# EDUCATION IN TIMES OF NEED

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## Abstract

The motivation for the research is based on the recognition that over the worst of the epidemic, we are experiencing new uncertainties. The pandemic meant both constraints and opportunities. New tools and creative solutions emerged driven by ICT companies while looking back we also had to learn that part of our world had no chance to join and solve social, educational, and health problems with these tools. We may think that this will only happen in developing countries. Still, even in Western societies, there are many for whom home education is not provided to a satisfactory standard. They do not have access to education in the event of an emergency, such as a pandemic, a war situation, or energy restrictions. *Research questions*: How has education without ICT tools been solved during the pandemic in disadvantaged areas? What can we learn from the experience there?

During the lockdown, some parts of Africa, South-East Asia, and South America switched from formal education to innovative approaches that use local communication channels for education. This paper is focusing on community radio as it has been used extensively as an educational tool in developing countries since the 1970s (Nwaerondu & Thompson, 1987) (Africa Educational Trust, 2019). The revival of radio in education was the consequence of the pandemic and emphasized local specifications (Education Development Center, 2020).

The research is based on a scientific literature review (database of ERIC). Also, first-hand information was collected from Community Media Forum Europe affiliate member organizations in Asia. Selected case studies from Bangladesh (BNNRC, 2020), Indonesia (Prahmana, Hartanto, Kusumaningtyas, & Muchlas, 2021), Bolivia and Sierra Leone have several similarities to ensure engaging radio lessons and provide access to education in rural areas.

*Results and conclusions* worth further reflection: Radio is a good alternative to ICT when online learning is impossible, cheap and accessible in most households, does not need mains electricity, works with batteries, etc. The partnership between local actors (volunteers, civil society, religious groups) is essential for long-term commitment to spread awareness, provide space and resources for the radio station or the staff and teachers. The factors of most concern are the missing educational content in audio formats and the difficulties of producing such content in a short time. Therefore, I suggest the promotion of partnership and collaboration between the education and media specialists and preparing educational protocols with emergency governmental organizations.

*Keywords: Educational radio broadcasting, community radio, emergency education.*

## 1. Introduction

Education has undergone significant transformations worldwide as a direct result of the Covid-19 pandemic. While ICT companies have played a crucial role in introducing collective solutions, certain regions of the world have been unable to participate in addressing social, educational, and health challenges using these tools. Even transnational organizations have prioritized the utilization of ICT tools in education during lockdowns, recognizing their importance for all nations in the 21st century. According to UNESCO (UNESCO, 2020), the closure of schools during the initial phase of the pandemic resulted in approximately 826 million students (50% of total students) being unable to attend school. Moreover, even in times of peace and stability factors such as poverty, regional disparities, and famine have further impeded access to education in regions with existing educational systems. Consequently, community development and education face significant uncertainties during these times. However, the pandemic has also presented unprecedented opportunities to explore innovative solutions to these challenges (Westoby & Harris, 2020). The Covid-19 pandemic, compounded by measures like lockdowns, has exacerbated the situation, particularly in regions with limited access to ICT. As a result, alternative means of providing education,

such as radio, television, and mobile phones, have been adopted in certain parts of Africa, South-East Asia, and South America. These regions have transitioned from traditional formal education to innovative approaches using local communication channels for educational purposes. Community radio, which has been utilized extensively as an educational tool in developing countries since the 1970s (Nwaerondu & Thompson, 1987; Africa Educational Trust, 2019), has experienced a revival in the context of the pandemic, highlighting the significance of local specificities and resources (Education Development Center, 2020).

## 2. Methods

This research employs three distinct methods. Firstly, from March 2020 to March 2022, first-hand information was collected through email and regular newsletters from affiliate member organizations of Community Media Forum Europe, an international non-profit organization founded to strengthen the participation of the community media sector in European discussion and regulation processes. The research is focusing on information from affiliate members because they are located mostly in Asia. Secondly, an ongoing process since December 2021 involves conducting scientific literature research and analysis. The ERIC database (online library of education research, https://eric.ed.gov) was accessed in December 2021, yielding over 100 papers identified using the keywords 'community radio, education, covid'. Only full-text and peer-reviewed papers published in 2020 and 2021 were selected – the peak times when Covid-19 hit the world - with the assessment of these papers continuing throughout the summer of 2022. Thirdly, also ongoing since December 2021, secondary literature processing was conducted. Multiple searches were performed on Google using the same keywords such as community radio, education, and Covid, specifically focusing on reports from international mass communication organizations, transnational organizations (such as UNESCO and the World Bank), international not-for-profit organizations, governmental offices, and ministries. The assessment of these selected papers will continue throughout the summer of 2023. This study presents the current state of research as of January 2023, relying on a literature review and case studies examining the role of radio in education during the Covid-19 pandemic. Case studies from Bangladesh (BNNRC, 2020), Indonesia (Prahmana, Hartanto, Kusumaningtyas, & Muchlas, 2021), Bolivia (Borchers, 2021), and Sierra Leone (World Bank, 2021; Sengeh, 2021) exhibit several similarities in terms of strategies employed to ensure engaging radio lessons and enhance access to education in rural areas.

## 3. Results

The emergence of the first community radio station in Bolivia in 1949 was a response to the poverty issues faced by mining workers and the dissemination of state-controlled propaganda on mainstream radio channels, which failed to address their concerns truthfully (Prahmana, Hartanto, Kusumaningtyas, & Muchlas, 2021). Community radio, since its inception, has served as a platform to amplify the voices of marginalized groups who are often excluded from public service and commercial radio broadcasts. It operates based on several key principles, including the active participation of community members as primary contributors, a focus on local interests and needs, and a non-profit orientation to serve the community rather than generate revenue (Lewis, 2008). Community involvement plays a crucial role in shaping the content of broadcasts, and the management of community radio stations is typically entrusted to members of the local community (Velics, 2021; Doliwa & Purkarthofer, 2021). During the Covid-19 pandemic, countries worldwide faced the challenge of reorganizing education in compliance with social distancing measures and other restrictions. This study specifically concentrates on regions where ICT technology was not a viable solution due to geographical limitations, inadequate access to technology, or low levels of digital literacy.

### 3.1. Bangladesh - they have the tool and use it to disseminate correct information

Established in 2009, the BNNRC (Bangladesh NGOs Network for Radio and Communication) functions as a national apex organization dedicated to the development of community media. Their mission centers around the establishment of a democratic society founded on principles such as the free flow of information, equitable and affordable access to information, and ICT for remote and marginalized populations in Bangladesh (BNNRC, 2022). With a network comprising 18 community radio stations currently broadcasting in the country, they collectively air 157 hours of programming per day, encompassing information, education, local entertainment, and developmental initiatives. The primary objective is to empower rural communities and ensure their right to access information. To achieve this, the network is embedded in the locality: local presenters (mostly women), local language, and addresses general topics of health, agriculture, and education, next to local culture. The existence of this network, with approximately 6.18 million listeners, has served as a robust foundation for providing information since

the outset of the Covid-19 pandemic. On 1st March 2020, the 18 radio stations commenced the broadcast of the Coronavirus Education program targeted at rural populations, delivering the initial information about the virus and prevention measures in the local language, facilitated by local presenters (Rahman, 2020). This consistent coverage gradually alleviated panic in rural areas, prompting listeners to seek further information through live broadcasts, telephone calls, text messages, and Facebook Live sessions. Undoubtedly, this solution proved effective, as the audience displayed greater receptivity to advice from individuals who shared the same language or dialect and were familiar with their community. In subsequent stages, the focus shifted to combating misinformation, leading to the launch of the Counter Misinformation & Malformation Awareness Campaign on 7th February 2021 (Rahman, 2021). The campaign aimed to identify and address various forms of misinformation regarding the immunization program, while providing scientific information to disadvantaged and marginalized communities at risk during the immunization process. As part of this initiative, community radio stations broadcasted a variety of programs, including news, radio dramas, jingles, vox pops, and public service announcements, to raise awareness about the Covid-19 vaccination program and counter-propaganda. The information delivered by community members in the local dialect holds greater credibility and acceptance compared to that provided by unfamiliar sources. Likely, younger voices and women reporters were particularly well-received in this regard.

### 3.2. Indonesia – they have the tool but not yet using it for education

The challenging geographical conditions in Indonesia have posed significant obstacles to ensuring widespread access to online learning during the Covid-19 pandemic. In response, the Indonesian government has taken measures to address the issue and provide education during these uncertain times. Policies and guidelines have been established and implemented for remote learning; however, these measures do not cater to individuals who lack internet connectivity. According to Prahmana, Hartanto, Kusumaningtyas, and Muchlas (2021:1), many students are compelled to undertake arduous journeys, such as trekking up mountains, climbing trees, or venturing into the woods, in search of an internet signal. Consequently, teachers have had to assume additional responsibilities and visit students' homes to deliver education. It is evident that this approach is inefficient and fails to serve the best interests of students, parents, and teachers. Radio has been employed for educational purposes in Indonesia since 1980. The Ministry of Education and Culture has developed Radio Edukasi (Education Radio), which supports both formal and informal learning and collaborates with other radio stations. However, the country's topography poses challenges to clear radio transmission. To overcome this issue, the utilization of community radio (Radio Komunitas) could be a potential solution. Community radio stations, recognized by Law Number 32 of 2002, are more localized and have legal status already. The Indonesian Community Radio Network (ICRN), established in 2002, encompasses 11 networks spread across different parts and islands of Indonesia. Unfortunately, community radio has primarily focused on broadcasting socially relevant social content for local communities and has not yet been utilized for educational purposes. Prahmana suggests that a community radio-based blended learning approach could serve as an alternative solution to provide education in challenging areas (Prahmana, Hartanto, Kusumaningtyas, & Muchlas, 2021).

### 3.3. Bolivia – they have the tool and let children use it

In September 2021, the Bolivian Community Radio Network introduced Radio Escuela (School Radio) as part of a project funded by the German Federal Ministry for Economic Cooperation and Development, with financial support from DW Akademie. The initiative aimed to provide educational programming to students residing in rural regions, broadcasting a total of 100 programs. The project primarily targeted four rural areas in central Bolivia, leveraging radio as the primary medium for the learning process. The content reached over 25,000 students through approximately 20 local radio stations. In addition to the broadcasted programs, the Bolivian Community Radio Network developed supplementary materials such as brochures, worksheets, and games to facilitate individual learning. An additional benefit of the project was to foster media literacy among young learners, encouraging a critical approach to media consumption by teaching them how to assess and verify information. Furthermore, the project promoted active student involvement, enabling learners to host the Radio Escuela program and allowing listeners to send messages that were read aloud by the young hosts (Borchers, 2021). This project exemplified the principle of participation in community radio, exemplifying the notion of "from, by, for, and about the community."

### 3.4. Sierra Leone - they have past experience to build on

During the Ebola outbreak from 2014 to 2016, radio served as an educational tool. These were far before the dominant position of Zoom and online learning platforms. With students being out of school for a prolonged period of nine months, the implementation of an interactive Radio Teaching Programme proved

successful. The situation presented by the Covid-19 pandemic resembled this prior experience, and the established routine helped reinforce the distance learning process facilitated by radio during school closures in 2020-2021. Given the familiarity with the method of utilizing radio for education, teachers were able to focus on sharing their expertise and creating more pedagogically well-designed content. They organized themselves, engaging in peer learning, developing teaching manuals for early-grade students' literacy and numeracy, and convening in small groups to discuss lesson plans (World Bank, 2021). In 2020, the Institute for Governance Reform and Oxfam Sierra Leone investigated the education system, revealing significant shortcomings. These included limited access to the Radio Teaching Programme due to a lack of contiguous FM radio transmitter coverage and a limited number of receivers. Consequently, certain rural districts were unable to reach all students effectively. An analysis suggested that increasing the number of stations would be beneficial. For example, the incorporation of 14 transmitters would enable a 90% reach, while 17 transmitters would extend the coverage to reach 96% of students, approximately 2.8 million children. In response to this finding, the Ministry of Basic and Senior Secondary Education has committed to procuring the initial set of three transmitters, with an additional two transmitters being acquired through collaboration with an NGO partner (Sengeh, 2021).

## 4. Conclusions

The utilization of existing local communication technologies holds the potential to address the challenges associated with achieving the United Nations' Sustainable Development Goal 4, which aims to ensure inclusive and equitable quality education for all, even in times of emergencies such as a pandemic. Radio serves as a viable substitute for ICT in areas where internet connectivity and online learning platforms are inaccessible (UNESCO, 2020). There is a growing availability of manuals and guides that facilitate the planning and implementation of education through radio. The significance of the pandemic is evident in the majority of these resources being published in 2020. Transnational organizations, such as the World Bank, offer pragmatic guides like the Education Radio Knowledge Pack and Education TV Knowledge Pack (Zacharia, 2020), as well as the Interactive Audio Instruction Repurposing Toolkit (Education Development Center, 2020), which assist decision-making processes and project implementation. These manuals not only aid in planning community-based solutions and projects but also emphasize the importance of local engagement. By leveraging local resources, education programs can be designed using the local language or dialect and involve community members and partners. Long-term commitment and the mobilization of awareness are facilitated through partnerships and collaborations with local actors, including volunteers, civil society organizations, and churches (Velics & Doliwa, 2015). These partnerships also contribute to financial support and enable practical project activities, providing resources and space for radio stations or training support staff and teachers. However, numerous challenges persist in the implementation of emergency radio education. These challenges include the lack of educational content in an audio-visual format in local languages, doubts regarding the timely production of such content, and the absence of partnerships and collaborations between education and media specialists. Further investigation is required to address these obstacles comprehensively and transform radio-assisted learning in disadvantaged areas into a practical reality. As demonstrated in Lagos, the availability of more community media centers in different communities would be beneficial, fostering group listening environments where learners can receive supervised support, as solely self-directed learning has proven to be less effective (Sanusi, Talabi, Adelabu, & Alade, 2021). A detailed understanding of these factors is necessary to advance radio-assisted learning initiatives in marginalized areas.

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# RETHINKING RURAL EDUCATIONAL CONTEXTS AS SITES FOR TEACHER EDUCATION TO INNOVATE TEACHING AND LEARNING

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## Abstract

Despite recent prioritization in national politics and economics, rural communities and schools across the United States (US) are still facing an array of challenges. In the US, rural schools are funded less proportionately than and often do not have the resources of suburban and urban schools. In addition, rural schools struggle to recruit and retain teachers in nearly all subject areas. Rural schools are often unable to provide the same academic opportunities as suburban and urban schools, which has compounding effects on all students, whether they want to take advanced placement courses or other specific courses for their chosen career pathways. Furthermore, rural student populations are becoming increasingly diverse and require rural schools to provide new services (e.g., English language learner [ELL] resources, mental health support, internet access) to their community. To better address these challenges the Rural Education Center at Kansas State University has increased their efforts to collaborate with rural schools in addressing their need for resources, teachers, and support. We use the theory of ecological agency to frame ways in which the contextual affordances and challenges of rural educational settings provide distinct opportunities for teacher education programs to innovate teaching and learning in rural schools. Many of the factors that have prevented sustained and authentic engagement with rural schools have been minimized in recent years through technology and increased broadband connectivity in rural contexts. Technology offers a range of opportunities for teacher education programs to engage more authentically with rural schools and provide sustained support through (1) telepresence-based field and student teaching experiences, (2) distance and online-based supervision, and (3) shared virtual and online pedagogies of the rural. To make these innovative engagements more sustainable, the use of technology in rural schools will need to be evolved and supported in new manners to have an impact on the agency of rural teachers to aid their students' learning. In this way, rural can be a lens for technological innovation in teacher education and rural schools.

*Keywords:* Rural, teacher education programs, teaching and learning, innovation, ecological agency.

## 1. Introduction

Despite recent prioritization in national politics and economics, rural communities and schools across the United States (US) are still facing an array of challenges (Showalter, et al., 2019). In the US, rural schools are funded less proportionately and often do not have the resources of suburban and urban schools, while also struggling to recruit and retain teachers in nearly all subject areas, especially STEM. Rural schools are often unable to provide the same academic opportunities as suburban and urban schools, which has compounding effects on all students, whether they want to take advanced placement courses or other specific courses for their chosen career pathways (Showalter, et al., 2019). Furthermore, rural student populations are becoming increasingly diverse and require rural schools to provide new services (e.g., English language learner [ELL] resources, mental health support, internet access) to their community. These challenges can be seen in states like Kansas, as well as across the Midwest (Nguyen, 2020).

Teacher shortages continue to be an issue across the United States, especially in rural communities. Teacher education needs to find more effective ways to engage with rural schools and contexts to address these shortages. The need to engage with rural schooling serves several goals. The most obvious, of course, is to recruit rural students into teacher education and to prepare teachers to return to rural schools. Beyond that, teacher education as an academic discipline needs a much more robust research agenda with regard to rural education. We need increased engagement to both better understand how to serve rural schools, as well to better prepare preservice teachers for the pedagogy of the rural (Walker-Gibbs, Ludecke, & Kline, 2015). Recruiting and retaining highly qualified teachers in rural settings has been an ongoing challenge (Azano & Stewart, 2015), and only amplified by the COVID-19 Pandemic (Wang, et al., 2021). Teacher education should play a role in addressing teacher shortages in rural, and all, contexts.

Factors that have attributed to teacher education programs lack of engagement with rural schools in general have much to do with two factors: proximity of rural schools to teacher education programs and the complexities of teaching in rural schools. Primarily, rural schools are often long distances from university teacher education programs. The distance and proximity of rural schools to teacher education programs has a dually limiting effect. First, rural schools are not conveniently accessible to teacher education programs for field experiences and student teaching experiences, and subsequently their university supervisors. With limited access to rural schools, preservice teachers' experiences with rural schools (if they have any) are often fleeting, contrived, and lacking in critical engagement with rural pedagogical issues (Azano & Stewart, 2015). Second, teacher education programs are not conveniently accessible to rural students that are aspiring to be teachers. Often times for rural students the idea of leaving their rural community as either a young or mature adult has cultural and financial implications that can cripple aspirations of attending the university. While college or university communities are often relatively small in comparison to cities, these communities can be significantly larger than rural communities. Furthermore, college and university towns often have a significantly higher cost of living.

Secondarily, the complexities of teaching rural schools provide a range of factors that limit teacher education programs' abilities to prepare preservice teachers who want to teach in rural settings. The complexities range from the need for place-based pedagogy and specific career and technical education pathways, to multiple-subject certified teachers (e.g., math, science, and agriculture) to cover all courses of study and meet the financial needs of the rural schools and community (Azano & Stewart, 2015). Complexities of any school context are hard to capture fully through teacher education programs, but especially if preservice teachers have limited or no access to that context. Finally, as teacher education struggled to address the need for diversity—to increase the numbers of diverse candidates and faculty and to provide field experiences in diverse settings—rural schools were, rightly or wrongly, viewed as not contributing to that exigence. This can be attributed in part to faculty and student bias about rural communities, lack of experience in rural schools, and stereotypes of rural students. Many rural communities in Kansas are diverse with 50%-80% of the student population identifying as ELL.

Many of the factors that have prevented sustained and authentic engagement with rural schools have been minimized in recent years through technology and increased broadband connectivity in rural contexts (USDA, 2021). Furthermore, one benefit of the COVID-19 Pandemic has been that rural stakeholders that were once reluctant to engage with technology have become more comfortable with a technological presence in their schools. Technology offers a range of opportunities for teacher education programs to engage more authentically with rural schools and provide sustained support through telepresence-based field and student teaching experiences (Wertzberger, 2019), distance and online-based supervision (Clark et al., 2021), and shared virtual and online pedagogies of the rural (Wang et al., 2021). While these innovative uses of technology have begun to engage rural schools more fully, to make the engagement sustainable the use of technology in rural schools will need to be evolved and supported in new manners to have an impact on rural teacher recruitment. In this way, rural can be a lens for technological innovation in teacher education. The next three-five years will be pivotal for teacher education programs to establish technologically-based relationships with rural schools to fully realize opportunities for innovation.

## 2. Theoretical framing

We approached our rural school and teacher education partnerships "ecologically," wanting to better understand the interrelations and connectedness of the socio-cultural context in which each unique rural school operates (Wideen, et al., 1998). In regard to interrelations, we mean the relationships among those present in the rural school context – students, teachers, administrators—as well as the contextual conditions of the school, community, public and personal spaces. The connectedness and disconnectedness of these relationships create possibilities and opportunities for agency within each rural school's ecological context. Thus, this work was informed by an ecological theory of agency (Biesta & Tedder, 2015). There has been a lot of recent research on the topic of agency, especially for teachers in constraining contexts (e.g., underfunded schools, ELL classrooms without resources or support, classrooms during COVID-19) (Biesta et al., 2015; Buchanan, 2015; Kayi-Aydar, 2015), including the use of ecological agency (Oolbekkink-Marchand, et al., 2017). Ecological agency theorists define agency as action in the context of structures, or an actor's capability to "critically shape their own responsiveness to problematic situations" (Biesta et al., 2015; Buchanan, 2015; Kayi-Aydar, 2015; Priestley, et al., 2012). In an ecological view: "actors always act by means of their environment rather than simply in their environment [because] the achievement of agency will always result from the interplay of individual efforts, available resources and contextual and structural factors as they come together in particular and, in a sense, always unique situations" (Biesta et al., 2015). Similarly, our view of agency situates agency as something an individual achieves under distinct ecological conditions, and the resources available to them.

We use "ecological" as a lens to view the rural school context holistically, and the wide range of factors, both inside and outside the school, that enable and constrain not only the school administration's actions, but also our partnerships. Agency, in the ecological sense, maintains actors constantly achieve agency in response to the ecological conditions of the context, even for those who seemingly have the more constraints, or even more affordances. Therefore, in an ecological sense, as a land grant institution, we view our partnerships with rural schools as a mutual way to achieve agency given the distinct context and constraints in which each rural school finds itself. An ecological theory of agency is relevant to our work with rural schools because it prioritizes individuals' reflexive and creative counters to cultural, economic, political, and societal constraints that open inquiry into possibilities (Pantic, 2015). Through partnerships with rural schools, the REC hopes to provide new possibilities for both the reproductive and transformative goals of our rural school partners. We use an ecological sense of agency to better understand the dimensions that our dynamic rural educational contexts utilize in achieving agency. The dimensions of rural educational contexts are dynamic because they represent a constant negotiation between historical precedent, future intentions, and current priorities. Scholars have described three primary dimensions in agency: iterational, projective, and practical-evaluative (Emirbayer & Mischa, 1998). Most recently, and simply, Pantić (2015, p. 768) illustrated the three temporal dimensions associated with ecological agency, as "influences from the past (e.g., adopted routines), orientations towards the future purposes (e.g., intentions, hopes, fears) and engagement with the present (e.g., judgments about opportunities)." We use these dimensional elements of agency to provide framings for the goals of our partnerships in a structurally constrained ecological context.

We exercise the iterational dimension when we reflexively select and utilize values and beliefs related to past experiences and life histories, past instances of achieving agency, and realizations and actions that were important. (e.g., rural community values, beliefs, and identities and past experiences working with post-secondary institutions). We draw upon the projective dimension when employing intentions to transform and bring about a future that is different from the past and the present, and our partnership with rural schools often prioritizes the projective (e.g., teacher recruitment, grants focused on career education). The practical-evaluative dimension situates our partnerships in the present, where all stakeholders' agency is interacting with the ecological context and being influenced by both past reflexive iterative knowledge and future projective intentions. While the iterative and project dimensions provide priorities for ecological agency, it is in the practical-evaluative dimension where those priorities are negotiated within the context.

## 3. Vision

Rural schools offer an opportunity for teacher education programs to develop innovative ways of using technology to recruit teachers equipped for the complex needs of rural communities and students. At our institution we are addressing recruitment by using rural schools to innovate our teacher education programs in three ways: (1) telepresence-based field experiences, (2) distance and online-based supervision, and (3) shared virtual and online pedagogies of the rural. In developing innovative practice for our teacher education program, we have relied on rural schools to be the sites to pilot new approaches to ongoing issues in teacher education. We have found rural districts and schools to be ideal sites for innovation because they offer a highly flexible educational setting whereby their teachers and administrators are receptive to implementing new approaches to teacher preparation, and serve as valuable partners in the co-construction of those approaches. In turn, our preservice teachers benefit from their involvement in unique field experiences, while school districts are able to increase their recruitment opportunities through our partnership. We have several practices that have been effective thus far that can affect teacher recruitment.

First, we have found telepresence-based field experiences to be effective throughout our teacher education programs. Our telepresence-based experiences are facilitated through autonomous telepresence robots that can move throughout the classroom. Telepresence-based field experiences increase the richness of teacher education programs by providing opportunities to experience schools that our preservice teachers would not have seen otherwise. By richness, we refer to the depth of a pedagogical approach, it's layers and meanings, and possibilities for multiple interpretations (Doll, 1993). When preservice teachers engage with rural schools through telepresence, they encounter another layer of cultural and contextual experiences, as well as new modalities for them to use in interpretating school contexts. Most of our preservice teachers are from suburban schools and their perspective of what constitutes an elementary, middle, or high school can be narrow in scope. Telepresence-based field experiences also add richness to our program in terms of pedagogical outcomes. For example, at our institution, preservice teachers in their initial field experiences use telepresence robots to observe and interreact in rural classrooms. It allows us to better scaffold their experiences in the classroom, and they are able to see things like project-based learning and place-based learning in action. They also see a range of diversity with our rural classrooms comprising increasingly culturally and linguistically diverse classrooms, including representation of growing Latinx communities in rural settings (Chang, 2015). Most rural classrooms offer smaller class sizes

that allow our preservice teachers to interact more freely with both the students and cooperating teachers. The telepresence experiences deepen preservice teachers' understanding of classrooms and pedagogy, preparing them for subsequent coursework, and providing another conceptual example of schooling.

Equally important, telepresence-based field experiences initiate recruitment efforts and expose our students to a possible career in a rural school. We are working to evolve the use of telepresence experiences to add even more depth by cultivating professional relationships between rural school district administrators and preservice administrators. Rural school districts are leveraging this technology to promote their communities' strengths, share authentic opportunities for potential candidates to experience their schools and communities via telepresence and in-person, and recruit for in-service teaching. Ultimately, school districts are increasingly utilizing telepresence technology to build relationships with preservice teachers through the various field experiences built throughout the sequence of their teacher preparation, from early observational placements to and even including the final semester-long internships (Wertzberger, 2019).

Second, distance and online-related supervision technology also allows us to address teacher recruitment in rural school settings through our online teacher licensure programs. Our online licensure programs allow students who live in rural contexts, and who are unable to attend our university on campus, to attain a teaching degree completely from their rural context. A majority of our students in online licensure programs are currently working in schools, including rural schools. The primary goal of online licensure programs is to help rural schools recruit and train potential teachers in their community – some of which may be in a high school pathway program. The pedagogical innovations of our online licensure programs stem from video assessment software, such as GoReact, which allow for distance supervision and feedback. Secure virtual supervision platforms such as GoReact, allow preservice teachers to livestream or upload video, which university faculty can provide feedback that is timestamped within the video. Preservice teachers can respond and reflect on their videos, and related feedback. Technology, such as GoReact, that enables distance supervision allows teacher education programs to develop their preservice teachers practice and self-efficacy through regular and frequent feedback on their experiences as part of their semester or yearlong field experiences. We are working to evolve the use of distance supervision with even more pedagogical outcomes that add to the recursive and relational (Doll, 1993) outcomes of field experiences through more longitudinal and sustained experiences within schools. As we evolve the field experiences the role of the university supervisor needs to evolve along with it. In our rural school field experiences, technology has allowed our supervisors to take on a role that is better characterized as a coach, due to a more frequent, sustainable, and assets-based interaction model (Clark et al., 2021). Using GoReact is just the beginning of evolving the evaluative supervisor role, to a more supportive coaching role.

Lastly, we need to prepare preservice teachers for interdisciplinary approaches to subject matter. While these approaches are arising in all school contexts (e.g., STEM, STEAM, CTE), it is much more common in rural schools. By simply being more present in rural schools through telepresence and online programs we address rural teacher retention by supporting their pedagogies and providing additional resources. We call this shared virtual and online pedagogies of the rural. The increased presence in rural schools allows for a two-way street of sharing, developing sets of new relations. The concept of relations (Doll, 1993) as an approach to learning has both pedagogical and cultural implications. Pedagogical relations are best demonstrated through place-based learning. Often times the instructional practices are nothing new (e.g., expository writing, monitoring and measuring environmental aspects, or historical cause and effect) but applied to something in the rural community. From our experience, no one implements place-based learning better than rural schools, often because their sense of community and cultural identity comes through in their teachers' pedagogical relations. In many rural classrooms you see the talents of multi-subject teachers weaving together content, all while connecting it to their students' context. Our institution has worked to provide resources to these teachers to further connect their place-based learning to careers and technology in their community or region. This includes technology such as block-base coded drones and robots, telepresence robots, and bio-technology kits. We have been effective in getting rural teachers to use these technologies, and now we need to evolve our practice to better prepare our preservice teachers to use these technologies at the beginning of their careers – mentored by our rural teaching partners.

## 4. Implementation

Our experience with innovation in rural schools has led us to three suggestions for teacher educators, and their programs, who want to better engage with rural schools using technology. First, through the Rural Education Center (REC) at our institution, we have created rural professional develop school (RPDS) network of 15 school districts that partner with us on all of our initiatives, as well as another 90 school districts that we offer resources to regularly. The RPDS schools comprise a diverse and distinct group of rural communities across our state, with schools that want to provide equitable opportunities for their students. Having these partner schools facilitates cooperation, collaboration, and trustworthy

relationships that allow for increased innovation (e.g., telepresence field experiences). Each partner school has multiple telepresence devices for our preservice teachers and colleagues to interact in their schools. Our colleagues are able research and observe innovation in school sites they were unable to in the past. Second, teacher educators and their programs should utilize rural schools as pilot sites, which is enabled by the first suggestion. Rural schools offer a lot of positive logistical attributes that allow for smooth facilitation of research and innovation. Primarily, most rural schools are smaller in all aspects of schooling. They typically have smaller class sizes, less administrative levels to gain approval, and fewer teachers in each grade-level or content area. Secondarily, many rural teachers are innovation minded, given their limited amounts of resources, and the multiplicity of courses/subjects they plan and teach. These two factors make rural schools very amenable to research and educational innovation, and valuable to teacher education programs.

We understand very well the institutional barriers to the kind of implementation we have outlined. The status quo of professional practice is powerful, and we have decades of candidate field experiences in K-12 systems with the attendant university supervision, and we would be remiss not to acknowledge the systemic assumptions that field experiences happen when candidates are physically present in K-12 classrooms and supervision happens when a university supervisor sits in the back of the room taking notes. The local culture within most teacher education systems is strongly predisposed toward this traditional model, and while COVID-19 pushed some of those boundaries, any move toward technologically mediated field experiences with remote supervision will require adequate conversation among professionals to secure the necessary institutional will. Furthermore, the role of technology in the future of field experiences must extend beyond replicating old paradigms in new spaces. It must assist in envisioning new constructs by which we define best practice in teacher education. This includes leveraging technologies to connect geographically and culturally diverse school partners in collaborative efforts to diversify teacher education, and to construct more accessible teacher preparation pathways for non-traditional candidates. Institutional conservatism and inertia notwithstanding, we believe the need to engage teacher education with rural education provides a powerful incentive for new paradigms of practice, research, and innovation.

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# SUCCESS STORIES OF STRENGTHS BASED INSTRUCTIONAL (SBI) APPROACH FOR CHILDREN WITH EXCEPTIONAL NEEDS

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## Abstract

SBI is a systematic approach of an instructional training model with a primary focus on identification of a child's strengths (Chakraborti-Ghosh 2013, 2019), the main theme of this paper. The paper will explain how Strengths-based instructional approach can be beneficial to open up communication, relationship, and the trust between parents and children with exceptional needs; teachers and students, among siblings, caregivers and more. This paper presents success stories of SBI in an informal interactive sessions with interviews, reflective discussion using a narrative case study of each participant.

*Keywords: SBI, narrative case study, informal interviews, parents, children with exceptional needs.*

## 1. Introduction

Children with Learning, Communication and Behavior Challenges are always a struggle for parents, teachers, and caregivers. Strength Based Instruction (SBI, Chakraborti-Ghosh 2013, 2019) approach has recently been used to open the communication with children with learning, communication, and behavioral challenges in Kolkata India with the presence of their parents. An interactive session using verbal interview was conducted. The result of these interviews have been accumulated in a narrative case study format. The presentation will provide the success story of this approach.

SBI is a systematic approach of an instructional training model with a primary focus on identification of a child's strengths (Chakraborti-Ghosh 2013, 2019), the main theme of this paper. SBI emphasizes the strengths of each children enhancing their self-confidence, and self-esteem. This instructional practice prepares teachers to develop their lesson plans recognizing the strengths of all children in an UDL environment to establish a community of learners based on their strengths, learning styles and abilities. SBI impacts on confidence building, lesson adaptability, and adjustment of any students at any grade level including children from diverse cultural, linguistic, and socio-economic backgrounds. SBI model is an instructional Training Model which has been used to train pre-service and in-service teachers across the curriculum. SBI has Four Elements: Students, Content, Process, and Outcome. As Rose and Meyer, (2007) pointed out that environment, using the multiple intelligences and strengths with technology as a tool for instruction, learning, and performances is a key to success. SBI is a one-step forward to that direction.

## 2. Interactive session with children & parents

<u>Rules for parents</u>: Could start the communication. Children were the first to start talking about themselves. What they like and dislike. Parents will only respond to the question they have been asked.

**Case One**: 15 yrs. old girl. Grade 9. Daydreamer, Obsessive compulsive behavior (OCD) with handwashing. Desperately wants to socialize and be liked by her peers and by childhood friends/schoolmates at school. Wants to be popular. Likes socializing but intimidated.

Strengths: Caring, and Always smiling. Her smile is contagious and bring positive vibe to others. However, she is teased by her peers for that.

Area for improvements:
1. To develop an understanding of the excessive use of water that can cause skin issues
2. To write a journal with her daydreaming story and present to the parents when it is complete. She should have been given a set time to write on her daydream fantasy, not while inside the bathroom.

Communication: She understands that her mom gets irritated while she gets late for school, spending too much time in the bathroom.

Mother's Response:
1. Frustrated with OCD more than her interest in making friends at school.
2. Expectation vs performance
3. Lack of time vs personal frustration
4. Gender role vs family expectation

**Case Two**: 13 yrs. old boy. In Middle school. Likes the fantasy of having a boyfriend and/or girlfriend. Speaks his mind. Loves music but not confident. Works heard to concentrate on one area, needs attention to Voice his opinion. Has Attention Deficit Disorders and some writing disorders.

Strengths: Confident, takes initiative, opinionated.

Area for improvement:
1. Needs to wait or raise hand before responding.
2. Needs to organize thoughts before speaking.
3. Needs to write points to discuss in tablet or computer.

Mother's Response: They like mountaineering, hiking, and trip to the mountain when gets time. Supportive of boy's ideas. Not over-critical. Do not understand how ADHD can be treated, but wants to learn!

**Case three**: 11 yrs. old boy with high functioning Autism. Mostly non-verbal. Has a non-disable sibling brother. Loves his brother but constantly fights.

Strengths: Loves to sing and draw. Loves to play soccer with his brother and other children.

Area for improvement:
1. Cannot concentrate on one area.
2. Slow learner. Processes slowly.
3. Has a difficulty in concentrating, socializing, and making eye contact.

Parent's Response:
Mother has hired a private teacher for music and art lesson.
Emphasize more on his creative sides.
Father did not know his love for soccer.
Father compares his ability with his non-disabled brother.
The Expectation vs. Frustration
Ability vs. Performance

**Case Four**: Middle schooler, 11 yrs. old girl, in 8th grade, identified with high functioning Autistic spectrum disorder.

Strengths: Loves Math. In high school algebra class. Loves to play math software games in her tab. Loves to work with technology. Created a YouTube channel to teach math with the help of her teacher and mother.

Area for improvement:
1. Has a difficulty in concentrating, socializing, and making eye contact.
2. Does work well in large crowd.
3. Works best alone
4. Emotional outburst when angry

Parent's Role: Mother is extremely involved. Mother is a software engineer and father is a professor of computer science.

1. Mother is more persisting and engaged than father.
2. Father is very supportive of Mother's engagement with school.
3. Mother was informed about SBI approach and determined to make it a great success.
4. Determined to make daughter as functionally independent when she grows up.

**Case Five**: 27 years old adult. Identified with High functioning Asperger's syndrome.

Strengths: Loves to organize household items. Loves to cook but scared of Fire due to an old accident. Loves to greet guests. Good with computers. Speaks Hindi but the language is spoken at home is Bengali.

Area for improvements:
1. Has a difficult in concentrating, socializing, and making eye contact.
2. Loves to Eat but cannot control the appetite.
3. Hormones is strong with unknown female.
4. Currently working on good touch vs bad touch. But understands the proximity control when reminded by mother.
5. Likes to stay home because of some incident of traveling alone and got lost.

Mother's Role:
1. Wants to make her son as functionally independent as possible.
2. Works on three jobs to stay away from home.
3. Father works out of town and visits once a month.
4. Parents created a trust for future caregiver to take care of him after their death.

## 3. Summary & conclusion

The strength-based approach has its foundation in social work and builds upon the client's strengths, specifically seeing the client as resourceful and resilient when they are in adverse conditions (Strengths Based Models in Social Work, McCashen [2005]). A unique characteristic of this approach is that it is client led and is centered on outcomes using an individual's future set of strengths. Erika Stoerkel, explained in detail on "What is a strength-based approach?" in an article on Positive Psychology (2019). She explained how strength-based approach focuses on the positive attributes of a person or a group, rather than the negatives. There are multiple ways the strength-based approach can be applied, including in leadership, counseling, community and social work, and pediatrics. Powell (2015), a licensed psychologist from Colorado has been practicing for years on Strengths Based approach for intervention with At-Risk youth.

However, Strengths Based instructional approach has never initiated until Chakraborti-Ghosh started training her pre-service and in-service special educators to create a lesson on strengths-based approach. An evidence-based practice was established with the help of the parent and teacher of a high school girl who loved music and technology in 2013. Eventually, the success story was published in 2019.

### Strengths Based Approach and Mental Health

The author has been focusing on Strengths based instruction as a pro-active approach rather than a reactive approach. If it starts as early as Pre-K, then family, teachers, therapist, and administrators all can be aware and be prepared of any upcoming accidents or behavior explosion. Mental Health has been critical issues and growing explosively with all gun-violence in the United States. All school shooting has been blamed to mental health but not enough emphasis on proactive approach to focus strengths-based approaches to address emotional and behavior explosions. Many health systems have traditionally adopted a view of mental disorders based on pathologies and the risk individuals have towards mental disorders. However, with this approach, mental disorders continue to cost billions a year for the healthcare system. Strengths-based approach moves the focus away from deficits of people with mental illnesses (consumers) and focuses on the strengths and resources of the consumers (Xi, 2013).

### The Win-Win Situation

This Interactive session with children and parents has taken places in many settings through one on observation, interview, feedback, and responses from both the parents and children, youth, and adult.

All parents have agreed on SBI approach. It proved one more time how children and parents can create comfortable communication zone with the help of the teachers, counselors, and researcher like me to have a positive outcome for everyone. We as an adult are more focused on what to teach, but not put enough emphasis on student's learning styles. We also tend to focus on inabilities or disabilities rather than their area of strengths or abilities. Maybe some day with more sessions on SBI and training teachers to develop their lessons using Strengths Based Instructional Model will minimize the mental health cases such as shooting, stabbing and gun violence.

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# A DESIGN OF ONLINE LEARNING MATERIALS FOR DEVELOPMENT OF LEARNER AUTONOMY

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## Abstract

There are many reports indicate that educational inequality may be widening during the pandemic, and various factors contribute to the educational disparities. Though the problems are big, we need to continue our efforts to improve the educational disparities, one step at a time. As an effort of the improvement, we concentrate on the factors attributed to learners, the difference between a learner successfully studies with no stress and one without good learning progress as expected is caused by whether he/she has adequate learning skills adjustable to online/HyFlex learning style or not. From literature research we can recognize such learning skills same as those acquired in learner autonomy/self-directed learning. When we designed the course, we employed competency-based learning and task centered instruction. As is well-known a wide variety of learning skills required for autonomous learning. It is impossible to acquire all skills with only exercises in a course only. Then we restrict our learning materials as to develop competencies of learner autonomy. Also, we assume the competences broadly as employability skills like written communication and the problem-solving skill because we regard those as essential for life-long continuous learning. As for the latter, from interviews of some students we found that our students have not been sufficiently trained to apply them practically, for example, in problem solving and learning practices, although they are familiar with the concepts of these employability skills. We carried out a practice providing an online course to learn such skills in a university, and then made sure that such online self-study is to be not only training of them practically but cultivating meta-learning skills.

*Keywords: Self-directed learning, task centered instruction, reflection, online learning, Hyflex style.*

## 1. Introduction

The pandemic of COVID-19 makes us to change teaching and learning style from traditional face to face to online/HyFlex. There are many reports indicate that educational inequality may be widening during the pandemic, and various factors contribute to the educational disparities. It seems that the inequality depends on various factors like economics, educational infrastructures, and so (e.g., Adedoyin & Soyka, 2020, Marinoni, van't Land, & Jensen, 2020; Blaskó, da Costa, & Schnepf, 2022). In Japan, many of similar survey were conducted by some institutions. We focused on an awareness survey of attitudes about educational disparities perceived as a result of the school closure measures targeting about 1,000 younger Japanese aged from 17 to 19 years old (Nippon-Foundation, 2020). The survey showed that 58.6% of respondents felt "there was an educational disparity due to school closures". It also indicated that there are many reasons attributed by students' environment, such as the introduction of online classes, the home environment, and the school closure period, but if we particularly concentrate on the factors attributed to learners, the difference between a learner successfully studies with no stress and one without good learning progress as expected is caused by whether he/she has adequate learning skills adjustable to online/HyFlex learning style or not. We consider that the reasons why some students could not learn independently via the online/HyFlex learning style where they have not developed the skills of self-directed learning (autonomous learning).

We cannot envisage educational method recovering old traditional face to face lecture style after the pandemic. Indeed, from a student survey on the state of online courses we cognize that many of students believe that the preferred learning style after the pandemic is online for lectures, face-to-face for practicums, and both formats for seminars (Schoo, 2021). Though instructors have been forced to develop and manage own online/HyFlex course by themselves during the pandemic, they usually are less familiar both with instructional design and online contents development (Hodges et. al., 2020, Ferri, Grifoni, & Guzzo, 2020). We believe that the student opinion is so realistic that we will be asked to provide education in a reasonable learning style makes sense to students. If we are to provide education in a manner consistent with students' aspirations, then any learner should acquire or increase the readiness of learner autonomy/self-directed learning. Thus, we have developed a training course to cultivate learning skills required in autonomous learning. The courses were provided as HyFlex and designed according to a proposal for building learner autonomy though online self-study and face-to-face collaboration with peers. All learning materials are published as open course modules of Moodle learning management system (LMS), because we hope to support instructors as described above. In the present paper we show the course design and the practice carried out for two academic years.

## 2. Course design and methodology

In our project we decided to modify an existing course. The course is so-called the first-year experience courses where students learn essential academic skills like logical writing, problem-solving skills and team-working. It is offered by multiple instructors with the same syllabus, uniform evaluation, and PBL (Project-Based Learning) format. So, students set their own project theme of interest and then make project teams. Usually, an instructor gives short lecture with an assigned textbook, then start to perform team activities determined by themselves. We would employ it to acquire or increase the readiness of learner autonomy that is learning style as self-study by offering all instruction and information via online. When we designed learning materials, we would try to decrease his/her feeling of the disadvantages in online self-study. The efforts for decreasing the disadvantages have studied in the field of distance education and learning (IU, 2023). The research field has long history so that there are many good practical examples and many fine research papers related or regarding with the distance education (Moore, 1997; Ferri, Grifoni, & Guzzo 2020). From the literature study, we consider that the disadvantages are roughly divided into three research results; the readiness of self-directed learning (Francom, 2010), the transactional distance theory (Moore, 1997), and equivalence theory (Simonson, 1999), and closely related each other. We follow the findings of the transactional distance theory in design of our course and development of the course materials (Bornt, 2011; Suzuki & Hiraoka 2021). The theory suggests that learner autonomy is cultivated with decreasing the total amount of scaffolding of learning (Suzuki & Hiraoka, 2021). Thus, we adopt a design with a certain level of structured materials and minimum level of verbal explanation by the instructor.

As we described above, we employ an existing course for our purpose. In developing the renovation of the existing course, we were faced with some constraints, particularly activities of students.

*Figure 1. Schematic diagram in designing of the developing course.*
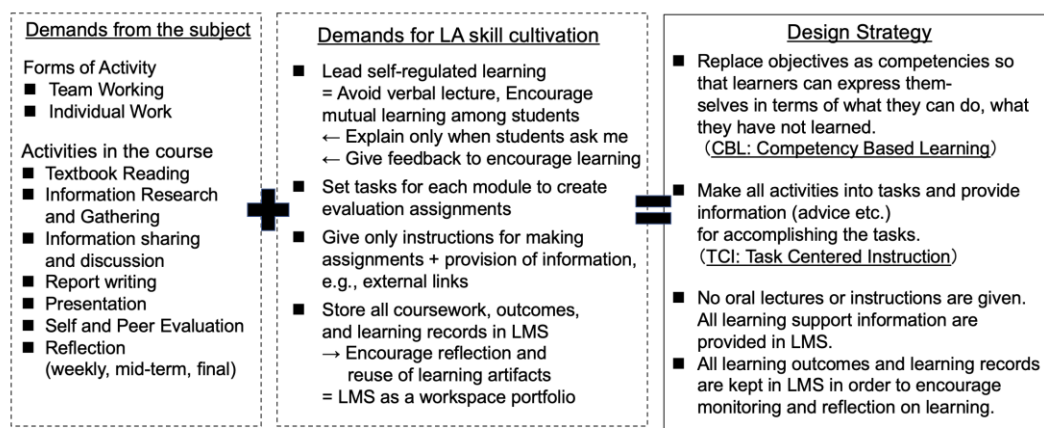
In our design work, we have had to impose on ourselves the consideration of the given requirements both from the subject matter and from the cultivation of learner autonomy. Figure 1 shows our strategy in design of the course schematically. After some consideration we decide to employ the framework of competency-based learning (Voorhees, 2001) and task centered instruction method (Merrill, 2007). Hereafter, we write the former as CBL and the latter as TCI. The method of CBL allows students to check their own achievement based on a competency-based view of academic achievement, which is based on "what they understand" but also on "what they can do. Development of learner autonomy requires students to reduce dependence on instructors and to encourage him/hers to take control of their own learning (Ertmer & Newby 1996). TCI, On the other hand, is an instructional method that focuses on the accomplishment of assignments (tasks). We equate assessment tasks and competencies so that our students naturally acquire the competencies through the creation of the assessment tasks. We decided to set up the competencies by replacing the subject achievement objectives with employability skill expressions in order to make it easier for students to understand what they should do as learning activities. Also, in consideration of students are not accustomed to self-study, we made the assessment tasks to be broken down into smaller-scale tasks (exercises) so that students can learn step-by-step and more clearly understand what they have achieved. We consider that CBL and TCI are one of the good methods for developing learner autonomy because students can easily grasp what they have learned and what skills they have acquired.

## 3. Practices for formative evaluation

We carried out courses using the learning materials developed in this project for two academic years. The practices are not only classes for credit, but also a formative evaluation of the learning materials and strategies for cultivating learner autonomy. The total number of students in the three classes over the two years is approximately 100. As we mentioned before, the courses were provided as HyFlex style where students conduct their learning though online self-study and collaboration with peers in face-to-face and/or virtual meetings. Usually, a blended course that can be freely varied is referred to as HyFlex-type. We call our courses HyFlex because we give students the choice of either face-to-face or online peer activities as well as self-study with online materials. We chose this learning style partly because of the Corona disaster, but also because we think in the future, project workings will be done more prolifically online as well as in person. In addition, we of course intend that collaborative learning with peers to reduce the students' isolation and disengagement of learning caused by online self-study.

It is not possible to immediately judge the extent to which this course has contributed to the students' progress for the development of learner autonomy, because we need to continuous monitoring of the students' learning activities and behavioral changes. But we can confirm, at the very least, many students thought that they had been able to acquire independent learning skills in this course from the results of students' course evaluation questionnaires. We show a result of the questionnaire of a class in Figure 2.

*Figure 2. a result of students' course evaluation questionnaire.*
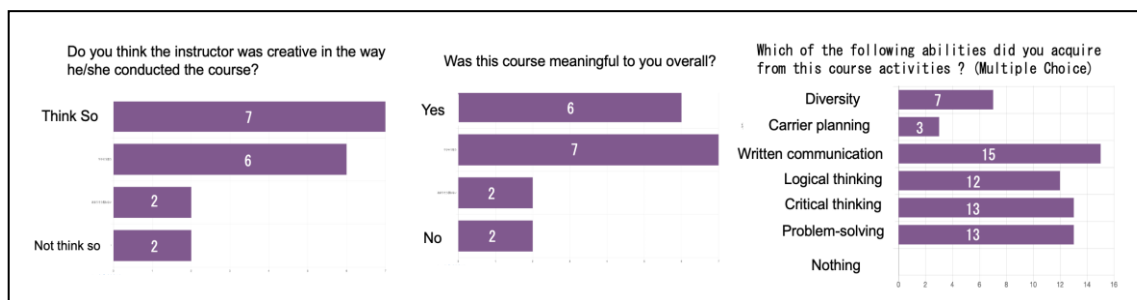


The response rate for this class was around 63% (N=17/27). As the left and middle figures indicate that most of our students thought the contents of learning and delivery methods, and also HyFlex style where they have online self-study and collaboration with peers in their own choice are generally well acceptable. We attribute this result to the students' experiences with online/HyFlex learning under the Corona disaster and consider that it is a natural consequence of the findings on the survey of the preferred learning styles after the pandemic described above (Schoo, 2021). The right figure shows self-evaluation of acquired skills through the learning activities in the course. The main subjects of the provided course are to acquire written communication (report writing) and problem-finding skills. We think that this diagram implies that the change from the traditional description of learning objectives

in the syllabus to a more direct description in terms of competencies has enabled the students to understand more clearly what they have acquired through their studies in the subject. It is interesting for us to note that many students indicated that a secondary effect of this practice was the development of logical and critical thinking. These skills are meta-learning skills for autonomous learning. We predict the cycle of self-study and sharing acquired knowledge with peers led to the responses.

While we received positive comments from most of participants, we also received negative feedbacks that we should revise in the future. They mainly referred to the amount of information provided online documents including task instructions and that of exercises. We say, more specifically, the quantity of both is too much. We consider the adjustment of the amount of learning in online distance learning and the amount of information to support self-study to be one of the difficult issues. Indeed, there are many practical reports on these matters. We have already addressed the comments on improvements that can be made easily, but appropriate revision of the content in the light of our own students' learning ability, while referring to previous research, is an issue for the future.

## 4. Concluding remarks

We have conducted to improve education to cultivate learner autonomy that is the stem of learners' ability to learn. It has been highlighted by the documents of educational inequality due to school closures associated with the pandemic. In the present paper we report the results of a formative evaluation exercise, which involved the instructional design and online contents of the developed course in accordance with the frameworks of the competency-based learning (CBL) and the task-centered instruction method (TCI). We consider that CBL and TCI are one of the good methods for developing learner autonomy because students can easily grasp what they have learned and what skills they have acquired. From the formative evaluation practices, we have confirmed that our students thought the contents of learning and delivery methods, and also HyFlex style where they have online self-study and collaboration with peers in their own choice are generally acceptable, while students have asked us to continually improve our learning materials and instructions. At least we could obtain adequate information to revise the course design and what students want from us to support their self-study that is development his/her learner autonomy.

We cannot envisage educational method recovering old traditional face to face lecture style after the pandemic, because students hope to proceed their learning in a reasonable and efficient approach, rather than the traditionally uniformed one as indicated by the report about the preferred learning styles after the pandemic. It is not possible to immediately judge the extent to which the present efforts have a contribution to the students' progress for the development of learner autonomy, because if it will be clear, we are demanded continuous monitoring of the students' learning activities and behavioral changes. But, at the very least, our learners confirm that they have been able to train in the self-study skills that are at the heart of learner autonomy throughout the experiences of our course. We expect that instructional strategies and delivery method as presented here could be one of the mainstreams of educational implementation in higher education near future.

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# IDENTITY-BASED ACTIVITIES CARRIED OUT THROUGH ENGRAVING AND STAMPING EXERCISES.
# ART MEDIATION WORKSHOPS BASED ON LOCAL ENGRAVERS' WORKS AND AIMED FOR STUDENTS FROM THE CITY OF TOMÉ IN CHILE

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## Abstract

This paper will refer to a project that consists of an artistic mediation in Tomé, Chile. This project involved an art exhibition that represents an innovative pedagogical proposal to reckon the value behind the creation of images of identity through techniques related to engraving and printmaking as strategy to gain knowledge. Through the Artistic Teaching Methodologies, this project proposed creative exercises based on the work of 6 artists. The aim was to understand what could be observed in the works of art, relate to it from personal experience and, finally, to create something from it. Thus, teaching art through art. The dynamics and the visual results from the work of the students were analyzed through Arts Based Methodologies using visual instruments.

*Keywords:* Art education, mediation, artistic teaching methodologies, engraving, printmaking.

## 1. Introduction

The experience "Identity-based activities carried out through engraving and printing. Artistic mediation workshops based on regional engravers and aimed for students of the commune of Tomé" was an exhibition that had as a common thread the inquiry about territory, as well as individual and local identity. The strategy to deepen the aforementioned concepts was achieved through mediation between the works of art and the spectator via the art of engraving. The goal was to generate spaces for individual and collective creation around the work of 6 local artists. In this way, students of different ages abandoned the role as a passive spectator to adopt an active and creative role within the experience.

The proposal was based on the use of Artistic Teaching Methodologies (Mena, 2020; Rubio Fernández, 2021; Caeiro et al., 2021), in which the main strategy is the use of experiential, creative processes and works of art as the central point to provide a learning experience.

For the analysis of results, the Arts-Based Methodologies (Roldán and Marín-Viadel, 2012), which use images as the most important data and findings, are employed.

## 2. Knowledge of heritage and identity through art education

The most widespread ideas about heritage understand it as a set of goods of different nature that a society inherits from its ancestors and that gathers elements of different kinds (historical-archaeological, artistic, ethnic and even natural). These elements belong to a material range and are an instrument of both cultural identity and social connection. For this reason, their conservation and dissemination are generally ensured. This set of material components also include those that are immaterial or intangible (Calbó et al., 2011).

Memory and recollection are heritage elements which are intangible. Stored inside of each individual, they are essential in shaping the identity of a community as well as each individual's identity. Therefore, identity is born from both inner perception and outer vision: how we see ourselves (voluntary ascription), and how we are perceived (identification). Consequently, identity is based on a real construction and also on an ideological, political and cultural one, that hierarchizes symbols that allegedly belong to each person. This channels cyclically collective energies and feelings (Arévalo 2004). From this point of view, it would be expected to think that heritage, as a cultural construction, takes a part in the construction of identity of each person that conforms the social fabric.

Articles 7 and 8 of the Convention on the Rights of the Child (approved in 1989 and passed into law in 1990) directly refer to respect every child's identity, as each child has a name and a nationality that must be respected by both parents and the State, as well as preserved, and restored in the event of deprivation of some of its elements (O.N.U., 1989). With this declaration, identity is granted as an indispensable attribute of each individual, which must be recovered if lost. The question, then, arises: how does education deal with this indispensable attribute?

Art today is demanded in the creative experience of every human being, acting as the device that makes it possible for the most personal and meaningful relationships to be born. Art also includes all kinds of aesthetic practices, which, in themselves, are constitutive of patrimonial identity (Calaf Masachs, 2003). Art Education, as the discipline responsible for promoting productive and appreciative artistic processes, can and should contribute to the understanding of heritage (and, consequently, of the identities that make it up), encouraging its communication and including as an important addition to the artistic curriculum of different education stages (Gutiérrez-Pérez, 2012).

## 3. Printmaking as a vehicle to shape these experiences

One of the main interests within the current practice of printmaking is focused on investigating the different possibilities that this medium provides to creation in general. This refers to looking through how we can use printmaking in art education in order to know which are the contributions it leaves in relation to other aeras in education, identify the benefits related, and defend its relevance within the teaching-learning processes.

The different factors of this technique are well known for their influence and involvement in the teaching-learning process. It contributes to stimulate the development of rational thinking, it also provides rules for creation that can be connected to play, and it sets certain conditions that are ideal for collective work in the development of transversal values (Castillo-Inostroza et al., 2020).

The art of engraving leaves an implicit print behind, creating a connection with the print that already lives inside the memory. This print comes to the surface when there is the motivation to review what has been experienced in everyday life and what has become part of a human's personal construction. Thus, engraving -as an accurate, concrete, and playful technique at the same time- embodies the metaphor of what a print is, becoming the main vehicle for creation.

## 4. Artistic Teaching Methodologies as a strategy for the creation of experiences

*It is no longer believed in the existence of a creation that originates from nothing, maintained by the talent from which it comes in an artistic way, without taking into account in the aesthetic elaboration the performance of the personal background of each person, their experience and the environment in which they develop* (Morales, 2001, p. 80).

Among the research practices that arise from qualitative interpretation are the Arts-based Methodologies (Roldán & Marín-Viadel, 2012). As a consequence of different methods related to this line of research, other methods related to teaching have appeared, such as the Artistic Teaching Methodologies, which emphasize the appreciative dimension.

The Artistic Teaching Methodologies were created as a strategy that allows the establishment of horizontal models to approach the works of art that are considered a novelty (Mena, 2020), being located in a place close to artistic activity. Based on this premise, these methodologies are based on the creative experience and creation strategies of artists, putting into action different teaching and learning methods (Caeiro et al., 2021). Thus, we can understand them as those methods based on the ways in which art uses ideas, processes and matter, grounded in the aesthetic as a producer of knowledge and thought.

The Artistic Teaching Methodologies do not refer only to teaching art, but to teaching art through art itself, joining language, art media and cognition processes. Teaching under this methodology should provoke situations in which aesthetics is the structural basis of the experience. For that, it is necessary to consider art education from a contemporary approach aspiring to teach art to learn art and adjusting pedagogical processes to artistic processes to open that medium to the educational experience (Rubio Fernández, 2018).

Our project enters into the spirit of the M.A.E. by using the work of 6 artists as the main activators of the experience. Each work (its composition, formal and semantic elements, materialities and techniques) is transformed into a teaching proposal that becomes, at the same time, individual and collective work.

## 5. Mediation days: Proposal and unfolding

*To perceive, a contemplator must create his or her own experience. And this creation must involve relationships comparable to those experienced by the creator* (Dewey, 2008, p. 62).

The workshops involved activities aimed at generating dialogues around our local images, knowledge, places, customs, histories, belief systems and other elements. These emerge from the analysis of works that lead to questions about those areas. Thus, the deployment of the conference included an exhibition organized in 6 modules in charge of mediators. Each mediator receives a small group of no more than 5 students -from kindergarten to high school including older public- inviting them to visit the exhibition.

Each module presents a graphic work that invites visitors to observe it, understand its meaning and create from it in an exercise linked to printing, which overthrows the position of inactive spectator in front of an artistic piece. The learning (contained in the visual result of the students), is arranged indistinctly around each work to generate an installation space in which each image is added to the other to develop a collective and gradual work during the period of the exhibition.

The following table shows the exercises developed by the students:

*Table 1. Summary of proposed actions for each module.*

| Artist | Action |
|---|---|
| Freddy Agurto. | Creation of a print that collects characters or places of personal importance. |
| María Pavés. | Creation of an urban landscape divided into planes through the stamping of light poles as a central figure. |
| Américo Caamaño. | From the analysis of the drying process of fish, a textured fish is created from the stamping of waste materials |
| José Pedreros. | Creation of a self-portrait using the stamping of the main form present in the work. |
| Lucía Hernández. | Creation of a print from the scientific observation of a natural form. |
| Tatiana Binimelis. | Expansion of the artist's landscape through the stamping of waste textures |

## 6. Interpretation of the data

This experience uses Arts-Based Methodologies as the main method to interpret the learning dynamics occurred and the visual results. "Arts-Based Research proposes an approach and openness from scientific research to artistic creation to use its forms, knowledge and wisdom" (Marín-Viadel and Roldán, 2019, p. 885), consequently, its deployment implies the systematic use of artistic processes of creation in current artistic expressions (and in all the different forms of the arts) as the first way of understanding and analyzing the experience, both by the researcher and by the people involved in the studies.

In this way, the production of images parallels theoretical development and shapes the visual data. This provides a perspective of interpretation of the self, shaping an investigation that gives more than just meaning to our experience.

What kind of images emerge when creation is elicited from an artistic work that invites us to reflect on different aspects of identity?

Each module involves the production of a set of images that act as data. The analysis of the iconographies contained in those images, as well as the students' creative dynamics, are summarized in the following table:

*Table 2. Summary of main findings for each module.*

| Artist/Identifying Feature | Findings |
|---|---|
| Freddy Agurto Local identity | In greater number, the images express elements related to the marine landscape of the commune and its related activities: fishing, beach, sun, sea, marine products and animals. Lesser numbers of important local urban elements appear, such as the textile factory, houses, roads or objects of family property. The natural landscape is represented in third place. |
| María Pavés Urban identity | The possibility of play offered by this module for the understanding of the composition in planes of a landscape gave rise to a dynamic result. In this way, to the poles of different sizes offered as the only element of composition, other patterns made by the students were spontaneously added: people, cars, lighting, roads and vegetation, elements that were added, enriched and changed the initially proposed landscape. |
| Américo Caamaño Local traditions | The experience was based on textural research for the creation of a fish. As a result, the variety of textures found by the visitors stands out, which implied the use of resources such as the overprinting of one or several textures to achieve a unique result. The use of waste material is positively valued for the different wefts it offers. |
| Jorge Pedreros Personal identity | The result is made up of different self-portraits of each visitor. Although the transversal resource for the creation is the figure present in the work of reference, the paper support that receives the print gives singularity to each image. Collage stands out as the most used strategy for the intervention of the paper support. |
| Lucía Hernández Daily flora | The experience manages to captivate visitors' observation. Lines and dots stand out as the most used strategies to interpret the observed shapes and their details. |
| Tatiana Binimelis Local landscapes | Although a limited spectrum of textures was proposed to be explored in the printing, a variety of tonal values emerged. The use of overprinting for the creation of new visual textures stands out. In this module, the students also proposed some figurative elements, beyond textures, to complement and continue the landscape, such as mountains, trees and rivers, present in the locality. |

In order to treat the visual data of the experience, instruments derived from the Arts Based Methodologies are used, such as the photo-essay and the sample series. These instruments show and interpret the dynamics of creation and aesthetic production of the students. Figure 1 shows the development of the local identity module and its main visual results through photographs and a visual table that organizes the main findings.

*Figure 1. Dynamics and textures obtained in the module at Tatiana Binimelis. Photo-Essay.*
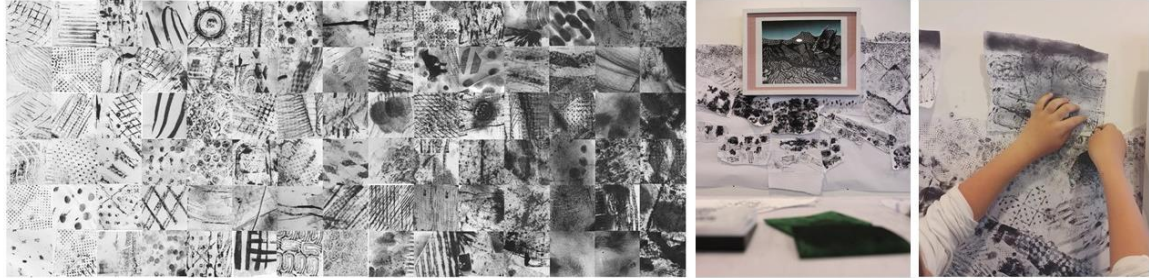


Figure 2 gathers in a word cloud the impressions of 100 students after visiting the exhibition. These were collected from a guestbook offered to anyone who wished to leave their impressions.

*Figure 2. Word cloud with the most important opinions of the students.*



## 7. Conclusions

This proposal, being an unprecedented experience of artistic mediation in our territory, constituted an instance of methodological updating and of the discipline of engraving within art education. As main points of reflection, we mention the following:

Instances of this type should be conceived with aesthetic museum criteria and clear objectives. However, the fluidity, openness and divergence in decision making should not be forgotten, since these are dynamic actions that receive heterogeneous audiences. In this aspect, it is pertinent to adapt each experience according to the group, avoiding standardizing the action and respecting the initial criteria.

On the other hand, the use of engraving was a highly motivating strategy, provoking great surprise in the visitors, who understood the basic processes involved in the creation of a print. In this aspect, it became clear that there is no need to resort to traditional and complex techniques to teach engraving.

As for the images obtained, these are derived from a clear knowledge of the local environment, which is identified and then transformed into iconography. In this aspect, we believe we have rescued aspects that run through the whole story, such as the marine imprint, its trades, products, places, family narratives and other properties. In this way, the exhibition does not present in its final composition a compendium of unconnected images, but a panorama of the individual and collective territory.

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# DEMOCRATIZING EDUCATION:
# PEDAGOGICAL ACTIVISM AND TECHNOLOGICAL FUTURES

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## Abstract

The current and ongoing urgencies for pedagogical invention in both philosophy and practice demand teaching and learning designs and applications that have consequence in terms of civic engagement. The achievement of democratic civic understandings, values, and practices depends on the recognition by educators that they are in fact, charged with the critical and ennobling task of developing through content and action the present and future civic capacities of their students; and such capacities are antidotal to the troubling ascendency of populism, political autocracies and thuggeries around the globe. In an era irrefutably afflicted with the profusion of disinformation, the erosion of public trust, and the destabilization of truth, education for democratic participation is both intervenor and instigator for the broad project of citizenship and social change. In this sense, pedagogies are necessarily activist in their commitment to social engagement and change. The recognition of the exigencies of democratic education is more than a matter of curricula content that engages critically with the definitions and principles of deliberative democracy; rather, such recognition should result in pedagogical approaches and practices that model democratic participation especially in terms of learning environments and an infinitely more expansive view of the classroom. Key and orienting in the project of democratizing education are the determinants and elaborations of technology, and in particular AI in the educational context. While there is considerable handwringing around potential compromises to academic integrity and a rapid and unrestrained increase in academic dishonesty without efforts to neutralize the foundations and capacities of AI-generated papers, this paper explores affordances of current and emerging technologies in terms of precise practices toward democratic education, from pedagogical innovation, creative approaches to course design, new evaluation methods and criteria, expansive and experiential learning spaces, and more.

*Keywords: Democratic education, AI, technological advance.*

## 1. Introduction

The arguments presented here are motivated by two urgent and interconnected issues. First, as education is the oxygen of democracy and ultimately the means toward a vigorous and just civic culture and society, its cultivation and progress are no less than an antidote to authoritarianism; that is, democratic pedagogies are a counter to the rise of authoritarian regimes, and the ongoing and deleterious spread of disinformation, the erosion of public trust, and the destabilization of truth. Second, the values and classroom practices of democratic education are in fact, critical in the decisive advance of educational technology. With compelling concerns over the automation of education (and comprehensive societal automation in broader terms), and with technologies such as OpenAI's ChatGPT contesting and disrupting educational norms and practices, how do educators respond to reimagine, adapt, and reinvent teaching and learning practices? Do educators focus on the neutralization of the technology to mitigate the fears over AI-enabled academic dishonesty (to date, a fixation of academic responses), or do they begin to rethink pedagogical practice to reconceptualize course design, assessment measures and methods, reinvigorate and expand experiential and community-based learning, understand learning spaces as well beyond the confines of the classroom? Educators might invoke the practices of democratic education as key and consequential response to and anticipation of ongoing technological provocations of AI in education, and throughout society.

The university is above all, a site of citizenship, and democratic education is the means by which this purpose of citizenship is articulated and asserted. In perilous times when the foundations of democracy are eroded or under siege, when political discourse is debased, when ideologically driven denials of science challenge reason, the role of education as the custodian of democratic values is written in high relief. Indeed,

the education project is to cultivate student citizens who are independent and critical thinkers and eminently capable to grasping, questioning challenging and acting upon the sociocultural, political, and economic conditions and issues of their time; that is, students who understand and realize their agency, and who see themselves as protagonists in their own lives. In this way, the educational institution is necessarily charged with the custodianship and advance of civic literacy and serves as an exemplar of democratic education. This foundational purpose of the contemporary university figures decisively in the surge of technological change and the current accelerated expansion of AI in the educational context. As will be discussed, the very principles and practices of democratic education are a means by which open access AI can be productively harnessed and applied in education and pedagogical strategies.

## 2. A note on the philosophy of education

Discrete, experimental empirical method and data is certainly prominent in studies in education, but of course, there are numerous other approaches in the discipline that have yielded significant insights and understandings of education, and that have been enormously consequential and in fact, discipline-transforming. Educational philosophy and the politics of education are expansive critical inquiries that have had profound impacts on educational fields, and particularly so in critical analyses of education and technology. It is never enough to simply investigate how technology works because how technology works is deeply embedded in broader political dimensions of education in society; and the philosophy of education offers precisely a critique of the role and politics of education in society. There is no single methodological authority in academic inquiry in education, no single method that has an exclusive franchise on education scholarship, no immutable standard to which all studies in education must comply. We require a wide-ranging and multidisciplinary discourse to grasp and forge educational futures, and particularly in terms of the magnitude and the velocity of technological change. Studies in education overall, should be expansive and unbiased, and as much about ideas and philosophy as about empirical data method and analysis. Clearly some of the most prescient and influential work in the innovation and advancement of education have been in the areas of philosophy, applied philosophy and politics of education, and such works have been provocative, epochal, and discipline-transforming. This is not a critique of empiricism but rather is meant as an inoculation against constrained views of education inquiry that privilege only empirical method and foreclose on some of the most substantive and consequential thought on education and pedagogy across centuries.

## 3. Democratic education and experiential learning

Educational philosopher and reformer John Dewey understood that education and democracy were co-determinate. As he noted, "Democracy has to be born anew every generation, and education is its midwife." (Boydston, 1980)

Democratic education at its core, is a project of education that strives toward a robust account of citizenship as the foundational educational purpose and prepares students as citizens with tools for political and social engagement and participation. Simply stated, democratic education gives students the imagination and the agency to instigate and shape social change in positive and socially just ways. Henry Giroux's reflections on critical pedagogy and democratic education underscore this issue: "Education, in the final analysis, is really about the production of agency." (França, 2019). Giroux is emphatic that all education is an "introduction to the future"— an instruction for students to imagine and to struggle for the future they want—and that education is "at the centre of any discourse about democracy". Education then, is the site where students learn of their capacities to act upon, influence, and enhance public discourse, to see their learning as leading to meaningful and consequential civic engagement and social change. "Consequential" means that educational values, pedagogical design and practice, teaching and learning environments, and institutional policies and priorities need to be driven by the goals of democratic education and the achievement of citizenship.

The notion that education is a political process with real world impact and influence owes substantially to Paulo Freire's theories of critical pedagogy; in particular, Freire's expansive view of pedagogy that identified education as a civic and moral project driven by the urgencies of politics and citizenship (Freire, 1970). For Freire, there was no ambiguity in educational purpose, and no possible "neutrality" in the educational process. He argued that education functions either as an instrument of conformity or an instrument of freedom; and as an instrument of freedom, education reinforces the capacity of students as citizens to act with creative agency toward social change. An informed and active public is the direct and powerful progeny of education. The contention here writ large is that if the rise of authoritarianism is a failure of education, education also holds the ameliorative key — knowledge production must be concerned with and itself structured by democratic values and practices.

The notion of an unbounded classroom is a retheorization of pedagogy and how it must not only accommodate, but moreover facilitate and advance learning that is relevant, "real world" as students learn to act upon their world with resolve and imagination. Democratic education builds and sustains a sense of civic engagement, and the strongest inclination to civic action. Educators must forge classrooms that are never physical or intellectual enclosures, but rather spaces that engage and inspire while they also unsettle, provoke, and challenge complacency. An oft-cited dictum from John Dewey, is deceptively simply, but complex and provocative in its method. He urged an approach to pedagogy that is "as unscholastic as possible", that is activated and directed by "experience" or "empirical situations" from outside the school and that arise in everyday life. The methods of educators, argued Dewey, must "give pupils something to do, not something to learn; and the doing of such a nature as to demand thinking, or the intentional noting of connections; learning naturally results." (Dewey, 2008) Dewey advocated a philosophy of progressive education that privileges experience, that conceptualizes content as a process rather than as immutable and absolute, that evolves subject matter from experience, and that develops from the social embedment of that experience. With over a century of ongoing interpretation, application, development and revision, experiential learning remains a current and future-facing educational philosophy and practice that situates pedagogies and learning in a dialogue between formal and applied learning.

## 4. The future is upon us

Assessments of the future need to start with accounts of the past. Twenty-four hundred years ago, Plato (channelling Socrates) in *Phaedrus,* denounced technology in education. His concern was the erosion, if not the demise of the dialogic foundations of teaching and learning through the mechanization of education through the technology of writing. (Plato, 2005) Writing was critiqued precisely because it was static and immutable, and therefore carried an authority that silenced students—the weight and dominance of the written word forecloses on dialogue and the power of memory in this view. Indeed, this is an early theory of technological determinism in education in which technological development and design drive, and more so, fix or "determine" avenues of individual use, choice, and understanding.

Throughout the educational history of the digital age, technologies have been disruptive, and especially pedagogical norms and practices. Instructors in the university lecture hall and seminar classroom have often felt engaged in a losing competition for the attentions of students who were more inclined to attend to the distractions of their devices than the lesson content before them. These were students for whom the authoritarian model of unidirectional lecture delivery and the transactional relationship with assessment became less relevant and certainly less productive in terms of the quality of and knowledge gained in their educational experiences. Professors were often inclined to issue technology prohibitions in classrooms, a deeply out-of-touch response to the comprehensive social and cultural transformations instigated and sustained by technological advance. Beginning in the late 1990s to the present day, educational reform was seen as a matter of moving toward virtualized education in its various forms (a trend reinforced during the pandemic, of course), and many academics and institutions pursued an almost evangelical zeal for the affordances of educational technologies, a view that regarded online education as an ameliorative strategy to address receding budgets and oversubscribed courses as well as increasing managerial models and demands for accountability and cost-cutting.

Typically, technological advance outpaces pedagogical change, which brings us to open access AI in educational context. The accelerated progress of Open AI's ChatGPT has introduced much anxiety among educators, curriculum developers, academic administrators, and governments setting education policy around AI advances, applications, and both educational and societal implications. Such anxiety is not new, and indeed, the ascendancy and imagined supremacy of artificial intelligence has been resonant in the popular imagination. AI is met with both fear and excitement, panic and optimism, and new and emerging AI-powered chatbots in educational contexts demonstrate both responses. Stephen Marche for example, argues that the transformation of academia and its centuries-old conventions in the wake of AI is profound and irrefutable. He notes that the undergraduate essay, "the center of humanistic pedagogy for generations" is fundamentally disrupted with the introduction of ChatGPT, and "the college essay is dead". In another critical vein, Wong and Kindarji point to substantial concerns with large language models and other AI platforms having the capacity to produce, disseminate, and legitimate disinformation. (Wong and Kindarji, 2023) There are a profusion of adversarial strategies by educators to prohibit, block, neutralize AI technology and a substantial concern to manage the imagined negative impacts of AI—academic dishonesty and unrestrained automated cheating. At the same time, counterviewpoints call such adversarial strategies (which also urge the development of detection software and the use of watermarks for AI-generated essays) "an endless game of whack-a-mole". (Roose, 2023)

## 5. Conclusion

Values and practices that have long been foundational in critical pedagogy/democratic education offer creative and productive pedagogical strategies as AI continues to test and expand our learning environments and assumptions about teaching and learning. For both John Dewey (Dewey, 1916) and Paulo Freire (1970), and generations of subsequent progressive educators working toward the objectives of democratic education, experiential learning is foundational to the realization of students with agency. The core idea here is that educational philosophy and actual pedagogical practices (curriculum design, content co-creation, experiential-based assignments and assessments, and more) not only guide students in their relationship to knowledge and learning, but also equip students with capacities to address and challenge social and political power. As noted earlier, education's mission is democratic advance. Irrefutably, experiential and critical pedagogy are given renewed urgency in dynamic and expansive digital media and emergent AI environments; and our educational approaches must be continually invented and re-invented to account for the democratizing potentials of those media environments. Our pedagogical rigour, imagination, and practices depend in no small measure on our ability to read the shifts and acceleration in emerging media, technologies, and communication, in the volatilities of technological environments, and our readiness to devise pedagogies and spaces that ultimately promote the development of literacies in learning—media literacy, civic literacy, ethical literacy, digital literacy, and data/information literacy—and all in the interests of enabling student agency, autonomy and rigorous and creative critical thinking.

There are numerous concepts/measures to borrow from critical pedagogy to apply to current and emerging AI technologies, including:

1) The ongoing elaboration and expansion of experiential learning. The concept of the classroom as more than a physical space. Knowledge in the abstract becomes knowledge in action and practice.
2) Participatory teaching and learning models and strategies. Project and problem-solving-based approaches.
3) Critical engagement with and assessments of AI itself; that is, using Chat GPT as instruction and critique.
4) The unbounded classroom and the nurturing of informed citizenship. There is not more powerful educational promise and outcome than learning that speaks to real world public issues and that demonstrates to students that their studies have consequences in the public sphere.

As throughout the history of educational technology, and especially digital technology, the emergence of ChatGPT defines a critical moment in educational opportunities. In this moment, we would do well to eschew adversarial measures in relation to AI and channel the anxious urges to neutralize the technology and instead reinvigorate approaches in pedagogy that are activist, that reject authoritarian and transactional models of education, that enables students to see urgent and critical societal issues at stake in their education and are given a voice and an invitation to raise that voice.

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# AN EDUCATIONAL ESCAPE ROOM FOR COMPUTATIONAL THINKING - DEFINING THE REQUIREMENTS

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## Abstract

This paper presents an educational development project where game-based learning is used to facilitate introductory programming courses in higher education. The identified problem that is addressed in the project is the low pass rate and low student satisfaction in university courses on fundamental programming. A recommended pre-training for programming is computational thinking, and to learn about the fundamental concepts that are involved in programming, independent of specific programming languages. An initial literary review revealed that there exist several educational games on the combination of computational thinking and programming, However, these games are targeted towards a younger target group, or that they have a focus on specific programming. The aim of this study is to explicate the described problem, and to gather requirements for the design and development of an educational escape room. The research project follows the design science approach where the first two steps of 1) explicate the problem and 2) define the requirements were studied and described in this paper. The problem to address in the study was identified through literature searches and the authors' experiences as teachers in programming at higher education. To address the identified problem, requirements for a digital game were defined through e-mail interviews with teachers in higher education that teach fundamental programming courses. Answers were collected from teachers from three different universities in Sweden and analysed with open coding. Findings identified through the analysis will be used in future research studies to address the remaining steps of the design science methodology and further iterations of development. Findings show that some fundamental concepts seem to be relatively easy to introduce while others are harder to grasp for students taking their first programming course. Examples of concepts that could be learnt relatively easy are variables and non-nested selection. Some concepts that are seen as harder to introduce and explain are nested iteration and ternary operators. The conclusion is to build a game with different levels of thematic escape rooms, where the first levels have a focus on what teachers mentioned as easy concepts. The highest levels should introduce the more complex concepts, but that the concepts that are seen as most problematic could be omitted. This study was the first iteration in the definition of requirements, and more interviews will be conducted and analysed in the next phase of this two-year project.

*Keywords: Game based learning, educational escape room, computational thinking, fundamental programming, design science.*

## 1. Introduction

Programming education at university level is classified as problematic learning with low pass rates and high drop-out rates for introductory courses on the fundamentals of programming (Gomes & Mendes, 2007; Cheah, 2020). Many first-year students on undergraduate programmes in Computer Science and Informatics fear the introductory programming courses more than other courses (Gomes & Mendes, 2007; Watson & Li, 2014; Lukose, 2021). A frequently recommended pre-training for programming is computational thinking (CT), building on the idea learning about the fundamental concepts of programming before starting out with actual coding (Lyon & Magana, 2020)). CT should, by definition, be independent of specific programming languages, but involving concepts that are useful in concrete programming. Another popular way of motivating students is game-based learning, where games for learning computer science and programming could be implemented as educational escape rooms (Borrego et al., 2017; López-Pernas et al, 2019).

This study is a part of the SPEDAT project, where an earlier literary review revealed that there exist several educational games on computational thinking and programming, However, the conclusion was that these games are targeted towards a younger audience, or that the focus is on specific programming languages. The aim of this study is to explicate the described problem, and to gather requirements for the design and development of an educational escape room. These two research steps are part of a two-year project plan where the final delivery will be an educational escape room to learn CT. The research questions that guided this study were:

RQ1: Which CT or programming concepts do teachers find easy for students to learn, and which concepts are hard to learn?

RQ2: Which CT concepts or programming concepts do teachers find to be important pre-knowledge for programming courses, and how should they be implemented in an educational escape room?

## 2. Research context

This study is a part of the second phase of the SPEDAT project, a two-year educational development project carried out in a collaboration between the Mid Sweden University, and University of Gävle. SPEDAT is a Swedish acronym that could be translated to English as 'Games for computational thinking'. The aim of the SPEDAT project is too design and develop an educational escape room game where the players can learn about computational thinking and programming, without alignment to any specific programming language. In the second part of the project the main focus is on explicating the underlying problem and to gather requirements for the design and the development of the escape room game. The study has followed the Design science research approach that is described in the next section.

## 3. Method

This study was conducted with a Design Science approach involving the two first phases of the five-phase process that has been outlined by Johannesson and Perjons (2014). The first two phases that were studied and described in this paper were 1) To explicate the problem and 2) To define the requirements. All five phases in the Design Science process are depicted in Figure 1 here below.

*Figure 1. The five phases in the Design science framework (Johannesson & Perjons, 2014, p. 82).*
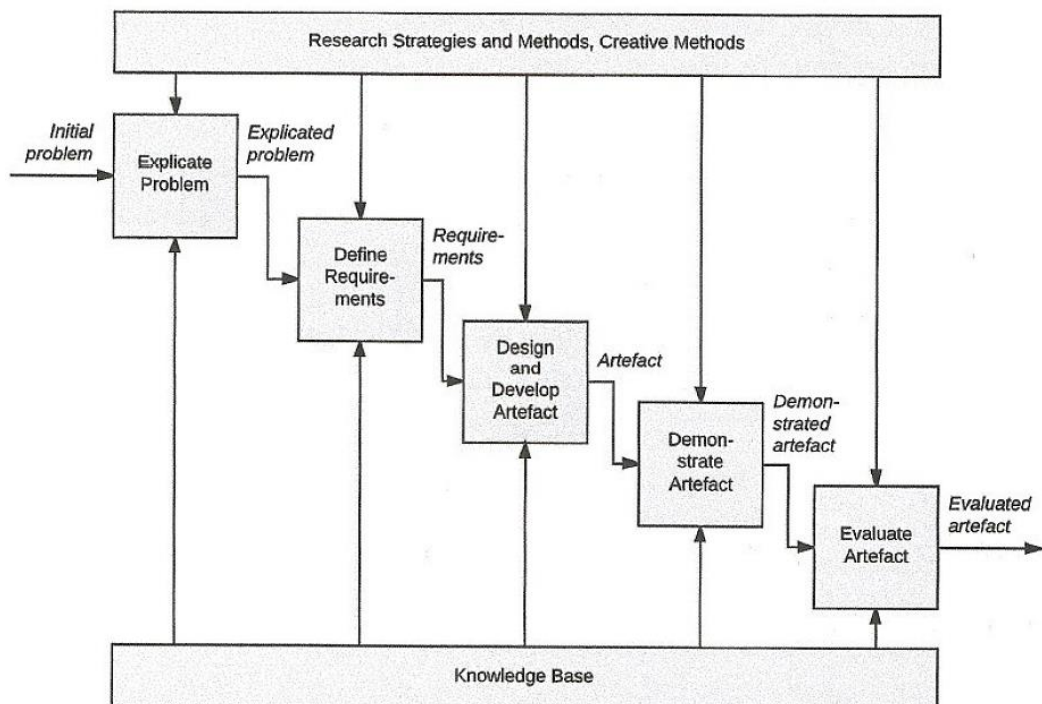
To strive for quality requirements, phase two should be carried out iteratively with the data collection and the analyses organised as described in the subsections below.

## 3.1. Data collection

The explication of the problem in phase 1 was based on the combination of results from literature searches, and from authors' earlier experiences as teachers in programming courses at university level. To address the identified problem, and to gather requirements for an educational game e-mail interviews were sent to teachers in higher education with experiences from programming courses. In this first iteration of the requirement definition answers were collected from six teachers from three different universities in Sweden. Informants were selected with the idea of a purposive expert sampling (Rai & Thapa, 2015), consisting of teachers that all have long and rich experience of teaching programming in higher education. All data were gathered during the end of 2022 and in the beginning of 2023. Later during 2023 more e-mail interviews will be conducted and analysed with the aim of data saturation. All informants have been kept as anonymous as possible during the process.

## 3.2. Data analysis

This first analysis phase was conducted by two of the authors following the Grounded theory concept of open coding as described by Khandkar (2009). In an inductive open coding process, researchers started by fracturing data into discrete parts, and thoroughly, by close reading, examine the parts to identify data extracts, codes and preliminary categories. In the next step that Khandkar (2009) refers to as 'Abstracting the concepts', data (the e-mail interviews) were divided into distinct and labelled ideas, events or objects. The name of these labels can be decided by the involved analysers, be derived from the content, so called 'in vivo codes'. During the analysis process, it can be difficult to describe all concepts in just a few words, which in open coding is complemented with explaining descriptions or 'memos' (Glaser & Strauss, 1967; Khandkar, 2009). Finally, the abstracted concepts are reanalysed and organised into categories, before writing up and presenting the findings. Open coding has also been called initial coding, and the first of three thematic analyses in a process that also should involve axial coding, and selective coding (Morris et al., 2016).

## 4. Findings and discussion

The six informants are all experienced programming teachers with between 7 to +25 years of teaching at university level. The most frequently used programming languages among these informants are Python, Java, C++ and JavaScript. Following the principle of answering the research questions, results from the analysis have been grouped into the four categories of 'Easy-to-Learn Concepts', 'Hard-to-Learn Concepts', 'Important prerequisites', and 'General game design'. These four categories are presented and discussed one by one here below. The findings in the first and the second category answers RQ1, while the findings in the third and the fourth category addresses RQ2.

## 4.1. Easy-to-learn concepts

One of the informants wrote that "variables, printing and isolated if-then-else statements seem to be easier to understand", and another answer mentions that "variables, constants, assignment ant print-outs" are what students understand easily. Several other interview answers also bring up variables, if-clauses, print-outs and simple mathematical expressions. In one interview the teacher finds it difficult to answer which concepts students in general learn easily since "There are students in our distance courses that completes the whole course without asking about anything, while others ask many questions about most parts of the course without learning how to program". The student groups in introductory programming course are often heterogeneous, and maybe with greater differences regarding pre-knowledge than in other subjects. Students that have earlier experiences of programming, which could be rather superficial would probably not find variables, constants and print-out statements hard to understand. This is also one of several reasons for developing educational games on computational thinking and fundamental programming. With just a bit of understanding of how the basic concepts work, the first programming courses at university level, would probably be a less painful experience. Finally, a quote from an informant with students that must have more than good pre-requisites: "To translate from programming language A to B do they find amusing, and that they also learn from it, despite that it is easy. It's like when your musical understanding develops when you transpose a song from one key to another".

### 4.2. Hard-to-learn concepts

One of the six informants contradicts the consensus on variables as an easy-to-learn concept. It was claimed in this answer that "The concept variable use to be a threshold. You have the habit of using variables in mathematics, but then as a numeric value that could be calculated in an equation. To instead interpret it as a place for storing values that can be changed, as in a programming language, goes against earlier experience". The other threshold that was pointed out in the same answer, the concept of functions, or methods, or procedures, or sub-routines, is also part of most of the other answers. Independent of earlier use of functions in mathematics, the way they are used in programming is puzzling with calls, recursive calls, parameters and return values. The Hard-to-Learn Concept that appears in most interview answers is object-orientation, and that the design of classes and creation of objects seem abstract to many students. A bit depending on the used programming language, object-orientation can be omitted in the introductory courses and the same must be the conclusion for our educational escape room. On the other hand, an idea to keep for the future might be the one about another specific game on object-oriented concepts only. Other brought up Hard-to-Learn Concepts were nested selection and nested iteration, about which a teacher wrote that: "Even the basics with while-loops gets them confused, nested loops or if statements, and ternary operator. Many students (specially the ones that already start the course knowing programming) use for-loops with break instead of while / do-while loops". Moreover, the informants mentioned that it is hard for novice programmers to follow the execution flow in programs, and to search for errors in code with complex flow control.

### 4.3. Important prerequisites

There are many concepts on the informants wishlists, some of them involves object-orientation, but most concepts refer to imperative or procedural programming. What appears to be interesting concepts to implement in our educational game are: algorithmic thinking, problem solving, basic computer knowledge such as file handling and naming conventions, and visualisation of algorithms and data structures. A suggestion for training of algorithmic thinking and visualisation of algorithms was "Which well-defined steps would it take to solve a problem, and in what order should they be executed? As an example, create an algorithm that moves the game protagonist further on, or kills an antagonist". The same informant suggested that this should be implemented as "black boxes that could be seen from both the inside and the outside". Several good suggestions, but we would rather like to call the transparent boxes 'glass boxes', and to keep the game free from violence. An important principle for the authors is to go for inclusive design, and not to scare off girls with unmotivated violence (Mozelius et al., 2022b). All suggestions are worth considering for the game even if some of them seems to advanced, for players without earlier programming experience, like the one on "to follow and implement a simple API". There are also suggestions that are to language specific such as the one on: " exploring more complex data types such as vector<int> in C++". Furthermore, the belief that we find highly relevant is "I believe that the improvement of computational thinking into designing algorithms (seeing logical sequences of steps). Also, they should learn the fundamentals of different statements to create algorithms (what, how and why we use: variables, input, printing, control flow, etc.)". Concepts that all would fit in well in the gameplay that we have sketched upon in the projects early brainstorming sessions.

### 4.4. General game design

Regarding the general game design, one informant's recommendations for pair programming are valid also for the single player game that we are planning for. In formal and informal learning, instructors could group the students, to play the game together while exchanging thoughts. The game could also be complemented with a 'play & study guide' with ideas for pre- and post-play activities. In non-formal learning this could be self-organised in the same way as many other single players games are played by more than one student. The recommendations implementing leader boards based on points should be considered, but the idea of giving points for "good-looking code" does not fit into the programming language independent design decision. One informant has the more general wish of "A learning game with programming - where programming is used for, yes, playing", and also with the recommendation of having a look at Sonic Pi (sonic-pi.net). Other informants recommend to get inspiration from other existing games such as the problem-solving game 'Opus Magnum', and the Zachtronic puzzle games that involves programming concepts. Several informants also highlight the idea of a number increasingly challenging levels in the game, and that also the protagonist should develop during the game play. Finally, a relevant idea from one of the interviewees is that each level, or escape room, should be linked to information that could help the players to escape from the actual room. This idea could be implanted as a variation of the game-based learning concept called 'Tangential learning' (Mozelius, Fagerström & Söderquist, 2017).

## 5. Conclusion

The conclusion is to design and develop an educational game with increasingly complex levels of thematic escape rooms. In the first levels the focus should be on what teachers mentioned as easy concepts. The highest levels should introduce the more advanced concepts, but that the concepts that the informants saw as most the most problematic could be omitted. This study should be seen as the first iteration in the definition of requirements, more interviews with programming teachers will be conducted and analysed in the next phase of the SPEDAT project. However, based on the findings in this study, the educational game should not involve any object-oriented concepts. This would make the desired playful encounter with computational thinking more complex and less joyful, and that the learning of 'Object-oriented thinking' better should be done in other specific educational games.

## 6. Future work

This initial open coding analysis should in the next iteration be followed up by an axial coding where data should be reanalysed to revise the categories presented in this paper. Moreover, axial coding is an analytic process that investigates interrelationships between the categories that earlier have been developed in the open coding process (Strauss & Corbin, 1990).

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# PAINTING AND MUSICAL COMPOSITION:
# STRUCTURAL CORRELATION OF TWO LANGUAGES

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## Abstract

This work observes and tries to explain numerous structural and affective levels of visual and musical language as similarities and possible mutual incentives for creation. Throughout history, there is a constant connection between those languages, those artistic expressions/forms, trying to explain and analyse them. The paper gives examples of musical works inspired by images, as well as images created based on the inspiration of musical content. The problem of unequal presentation of two languages to students: music and art, arises in the practice of Fine Arts classes. Since the work is performed in the field of visual arts, its structure and the technical possibilities of the art technique used to perform the work are explained, while the musical structure of the piece of music, which serves as a template, is reduced to listening to the impression and feeling that the student experiences, and in such a case, he would have his own an "ad hoc" reflex of the soul should be an incentive to perform work. In such a eurythmic reaction, the child does not listen to the music, but his own unprepared reaction, and such usually ends in a pattern or noncontrolled waving-patterning, since the performance of art work, which is a creative cognitive-emotional process, is reduced to a random reaction of hand movements as a eurythmically guided part of the body. The paper emphasizes the importance of explaining to students the structure of musical language when listening to a musical template, thereby approaching the place of the composer, his way of thinking. Visual language has a number of similar expressions as musical language, which can be the basis for connecting the two structures. Music is a temporal art in the way it is performed, and for it we need to have a time section through which we perceive/listen. The visual staging of the listened musical template is subject to the rules of the visual work, which is perceived almost instantly even though it is created over a period of time. The paper talks about the benefits and at the same time the importance of performing a structural correlation between the musical and visual art fields in a way of understanding the structure of the musical text as an essential aspect of the value of the musical work, which prevents children from misunderstanding music - exclusively as entertainment, backdrops that stimulate the mood and nothing else.

*Keywords: Musical composition, painting, structural correlation, synaesthesia.*

## 1. Harmony as the world's determination

The Pythagoreans made a very significant claim, 'Eyes are made for astronomy, ears for harmony, and they are sister sciences.' Pythagoras saw the pitch of a music note as inversely proportional to the length of a string that creates the sound, and tonal intervals as presented in numerical ratios (Kulhava, 2016).

Emile Mâle described Gothic cathedrals/architecture of the 13th century as "frozen music" (Pastan, 2004).

Johannes Kepler devoted a great part of his time to the relationship between music and the true nature of the cosmos. In 1916, he published *Harmonices Mundi*, wherein he suggested that music intervals and harmonies describe the movement of the six planets known at the time. In the third book of the mentioned body of work, he defines consonants, dissonances, intervals (adjustments – "tuning"), their dependence on the length of a wire, and when we feel music is pleasing to hear (Plant, 1995).

In his last book, *Harmonices Mundi*, Kepler writes that the ratio of maximal and minimal angle speed of each planet, the speed on the perihelion and aphelion, is a close equivalent to the consonant interval.

Kandinsky's contemporary, mathematician and artist, Francis Warrain, and the renowned astronomer Fred Hoyle agreed that the concurrence between music ratios and planetary speed described by Kepler was "exceptionally good" (Kollerstrom, 1989, p. 167).

Warrain extended Kepler's research and found that angle speed of Uranus, Neptune and Pluto, otherwise unknown at Kepler's time, match harmonious ratios as well. Solar System's physical activity itself, which was discovered by Kepler, is directly analogue to laws of music harmony. The sphere of music is, therefore, more than an inspired poetic figure (Plant, 1995).

## 2. Artists between intuition and reality

Van Gogh felt that, in his painting, he inherited the role of Berlioz's and Wagner's music and that, in such a way, he creates "art for aching hearts!" Van Gogh tells us that if we want to experience the work of art in the most intense possible way, we should listen to music (Gayford, 2007, p. 190).

Anyway, whose mood has not been affected by music?!

Every day, Henri Matisse played the violin before he started to paint, considering it helped him achieve focus.

Piet Mondrian was taken by the seductive jazz, and boogie-woogie dance style in the USA… His paintings *Broadway Boogie Woogie* and *Victory Boogie Woogie* represent an homage to American music. Composer Jason Moran felt that Mondrian's *Broadway B-W* 1942-1943 was actually jazz music (Moran, 2019).

J. Whistler used the following names for his paintings: *Nocturne, Symphony, Variations, Harmony, Notes, Scherzo,* and *Caprice 31*, whereby showing the connection between visual arts and music attracted and determined him. He stated, 'As music is the poetry of sound, so is painting the poetry of sight and the subject-matter has nothing to do with harmony of sound or of color.' (Quotefancy, nd)

Paul Cezanne was of the opinion that colours, as in music, need to be modulated.

A series of painters who were also in some kind of engagement with music strived to react in their own way by intertwining the two areas. Mikalojus Konstantinas Čiurlionis, Lithuanian artist, was also a painter and composer, and by using one idea, he created both visual art works and music compositions (Grigas, 2001).

The extent to which music and visual arts are "secretly connected" is shown in examples of Claude Debussy's compositions within the Symbolism Movement. Paul Verlaine and Gustave Mallarme were a great support and inspiration for Debussy. The impressionistic style of painting light on the shape, and not the shape itself, that is, the sensations of impressionistic and postimpressionistic directions in painting were also noticeable in Debussy's work. They entail flickers of light in polytonal sound images that evade the pure unique tone, numerous dissonances, unannounced and unsolved/unprepared modulations, parallel chords (example), major seventh chords, chromatic inflexions, forerunners of atonal dissonances of Schoenberg, and jazzy models of harmony and textures (*Pour le piano*, 1901). Debussy diverged from the rules, introduced polychromatic principles – the same as impressionism did in painting (Shaw-Miller, 2007, p. 29).

In *Nocturnes,* players create sounds: *sur la touche* – composing pointy notes creates a divisionism painting effect, using a tongue technique on the flute, *col legno* hitting the wood on the violin, and the lowered sound of the trumpet (*mute*). He uses the pedals abundantly, introduces the third pedal, snuffing out the tone's duration before its foreseen end.

Claude Debussy is considered an impressionistic composer, although he found inspiration in his contemporaries, that is, Symbolist poets. Flickering of light, disintegration of shape's firmness in favour of the impression of light that constantly changes the sensation of objects and nature's surface – all this is "visible" in the sound of Debussy's music.

'Delaunay has tried to create a painting vibrating in harmony and tone, similar to music, which was a goal or Orphism, the name alluding to the Greek poet and musician Orpheus' (Gompertz, 2012, p. 153).

Reiner Maria Rilke wrote about Klee, 'Even if I had not known he played the violin, I would have assumed in many occasions that his drawings were almost music sheets' (Jardí, 1991, p. 8). Klee is unique and interesting due to the fact he was explicitly in favour of understanding music performance and visual art works as two separate dimensions. Klee was deeply initiated in his perception of music, and through his great devotion to music, he built a complex sensibility for musical structure, while he felt something different when constructing his skill and creativity in visual arts. The sensibility for interpretation was completely different from the creative process he developed in visual arts. It is an undisputable fact that Klee developed an exceptional refinement in playing the violin, which was impossible to supress in his visual arts creation (Kagan, 1983).

In Klee, "music" images rest upon the pattern of a cannon, harmony, counterpoint – laws of music suggest a more structured idea, rhythmically more organised, with graphic elements recognised as templates for the symbolic forms in painting. In Klee's work, music notes can be circles or rectangular surfaces of paint. In *The Fugue in Red* (1921), he suggested polyphony through multiple overlapping of sharp-edged surfaces.

## 3. Synaesthesia

Synaesthesia is a sensory ability, neurological phenomenon entailing the experience of a feeling based on another sense. The word originates in Greek *syn* (union) and *aesthesis* (sensation). It was used for the first time by the Pythagoreans, who perceived Nature (divine geometrical harmony) as mutual intertwining of all microcosmic and macrocosmic phenomena. With the way it is performed, mimetic painting can suggest the illusion of warmth, coldness, lightness, and weight, thus creating the effect of synaesthesia (Šuvaković, 2005). The idea of multisensory experience became actual at the end of the 19th century with Nietzche, Freud and Jung, and it had its efficient moment when, as T. Phillips said, Kandinsky started his efforts in how to paint a symphony (Phillips, 1997).

By considering feelings a reliable orientation in realising structure, he called his painting *The Composition*, considering it, as M. Dabrowski states in the exhibition's catalogue, the consequence of both sensations and inner necessity – artist's sensory reactions to the tectonic movements in his/her soul. (Dabrowski, 1995). One of the key moments in his initiation as a visual artist sensitive to synaesthesia was listening to R. Wagner's *Lohengrina*, which made him realise that music effects images, colours, impression, and motivates art composition. 'Just as sound and rhythm are combined in music, so the shapes and colours need to be united in painting by the play of their manifold relationships' (Kandinsky, 1977).

The syntax of emotional communication is the timbre that resonates both with structures of music and visual arts. As a neurological gift, synaesthesia can be more or less developed as a transcription tool, but at the same time, neither the musician could hear or perform the tone without "seeing" its colour, nor could a painter see the colour without "hearing" it.

Kandinsky wrote that synaesthesia as a phenomenon associatively connects incentives of various areas. Certain colour is ascribed to a certain sensation of taste or smell, a sound we hear can cause a hearing sensation in the spectrum of colours. Along the same lines, a colour, with regard to its purity, tone, surrounding – its imminent context, placement in the painting's composition itself, size, shape of the surface – can create the feeling of hearing its tone and the length of duration that has the nature of sound (Kandinsky, 1977, p. 25).

In his metaphoric confessions, *Concerning the Spiritual in Art* (1977), Kandinsky says, 'Colour is a means of direct influence on the soul. The keyboard is colour, eyes are harmonies, and piano, with numerous wires, is the soul. The artist is a hand that plays, touching one or other key, causing the soul to vibrate'.

In *Concerning the spiritual in art* (1977), Kandinsky presented the tables of colours with regard to their psychological effect and music-instrumental equivalent, the world of painter's colours followed by deep emotions that almost exchange their optical-material identity.

Schoenberg implemented some of Kandinsky's suggestions with regard to colour and certain instruments by orchestrating violet for oboes, clarinets, bass clarinets and fagots (Crawford, 2017).

Kandinsky painted *Impression III (Concert)* after listening to Schoenberg's concert in 1911 in Munich, precisely under the impression of dissonance (Hahl-Koch & Crawford, 1984, p. 21).

Synaesthesia was studied within the *Bauhaus* movement. Itten, connected with mysticism, regarded his 12-colour wheel as a "sound colour circle" (Colour Music, n.d.).

The nature of human perception is entailed by its attraction to similar concepts of likeness and recognition, and that is why a change in such paradigm is a great challenge in both principle and essence. In such effort, Kandinsky could not alter the paradigm by "himself", and the music, that is, his sensibility for the area provided him with the help he needed. As this is possible and innate in music, Kandinsky managed to empower the consumer with the ability to see and enjoy individual surface of colours, their tone, relief, stroke, etc., just as in music, the listener, despite hearing the complete harmonic image, devotes oneself to hearing the colour of certain instruments, voices, rhythmic structures integrated in the layers of harmony, etc.

Closeness between Kandinsky and Arnold Schoenberg was manifested as friendship and deep understanding. Schoenberg was a composer, theorist, writer, painter – hence, nearly a mirrored reflection of Kandinsky, who was famous for his use of atonality and the creation of a 12-tonal (dodecaphony) chromatic scale. The painting style of Schoenberg was considered worthy enough for inclusion in the joint exhibition of *Der Blaue Reiter* group (*The Blue Rider),* alongside Franz Marc and Wassily Kandinsky.

Both of them believed in the beauty of dissonance in art. Kandinsky understood Schoenberg's music through his perspective of one who had always aspired to investigate music art and the way it intertwines and complements with visual arts.

## 4. Elements of language and structural correlation

Kandinsky is a 20th century artist whose creation was influenced by music in greater measure than any other artist's, with regard to his understanding of "music as the ultimate teacher" (Trotter, n.d.). When transcribing musical sensations into visual art forms, short tones are recognised as dots; long/lasting tones as lines; high notes as light colours, deep ones as dark colours; pale-transparent colour hues present quiet music; repetition of music elements creates rhythm, presented in sequencing art elements, strokes and shapes.

It is necessary to note numerous manifestations of visual arts and music: music entails dynamics, form, melody, harmony, rhythm, texture, timber and tonality. Visual arts contain elements such as dots, line, colour, plane, surface, volume and space as the so-called visual arts foundation, whereas composition elements – contrast, harmony, rhythm, balance, symmetry, asymmetry, proportion, domination and union – present visual arts principles.

By mastering both languages, we can transfer language sensations from one area to another; transcription is possible because of the kinship of certain characteristics of both languages. Owing to such reciprocity, it is possible at time of inspiration to structurally correlate one area to the other and, in doing so, enrich and enlarge expressive possibilities of both areas.

Why are elements of music, visual arts and composition important? It is necessary to thoroughly understand the elements at the foundation of a language, mastered by musicians, composers or visual artists (and listeners and viewers), which are combined, to realise visual arts or music idea of a work, just as chefs, knowing the quality and origins of ingredients, blend them together for good taste. Young Ivan Pogorelić introduced in his interpretation the elements that Chopin as a composer had not written, for which he was excluded from the final round of the competition. The reaction of Martha Argerich, who withdrew herself from the judging panel, calling Pogorelić a genius, which was confirmed by his future career as a remarkable pianist (Predota, 2022).

No two artists would interpret a work of art in exactly the same way, regardless of how blindly they follow the author's instructions. A refined ear recognises the interpreter based on timbre, rhythm, technical details, expression, etc. Along the same lines, the sophisticated eye recognises a non-authentic copy. Precisely deep understanding and feeling for the area's language enables us as consumers to be in touch with the state the work was created in (visual arts or music), as the state it was interpreted in (music).

The following table presents the meaning of the same concept – element, wherefrom the extent of the kinship between visual arts and music language is visible:

*Table 1. Element of language and structural correlation.*

| ELEMENT | MUSIC | VISUAL ARTS |
|---|---|---|
| DYNAMICS | - type of loudness (dynamics), from very loud trumpeters in the Finale of *1812 Overture* by Pyotr Ilych Tchaikovsky to discreet pizzicato parts of string instruments in *Playful Pizzicato,* the 2nd movement of *Simple Symphony* by Benjamin Britten, when the orchestra is concerned, from *fortissimo* to *pianissimo*<br>-expressiveness of musical performance, emotional charge input | - "Colours were dynamite for us" (Quotefancy, 2023)<br>, gesture painting that entails the energy of "loudness" in its intensively dynamic expression, as opposed to refined layers of colour in Renaissance<br>- Expressionism as artistic movement wherein artists express their feelings by painting their experience of the world; expression as content of the always present artist's reaction |
| FORM | - composition's structure | - formal content of the work (motive, composition, dimension…) |
| HARMONY | - harmony of the used elements, instruments, chords harmony | - harmony of colours, complementarity, balance of style |
| MELODY/MOTIF | - sequence of tones, composition's recognisability | - distinctness of the composition's motifs, theme |
| RHYTHM | - tonal length and their repetition and frequency | - type of stroke, line, materials and their repetition, exchanging the art elements |
| TEXTURE | - numeracy of instruments/performers, richness and layers of sound | - processing the surface, layers of paint (colour, points, hues…) |
| TIMBRE/VALUE | - quality of tone's colour (instruments, orchestra, musical band) | - value, value of colours, purity of colour |
| TONALITY/ MODULATION | - major or minor scale, consonance/dissonance, dodecaphony scales, pentatonic modulation | - gradient/tone transitions, coloristic modulations |

## 5. Upcoming synthesis

It is indisputable that light and sound frequencies, i.e., colours and musical tones, can have a therapeutic effect. Throughout history, the benefit of the soul has been associated with the art of music and painting. The human soul, with its sensitivity and corresponding readiness for the frequencies of these two arts, shows that their (musical and artistic) mutual influence is logical and inevitable. Kandinsky's manifest *Concerning the Spiritual in Art* is one of the potentially important texts for getting out of the "rabbit hole" - the search for a further identity of fine art. 'Art will unite humanity. Art is one – inseparable. Art has many areas, but all are one. Art is a manifestation of the upcoming synthesis' (Roerich, 2019).

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# EDUCOAST – NATURE-BASED EDUCATION IN COASTAL GEOSCIENCES: A FIELD STATION IN SOUTHERN PORTUGAL

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## Abstract

Project EDUCOAST is funded by the EEA grants "Blue Growth Programme", and aims to promote nature-based education in the area of coastal and marine geosciences at the Portuguese Institute for Sea and Atmosphere (IPMA, I.P.) field Station in Tavira, in southern Portugal. This station is located in a unique coastal environment, which includes natural features such as saltmarshes, lagoons, barrier islands, dunes and beaches. Moreover, IPMA, I.P. station is equipped with a new research laboratory, "Centre Tavira EMSO-PT", dedicated to the study and characterization of marine and coastal sediments. Partnering with the University of Lisbon, the local *Tavira Ciência Viva* Science Centre and the Portuguese Environmental Agency, the project offers diversified training, including activities and short courses to various educational levels, local social associations, and maritime-tourism companies, lifelong learning for basic and secondary school teachers, summer schools for higher education students, academic field trips and internships, and communication and outreach for the public in general. The trainees have the opportunity to experience a hands-on approach to learning, by observing processes in the field, collecting data and analyzing it in the laboratory/office, and interpreting the results, all in one place. Besides providing a unique learning experience, the set of activities offered by EDUCOAST project falls within the priority theme of preserving and protecting the environment with special reference to the importance and sustainability of coastal systems using the Ria Formosa as a case study example.

*Keywords: "Hands-on", field station, geosciences, Ria Formosa.*

## 1. Introduction

Experimental learning and field trips provide a variety of experiences that cannot be acquired in the typical classroom setting, especially in the scope of natural sciences. Field-based nature education promotes critical thinking and problem solving, which aids in the understanding of new concepts. According to Kuo et al. (2019), several studies exist on this topic, suggesting that experiences of nature-based education improve academic learning, personal development, and environmental stewardship. For this reason, off-campus facilities have existed for a long time, preferably established in natural and pristine settings, and instructors often resort to field trips to provide authenticity to the experience of data collection and interpretation. However, despite the awareness of the importance of field-based education, there has been a general decline of field programmes in the schools' curriculum, from basic to higher education level.

The Portuguese Institute for Sea and Atmosphere, I.P. (IPMA, I.P.) has an experimental station in Tavira, southern Portugal, located in "Ria Formosa", a unique coastal environmental setting that includes sand barriers (beaches and dunes) saltmarsh and a lagoon, (Figure 1). The marine geology branch of the station is dedicated to coastal and ocean geological studies, including the analysis of present and recent past sedimentary environments, and morphodynamics of coastal, estuarine, and marine environments.

*Figure 1. Location of IPMA, I.P. field station adjacent to Ria Formosa.*



The geo labs were much improved in 2019-2020 through the acquisition of several state-of-the-art equipment in the scope of EMSO-PT project (FCT-Portuguese Roadmap of Research Infrastructures). The partnership with the Faculty of Sciences of University of Lisbon (FCUL), Tavira Ciência Viva Science Centre and the Portuguese Environment Agency provided the opportunity to extend this infrastructure to act as a field station to receive students and trainees in the scope of the EEA Grants funded project: "EDUCOAST - Nature-Based Education in Coastal GeoSciences: a field station in southern Portugal" (PT-INNOVATION-0067), providing "hands-on" field-based learning and using Ria Formosa as an "open sky lab".

## 2. Objectives

Under the blue growth strategy, the primary goal of the EDUCOAST project is to improve and foster hands-on teaching and learning in the marine and coastal geosciences education. Additionally, the project aims to stimulate natured-based education, to provide solid training in the field/lab of coastal and marine geosciences and to raise awareness on the importance of scientific knowledge.

The opportunities for carrying out nature-based programmes of formal, as well as informal, education are plentiful, including higher education and postgraduate levels studies, undergraduate or even professional lifelong training.

EDUCOAST innovates by promoting the first field station dedicated to marine and coastal geosciences in Portugal, focused on nature-based learning. Besides the outdoor learning experience and access to the specialised laboratories, it also provides trainees with the opportunity to learn from guest experts, an experience that is not commonly available to students nor to the general public. Students also acquire and develop generic competences such as teamwork, autonomous learning, critical thinking, and communication skills.

The team project is strongly committed to improve STEAM (science, technology, engineering, and math) literacy, hands-on pedagogical practices, diversity and collaboration, converging towards the objectives of the United Nations Sustainable Development Goal #4 that aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" as well as to prepare the next generations to meet the challenges that threatens the sustainability of coastal and marine systems.

## 3. The activities

All programme activities outlines are defined in close collaboration with the project partners in order to create fit-for-purpose contents depending on the target audience. The main activities include: 1) school visits on demand; 2) academic training for graduate and postgraduate students; 3) high school teachers life training course; 4) summer schools and 5) communication and outreach.

### 1)School visits on demand

School visits target primary and high schools, as well as local associations and usually correspond to half-day activities. The pedagogical offer typically includes a visit to the station surroundings, for observation and sample collection, followed by a lab analysis component. Thematic sessions include: "What are the differences between beaches and saltmarsh sediments?" (Figure 2);

"The importance of saltmarshes"; "Is the water in the Ria and sea the same?"; "The sand of the world in your phone", among others. Until present, in one year project, 438 students have participated in these activities that contribute to the ongoing *IPMA Escolas* programme (https://escolas.ipma.pt/).

*Figure 2. "What are the differences between beaches and saltmarsh sediments?" activity for basic school students.*



### 2)Academic training courses

This activity targets graduate and postgraduate students from marine-related courses of higher education institutions. It includes internships, related with final degree Dissertation/Project, master degree courses field work, and "field trips" for class groups. For example, two groups of students from the Faculty of Sciences of Lisbon University performed field and lab work between the 18th and 21st March, 2022 and collected sediment samples aiming to the characterization of sediment populations or performed intertidal cartography using video-monitoring, both in an area of the Ria Formosa adjacent to IPMA, I.P. field station (Figure 3). Also, two undergraduate students from the University of Algarve did their final degree work (April-July 2022) in the framework of EDUCOAST, on studying microplastics in the sediment record of the saltmarsh and by analysing the recent evolution of the coastline of the barrier island of Cabanas.

*Figure 3. Field work by FCUL students (18-21th March 2022).*



More recently, between the 22nd and 25th of February, 2023, a training activity entitled "Geodynamics and Ecology of the Coast - "Hands on" in Ria Formosa", was attended by 25 undergraduate and master/postgraduate students from the School of Technology of the Polytechnic Institute of Setúbal and the Faculty of Science of the University of Lisbon.

A half-day lecture at the *Tavira Ciência Viva Science Centre* was followed by three days of field and laboratory activities where students had the opportunity to get hands-on with the natural environment of the Ria Formosa. Field activities included observation, and sediment, benthic organisms and plants sampling in the salt marsh environment, and morphodynamic characterization of the beach and dune environment along the barrier island, resorting to topography and sediment transport measurements (Figure 4). This training course counted with the collaboration of professors from the Polytechnic Institute of Setúbal (IPS), Faculty of Sciences of the University of Lisbon (FCUL) and researchers and technicians of IPMA, I.P. In total, these academic training courses has already involved 38 students.

*Figure 4. Some aspects of the field and lab work of the training action "Geodynamics and Ecology of the Coast - "Hands on" in Ria Formosa", performed between 22-25 Feb 2023.*

**3) Teachers training courses**

High school teachers training must have, at least, 25 contact hours aiming to provide lifelong qualifications in coastal and marine related subjects, contributing to their curricular knowledge updating and providing them with field-based teaching skills that, overall will contribute to improve the quality of teaching. Besides the STEAM, multidisciplinary approach is highly promoted, namely in the production of their final report, submitted to final evaluation and grading.

The first edition of the training course entitled "Coastal zones: a changing world" took place from the 13th to 16th of July 2022 and had 17 participants. The main objective was to update and deepen the Biology, Geology and Geography teachers' knowledge, about i) the morphodynamic characteristics of the coastal zone since the Last Glacial Maximum and ii) its future evolution, estimated according to the scientifically established scenarios. The course was fundamentally based on the acquisition of technical skills of observation and characterisation of the coastal zone ecosystems. The theoretical sessions are enriched by several sessions of field and laboratory work, which include methods adequate to be applied and executed by primary and secondary school students, within a scope of know-how to do what they have learned (Figure 5).

Figure 5. Some aspects of the field and lab work of the first edition of "High school teachers training course".



**4) Summer school**

The first edition of the summer school was held from the 11th and the 17th of September of 2022, in collaboration with the Institute Dom Luiz, an associated laboratory of FCUL, in the scope of the doctoral programme "Earthsystems". The general theme was "Land-Atmosphere-Ocean interactions in a changing planet - A hands-on approach to Earth System observation and modelling". It had the participation of 25 students from 7 universities, both national and international. The training sessions were delivered by 26 researchers from 5 universities (ULisboa, UAveiro, UCoimbra, UÉvora and UCádiz), 1 State Laboratory (IPMA, I.P.) and 3 associated laboratories (IDL, CESAM, ARDITI) (Figure 6).

Figure 6. Field work, lab processing data and 2" pitch presentations during the first edition of the summer school.



The students were divided in 3 groups according to their different research areas, and all had hands on experience in Coastal Environment and Processes, Estuarine and Coastal Dynamics and Atmospheric Processes, including both field and lab components. Field activities included trips to the barrier islands, field measurements onboard a boat, and experiencing air-borne sensor deployment in balloon and drone. At the end of the course, the students presented a 2 minutes pitch with a theme of their choice followed by a 5 minutes discussion each (Figure 6).

**5) Communication and outreach**

Communication and outreach are important to divulge the objectives of the project and to reach a wider public that might take advantage of the current project's educational offer. Content was created for institutional websites and social networks, namely news, photos, and videos of the activities. Branding

products were created and shared with the participants (pads, pencils, pens, t-shirts, caps, bags and pen drives) and a website dedicated to the project was created with the main information.

Whenever the opportunity exists, project members take part in science related events, such as the Summer Live Science (August and September 2022) and the European Researchers' Night in September 2022, where at least 75 persons were involved.

## 4. Conclusions

After one year of activities, the expectations and goals of the EDUCOAST project have been widely met, by creating an educational offer that provides hands-on experience in coastal and marine geosciences, bridging the formal and in-class training. At the end of each activity, a questionary is provided to the participants and the feedback given by the school/university's population so far has been "good" to "very good".

The several activities' outcomes and final evaluations, such as the reports of the teachers training course, the 2-minute pitch that culminate the summer school of September 2022 and the internships of February of 2023 final work, have been evaluated with high marks, which allows us to foresee the continuation of this effort and the development of more initiatives among the school population, technically and scientifically consolidated by the training acquired in these activities.

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# ADVOCATING FOR PAEDIATRIC PALLIATIVE CARE NEEDS THROUGH THE DEVELOPMENT OF SOCIAL NETWORKING SKILLS IN SOUTH AFRICAN HIGHER EDUCATION

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## Abstract

The integration of Paediatric Palliative Care (PPC) within the social services qualifications is part of new development in education, but for the practice impact required, this space needs to benefit of a tried and tested framework on environmental networking, that may be at risk of only being seen as part of earlier innovation. Building from known insights on the integration of the sustainable development goal of building partnerships into the curriculum, focus will be provided on social networking skills from a person-environment perspective. Considering the risk to terminally ill children when sufficient partnerships are not in place, as required by the 17th sustainable development goal, a case is made for the use of a deeper understanding of the environment and the strengthening of support structures through social network analysis and environmental modification.

*Keywords:* Social network analysis, paediatric palliative care partnerships, environmental modification.

## 1. Introduction

UNICEF supports and encourages governments to focus on five specific asks for the implementation of global partnerships for sustainable development, with children needing to be at the centre (UNICEF, n.d). While South Africa (SA) is a signatory to the United Nations Charter on the Rights of the Child, underwriting the right for children to the highest possible standard of health and access to health and medical services through article 24 (UNICEF, 1990), a concerning lack of alignment between policy and funding for Paediatric Palliative Care (PPC) exists in SA. Of interest for this article is the 17th sustainable development goal (SDG17) that calls to strengthen the means of implementation and to build and enhance partnerships with diverse stakeholders (UNICEF, 2022). Results from a case study done with a child and youth care centre (CYCC), described in more detail and within another context in Swanzen (2022), also indicated a lack of sufficient partnerships to meet the needs of terminally ill children. This lack was evident in the poor access to quality and emergency health care, without significant expenditure, for which funding models across health and social service departments are not integrated and responsive. This raises the level of concern regarding children's rights, since an average of 75% of child-related SDG indicators in every country by 2019, either had insufficient data or showed insufficient progress to meet SDG targets by 2030 (UNICEF, n.d). Against the backdrop of grassroot challenges caused by CYCCs not receiving support for PPC, the need for social networking skills (in the context of the person-in-environment framework) to be developed as a community level solution, will be unpacked in this paper. The environmental modification enabled through these skills will address at least three of the key asks for with SDG17. Some studies like one at the Universitat Politècnica de València (Leiva-Brondo & Lajara-Camilleri, 2022) confirms that after activities related to sustainable development goals within subjects had been performed, students' awareness and literacy of sustainability improved. Similarly, an intentional focus on and organisational endorsement of the development of social networking skills, are believed to be part of the capacities to be leveraged to strengthen PPC service delivery.

From the author's own experience, a fitting part of foundational social work knowledge base exist around environmental intervention, but from a source that has not been updated through subsequent editions. A search for literature sources incorporating this framework for inclusion in the curriculum was found to be limited, motivating the attention drawn to this valuable tool through this paper. The few literature sources that touch on this framework, as references in this article will show, presents an absence of the previous American authors who published on this. The main source used in the next part have been

deemed too old to include in curriculum design and its full replacement has proofed to be difficult. Not only will searches on social networking cross-over to internet-based social media concepts that become relevant for marketing strategies and public trust (Sadiku, Omotoso & Musa, 2019; and Paskarina, 2023), it is also presented as social networks or maps (what) only and not the skill of social networking (how). There are some promising applications of social network analysis in health (McKinlay; McDonald; Darlow & Perry, 2017; Fortea-Cabo & González-Teruel, 2022; and Mukinda, Van Belle & Schneider, 2022) and social psychology (Butts, 2008). The usefulness of the social network analysis practice tool to comprehensively evaluate partnerships needed to support critical PPC services, will be explained, an intervention that will be more cost effective than just considering the high individual, medical care costs typically involved.

## 2. Proposed conceptual framework to address partnership goals

Because of the purpose of this paper, the interrelated concepts of sustainable development goals, PPC support and social networking will be highlighted, but most of the focus of the paper will be on the latter. This is to provide a more recent reference to a tool that has found relevance, but have not had sufficient backing through textbook publications, which risks its place in the social sciences curriculum.

### 2.1. Building partnerships for sustainable PPC

"Palliative care is a key facet of high-quality pediatric … care as it addresses physical symptom burden, goals of care, advance care planning, medical decision making, and end-of-life (EOL) care" (Massie, et. al., 2021: 452). An important link between SDG17 and PPC, therefore lies in the economics of PC and how this impacts on the quality of care required. The European Association for Palliative Care (EAPC) presses acknowledgement of the cost of EOL care, since out-of-pocket, higher medical expenditure increases the poverty trap, while sufficiently trained psychosocial professionals advocating for and identifying responsive networks are critical in the reduction of this cost (EAPC, 2022). On the economics of PC, the EAPC (2022) emphasised the return on investment to have already show promise and that PC enabled 85% of patients and families to spend less on medicine, which is significant if one considers that caregivers often lose their income while caring for terminally ill family members. The World Health Organisation and partner organisations published a number of documents on models of care to guide wider roll out of PC services, which discussion falls outside the scope of this paper. Specific advancement in the adoption of a rural model was presented by O'Brien et al (2019) who highlighted that in 2015 SA ranked 34th in the Economists 'Quality of Death Index', the highest-ranking African country, and that SA launched the National Policy Framework and Strategy for Palliative Care (NPFSPC) 2017-2022. The NPFSPC prioritises PC and training of health workers involved in PC, with emphasis on addressing issues of universal health coverage and the need to reduce suffering and promote development and dignity for all (O'Brien, et al). Considering that the training of social workers (SW) and child and youth care workers (CYCWs), the two recognised professions delivering social services to vulnerable populations in SA, hold the knowledge base and skill in working in resource constrained communities, which can reduce high medical EOL cost, it is critical to ensure their contribution to PPC is exemplified. Strong assessment information is required to facilitate improved partnerships and the next sections aim to demonstrate the detail required for understanding the environment context of potential partnerships.

### 2.2. Environmental assessment and the 'key asks'

Easing towards an understanding of social network analysis, the environment and the SDG17 asks will be touched on in this section. It is firstly worthwhile to note the allowance provided for alignment with the quintuple helix as a visualisation for the collective interaction and exchange of knowledge. According to Schocair, Dias, Galina and Amaral (2022) the *quintuple helix* includes the university as a leading sphere to generate knowledge and technology at the same industry and government level, including the influence from actors of the organised civil society, and consideration of the environment and sustainability. For the author this is further support for why higher education (HE) needs to ensure that community-level practice models remain relevant within especially the curriculums preparing social service professionals. This multi-level engagement is more likely to lead to advocacy for the meeting of PPC needs in resource-restrained settings such as CYCCs.

Key asks for SDG17 are to build, strengthen, and expand partnerships; broker meaningful multi-stakeholder coalitions and alliances; engage with the UN system as key partner; enhance North-South, South-South, horizontal and triangular cooperation; and leverage and pool resources, capacities, technology and data (UNICEF, n.d). It is evident why expertise in being able to analyse the environment towards networking is critical. Universally needed environmental resources include adequate social support systems, access to health and day care services and recreational facilities, mobility to

socialise, utilise resources and exercise rights as citizens, adequate housing, police and fire protection, sufficient nutritional intake, predictable living arrangements with caring others, opportunities for education,
self-fulfilment and employment, and access to legal resources and religious organisations (Kemp, et.al, 1997). Needs-driven assessment remains one of the key drivers for relevant service delivery in the social service sector and parallel to this should be an understanding of the context of the lived settings of clients.

The environment is defined as having physical, cultural and social spaces and are described as follows (Kemp et al, 1997): the *physical* environment comprises of the natural world and the built world; the *social* environment comprises the network of human relations at various levels of organisation; and the *cultural* space is influence by both the physical and social environments, and incorporates values, norms, knowledge, and beliefs. Adding the multidimensional entities of the perceived environment (individual and collective systems of meaning and belief); the institutional and organisation, and socio-political environments, a comprehensive foundation is set for environmental assessment. Environment assessment EA) is defined as "an ongoing process in which client and worker, in partnership, gather and critically analyze information on the client or client system, in transaction with multiple levels of the environment, including strengths, resources, potentialities and opportunities, as well as risks, challenges, and issues of concerns, and with the attention to the meaning of these environmental experiences for the client" (Kemp, et.al, 1997, p. 85). Table 1 provides a summary of various EA tools and methods. The horizontal headings indicate the types of environments and vertical are the client system types.

*Table 1. Environmental Assessment (EA) tools and methods.*

| Client system | Perceived | Physical | Social / Interactional | Institutional / Organisational | Social-political / Cultural |
|---|---|---|---|---|---|
| *Individual* | Perceived support network inventory Multi-dimensional scale of perceived social support Socio-political control scale | Assessment of universal resources EA Index PIE system | Social Network Map Ecomap Community Interaction Checklist PIE system | Ecomap Nurturing / Sustaining Environment PIE system | Culturalgram Power analysis |
| *Family* | Family support scale Narrative techniques | Family access to basic resources Family resource scale | Ecomap Inventory of social support | Ecomap Family Empowerment scale | Cultural Genogram Power analysis |
| *Group* | Ethnographic interviewing Participant observation | Participant observation | Sociogram Socio-environmental context of group | Context diagram of environmental transactions Force field analysis | Power analysis Nurturing / Sustaining Environment |
| *Neighbourhood* | Organisational history of neighborhood Participant observation | Physical description of neighborhood | Nomothetic ecomapping | Capacity inventory Inventory of local associations Community inventory | Framework for conceptualising community Power analysis |

*Kemp, et al, (1997, p. 122)*

## 2.3. Social network analysis skills

A social network is defined by a set of entities with a social relation in those entities, and the network is bounded by the set of entities on which it is defined (Butts, 2008). As a principle applying to any social grouping, network boundaries are of particular importance due to the intrinsically interactive nature of relational systems (Butts, 2008). The root of social networking being the start of environmental intervention, lies within person-environment practice purporting the following building blocks (Kemp, Whittaker & Tracy, 1997, p.4-6): partnership between clients and professionals, meeting on common ground as a unified team; mutuality where an open atmosphere is created for communication about sensitive concerns, built on mutual respect and trust; reciprocity in the helper-principle where giving and receiving help go both ways among all key players; social assets is where the assessment begins with looking at what is going wrong (deficits) and also what is going right (strengths); being alert to *resilience* as protective factors and mechanisms that blunt the effects of known risk factors and permit individuals and families to overcome extraordinary difficult life situations; *optimisation* as the goal to always create conditions within which each individual client, family or neighbourhood reaches the upper limit of its developmental potential; *natural helping* draws on the ability of clients and communities to aid themselves through ritual, spiritual practice, celebration and reflection; *social integration* involves working with 'private troubles' of clients in the context of raising public concern about the critical integrating function of individuals, families and neighbourhoods in maintaining social order and

promoting public safety, and thereby removing risk and change the environment; *coherence* describe processes through which the individuals, families and groups discern a sense of meaning beyond the struggles of day-to-day existence; and the fostering of *hope* that things can change for the better and that the power for change resides within.

From the building blocks of person-environment practice it is important to also have a deeper understanding of the environment, for which ecological systems theory has a lot of utility. Especially its building from Bronfenbrenner's basic concept that an individual's social field increases concomitantly with his or her overall development and the value of highlighting the transactional space of increasing personal competencies to deal with environmental blocks (Kemp, et al, 1997). Believing however that ecological system theory alone does not offer panacea, these authors expanded to social networks (the structure and number of a person's social relationships) and social support (exchanges within the network). Social support can occur through natural helping networks or can be professionally designed or mobilised, noting that more social network resources does not necessarily imply more social support (Kemp, et al, 1997). "Accurate, multidimensional, and textured information on neighborhood environments is an essential foundation for practice that incorporates a community perspective" (Kemp, et al, 1997, p. 76). When resilience, protective factors and environmental risks are added to the mix towards comprehensive social networking analysis, it will incorporate individual attributes, family or interpersonal factors, and community or neighbourhood factors (Kemp et al, 1997). The social network analysis starts with guiding questions to the clients to develop a social network map, after which the social network gird in Table 2 gets completed (Kemp et al, 1997). The top 15 people in a network is used, so the grid will normally have 15 lines.

*Table 2. Social network grid.*

| Respondent | Area of life Household Other family Work/school Organisations Other friends Neighbours Professionals Others | Concrete support 1. Hardly ever 2. Sometimes 3 Almost always | Emotional support 1. Hardly ever 2. Sometimes 3 Almost always | Information / advice 1. Hardly ever 2. Sometimes 3 Almost always | Critical 1. Hardly ever 2. Sometimes 3 Almost always | Directions of help 1. Goes both ways 2. You to them 3 Them to you | Close-ness 1. Not very close 2. Sort of close 3 Very close | How often seen 0. Not see 1. Few times p/y 2. Monthly 3 Weekly 4. Daily | How long known 1. Less than 1yr 2. 1-5 yrs 3 More than 5 yrs |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| To 15 | | | | | | | | | |

*Kemp et al (1997, p 111)*

In addition to the specific variables, assessment information from the other tools from Table 2, will assist the worker to understanding culturally specific patterns of help-giving, identify sources to aid in the maintenance of intervention gains, understand family system boundaries, pinpoint sources for conflict within the personal network, appreciate the client's perception, and encourage the client to actively restructure the immediate social environment (Kemp et al, 1997). Thorough assessment paves the way for effective intervention.

## 3. Environmental intervention

Environmental intervention is "both action in the environment and the process of transforming individual and collective perspectives through critical analysis of the impact of environmental conditions" (Kemp et al, 1997, p. 136). Core practice activities include gaining access to, developing and enhancing resources and services, including social networks that support, educate and empower clients and communities, and working to change toxic and oppressive environmental conditions (Kemp, et al, 1997). The eventual goal is twofold: to create an environment that nurtures and support growth and change, and to enhance individuals and groups' abilities to act in the environment on their own behalf (Kemp et al, 1997). Social network strategies towards environmental modification involve the four major approaches of natural-helper interventions, network facilitation, mutual aid or self-help, and social network skills training (Kemp, et al, 1997). One example of structural change under social network skills training, is to increase or decrease the size of the network, or to change its composition or frequency of contact, while an example under network facilitation, can involve the teaching of reciprocity skills, so individuals can act assertively when their rights aren't respected (Kemp et al, 1997).

## 4. Conclusion

Community work in SA is influenced by the sustainable livelihoods model. While its nature cannot be covered in this paper, this is another approach that requires the skills discussed in this paper, as is also the case for Community Profiling. While this article cannot cover more detail on the strategies discussed, a case was made for the importance of not losing the roots of analysing and intervening in complex environmental matters. Environment intervention is more than community work with impoverished communities. The individual's interaction with their environment is one of the strongest predictors of their quality of life. This link becomes even more critical when it comes terminally ill children and their families trying to navigate EOL needs.

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# GAMIFYING CYBERSECURITY: A STUDY OF THE EFFECTIVENESS OF A SPECIFIC GAMIFIED TOOL

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## Abstract

Secure software development refers to the practice of creating software applications and systems with a focus on security. Traditional approaches to teaching secure software development often involve classroom lectures and laboratory assignments that roughly simulate real-world scenarios. However, such approaches may not always be engaging or effective for students, who may struggle to connect the abstract concepts of secure software development to practical, real-world applications. Gamified learning refers to the integration of game elements and mechanics into the learning process to enhance engagement, motivation, and retention of knowledge or skill and can offer students a more interactive and immersive learning experience.

In this study, we explored the use of Hack The Box (HTB), a gamified platform for learning cybersecurity, as a tool for teaching secure software development to undergraduate students in a software engineering program. Students were given access to the platform and asked to complete a set of challenges designed to reinforce key concepts, such as secure coding practices, vulnerability assessment, and incident response. Students were also asked to complete a set of questionnaires to gather data on their attitudes towards the traditional laboratory approach versus the gamified approach using HTB.

The results of the study indicate that the use of gamified platforms such as HTB can be an effective tool for teaching secure software development. Students reported feeling more engaged and confident in their ability to apply secure software development practices after using the platform. They also found the platform to be more engaging and challenging than the traditional laboratory approach. Moreover, students who reported finding the traditional laboratory approach to be challenging or unengaging found HTB to be a valuable and effective alternative.

The use of gamified platforms also has several other potential benefits. For example, it can provide students with immediate feedback on their progress and performance, which can help to motivate them and encourage them to persist through challenging problems. Additionally, gamified platforms can provide a more accessible and inclusive learning experience by accommodating different learning styles and levels of expertise. For instance, students who may not have prior experience with secure software development can benefit from the more interactive and hands-on approach provided by the platform. However, challenges such as the difficulty level of some challenges and the need for additional support materials need to be addressed to maximize its effectiveness.

Overall, this study suggests that gamified platforms like Hack The Box can be a valuable tool for teaching secure software development to undergraduate students. Future research could explore the use of other gamified platforms and tools, and examine the potential benefits and challenges associated with their implementation.

*Keywords: Gamified platforms, cybersecurity education, student engagement.*

## 1. Introduction

In recent years, cybersecurity has become a critical issue in many areas of society. With the increasing reliance on technology and the rise of cyber threats, it is essential that developers are equipped with the necessary skills to create secure software systems. Traditional approaches to teaching secure software development often involve laboratory-based exercises that can be dry and unengaging for students (Smith et al., 2018), or that lack the realism that can be often found in the field. However, the emergence of gamified platforms has provided a new way to teach these important skills in a more engaging and interactive manner (Johnson & Brown, 2020; Thompson, 2019). In this paper, we explore the use of one

such platform, Hack The Box (HTB) as a teaching platform for secure software development and investigate its effectiveness compared to traditional laboratory exercises (Jones, 2021; Lee & Davis, 2019). We also examine the impact of student learning styles and gender on their perception of these approaches (Miller et al., 2022; Wilson, 2017). Our results suggest that HTB and similar platforms are highly effective and engaging tools for teaching secure software development principles and practices, particularly for students with a kinaesthetic learning style. We also found that the gender of the student did not have a significant impact on their perception of the approach (Garcia, 2018). Our study provides valuable insights for educators seeking to enhance their teaching of secure software development and highlights the potential of gamified platforms as a valuable tool in this field.

## 2. Literature review

Traditional laboratory approaches, including sample unsecure executables and source code for analysis, have been the mainstay of teaching secure software development for many years. However, recent advancements in technology have created new opportunities for teaching and learning in this field. Gamification is one such approach that has gained popularity in recent years.

Gamified platforms offer a new and innovative way of teaching and learning in different disciplines. They typically employ game-like elements such as points, badges, and leader boards to motivate learners and make learning more engaging and interactive. These platforms offer a more immersive, and dynamic learning experience, often in more realistic scenarios than traditional classroom-based instruction. Moreover, gamification can provide a safe and controlled environment for learners to practice their skills and knowledge, which is particularly important in the context of secure software development.

Research studies have shown that gamification can be effective in enhancing learners' engagement, motivation, and knowledge retention in the field of secure software development. For example, a study by Smith and Johnson (2016) found that gamification was effective in enhancing learners' engagement and motivation in a software security course. Another study by Jones and Lee (2018) found that gamification increased learners' knowledge retention in a cybersecurity training program. Other studies have reached similar conclusions, for example Alsaleh, Almulla, and Alarifi (2020) conducted a case study on using cybersecurity simulation games to teach cybersecurity. They found that the use of simulation games improved students' knowledge retention, engagement, and motivation. The authors suggested that game-based learning could be an effective complement to traditional teaching methods in cybersecurity education. An experimental study on the gamification of cybersecurity education conducted by Lu and Huang (2017) found that gamification improved students' knowledge acquisition and engagement. The authors suggested that gamification could be used to enhance students' motivation and interest in cybersecurity. Nickerson, Warren, and Yang (2019) explored the impact of a game-based learning approach on cybersecurity education. They found that the game-based learning approach improved students' knowledge acquisition and engagement. The authors suggested that game-based learning could be an effective approach to teaching cybersecurity, particularly for students who are visual learners or have limited prior knowledge of the subject.

However, gamification is not without its limitations. Some researchers, like Dicheva et al (2015) have raised concerns about the potential for gamification to distract learners from the actual learning objectives. Moreover, there is a lack of empirical evidence on the long-term effectiveness of gamification in the field of secure software development. There is also the challenge faced by educators in creating their own gamification vs using an off-the-shelf solution, including time, effort and support available to develop such solution and whether the areas covered by the off-the-shelf solution are always appropriate for the course.

Gamified platforms offer a promising approach to teaching and learning secure software development. While there is evidence to suggest that gamification can enhance engagement, motivation, and knowledge retention, more research is needed to better understand its long-term effectiveness and to address potential limitations.

Hack the Box (HTB) is one such gamified platform, offering many boxes hosting challenges. Boxes are instances of vulnerable virtual machines. These are virtualized services, virtualized operating systems, and virtualized hardware. Boxes can be Easy, Medium, Hard or Insane and can host different Operating Systems: Linux, Windows, FreeBSD, and more. Challenges are bite-sized applications for different pen testing techniques. These come in three main difficulties, specifically Easy, Medium, and Hard. Each of these has a certain set of vulnerabilities - most met in real life. The objective is to recon these Boxes, find out their vulnerabilities, and access two flags: one user flag (lower privilege account on the Box) and one root flag (highest privilege account on the Box). Each machine is built in a virtualised environment, isolated through a VPN and completely simulates a real-world security issue. ("Introduction to HTB", 2023)

## 3. Methodology

This study aimed to investigate the use of the HTB platform as a tool to teach Secure Software Development. Thirty students enrolled in a Secure Software Development module participated in the study. The participants were initially exposed to an example of the traditional laboratory approach and were assessed on this prior to being provided access to the HTB platform for several weeks, during which they completed a series of challenges specifically selected related to Secure Software Development.

To gather data on the effectiveness of the HTB platform, the study used a questionnaire consisting of both closed and open-ended questions. The closed-ended questions were designed to elicit responses on a five-point Likert scale, with choices ranging from "strongly agree" to "strongly disagree" or similarly contextualised choices. These questions focused on the participants' perceptions of the effectiveness of the HTB platform, their engagement with the material, and their motivation to learn. The open-ended questions were designed to elicit more detailed responses from the participants. These questions focused on the participants' experiences using both the traditional laboratory approach and the Hack The Box platform, their perceptions of the benefits and drawbacks of both approaches, and their suggestions for future improvements.

The data gathered from the questionnaire were analysed using descriptive statistics. The descriptive statistics were used to summarize the data and provide an overview of the participants' responses.

This study did not employ a pre- and post-test design. Therefore, the data analysis focused on the responses gathered from the questionnaire. The study aimed to identify the benefits and drawbacks of using the HTB platform as a tool to teach Secure Software Development, and to determine the participants' attitudes towards the platform.

## 4. Results

A total of 30 final year undergraduate students were surveyed regarding their attitudes towards traditional laboratory approaches versus the HTB platform in learning secure software development practices. The results of the survey showed that the most common learning style among the respondents was kinaesthetic, with 54% of students reporting this as their primary learning style. This was followed by visual and reading/writing styles, both at 18%, and auditory at 10%. Additionally, 77% of respondents were male.

When asked about the traditional laboratory approach to learning secure software development practices, 41% found it engaging to some extent, with only 14% finding it extremely engaging. On the other hand, 14% found it somewhat boring, and 32% of respondents were neutral. Regarding the effectiveness of the traditional laboratory approach, 50% were unsure on whether it provided adequate preparation for real-world scenarios, with only 18% saying yes, 32% saying no.

In contrast, when asked about the HTB platform, 90% found it extremely engaging, with 5% finding it somewhat engaging, and another 5% being neutral. Additionally, 86% found that HTB provided adequate preparation for real-world scenarios, with only 9% being unsure and 5% saying no.

Furthermore, when comparing the level of confidence in applying secure software development practices before and after using both approaches, 72% of respondents felt somewhat confident or above after completing the traditional laboratory approach, while 95% felt somewhat confident or above after using HTB.

## 5. Discussion

The results of the survey suggest that the traditional laboratory approach to learning secure software development practices may not be as engaging for students as the HTB platform. This is supported by the fact that only 14% of respondents found the traditional laboratory approach to be extremely engaging, while 91% found the HTB platform to be extremely engaging. This difference in engagement levels could potentially impact the effectiveness of the approach in adequately preparing students for real-world scenarios, as only 18% of respondents felt that the traditional laboratory approach provided adequate preparation, compared to 86% for the Hack The Box platform.

The survey also revealed that the most common learning style among the respondents was kinaesthetic, which involves physical activity and hands-on learning. This may explain why the HTB platform, which provides a more interactive and hands-on approach, was more engaging for the majority of students.

It is worth noting that the survey had a male-dominated sample, with 77% of respondents identifying as male. This may limit the generalizability of the results to a wider population.

Overall, the survey results suggest that the HTB platform may be a more effective and engaging approach for teaching secure software development practices compared to the traditional laboratory approach. However, further research is needed to confirm these findings and explore the potential impact of learning styles on the effectiveness of different teaching approaches.

## 6. Conclusion

Based on the results of this study, the use of gamified platforms, appears to be a promising approach to teaching secure software development practices. The vast majority (95%) of the respondents felt somewhat confident or above in their ability to apply secure software development practices after using HTB, compared to only 72% who felt somewhat confident or above after completing the traditional laboratory approach. Additionally, 100% of the respondents recommended the adoption of HTB as their preferred platform for the practical sessions for the module.

Furthermore, this study identified the most common learning style among the respondents as kinaesthetic (54%), followed by visual (18%) and reading/writing (18%), with auditory being the least common (10%).

The results also suggest that the traditional laboratory approach may not be as engaging or effective in preparing students for real-world secure software development scenarios compared to the gamified approach. Only 12% of the respondents found the traditional laboratory approach to be extremely or somewhat engaging, while 44% found it somewhat boring or extremely boring. Additionally, only 31% of the respondents felt that the traditional laboratory approach provided adequate preparation for real-world secure software development scenarios, while 69% were uncertain or disagreed with this statement.

On the other hand, the HTB labs were found to be highly engaging, with 95% of the respondents finding it to be extremely or somewhat engaging. Additionally, 95% of the respondents felt that HTB provided adequate preparation for real-world secure software development scenarios.

In conclusion, this study provides evidence for the potential effectiveness of using gamified platforms, such as Hack The Box, to teach secure software development practices. The findings suggest that this approach can be engaging and effective in preparing students for real-world scenarios. Instructors and educational institutions should consider incorporating such platforms into their curriculum. Future research could investigate the impact of different gamified platforms on different learning styles and explore the potential of incorporating other emerging technologies, such as virtual reality, in teaching elements related to secure software development practices.

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# RADIO NAVIGATION AIDS LEARNING, FROM VIRTUAL TO REAL WITH THE KOLB'S EXPERIENTIAL LEARNING CYCLE

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## Abstract

Using Kolb's learning cycle provides a structured approach to learning that emphasizes active engagement and application of knowledge. These characteristics make it especially suitable for practical engineering learning. In this study, we describe our enhanced laboratory design dedicated to radio navigation aids in the MSc Aeronautical Engineering program, apply the Kolb's experiential learning model, and evaluate its pedagogical effectiveness. As a conclusion, the learning process is highly reinforced when the laboratory practice includes one live session versus the all-online version, as it is shown in the competence tests where the mean of the qualifications is significantly higher.

*Keywords: Experiential learning, Kolb's learning cycle, navigation aids, laboratory.*

## 1. Introduction

This study is the continuation of a previous work, presented at the EDULEARN 2021 conference (Rubio et al., 2021), where we tried to improve the learning of Radio Navigation Aids in the MSc Aeronautical Engineering program. Radio signals and spatial modulation are difficult concepts for aeronautical students, as they fall apart from their background usually focused on mechanics and thermo-fluid dynamics. Therefore, we proposed to drive the students to a simulated scenario where they synthesize and analyze the involved radio signals. The effectiveness of this virtual laboratory experience was evaluated by several segmentation, competence, and feedback tests. Despite the fact that the overall performance was satisfactory in terms of technical learning and satisfaction grade, we detected room for improvement in two aspects. First, around half of the students found it difficult to use the programming language needed to create the digital signals. The second problem, which is not specific to this subject but to the whole Master, is that when using virtual laboratories, the students do not have the perception of doing real practices. Moreover, the COVID-related restrictions are now lifted off. Considering the aforementioned aspects, we propose to enhance the practice by adding a final stage with real navigation equipment, eliminating the need to use a programming language, and most important, rethinking the whole process according to the Kolb's experiential learning theory (Kolb, 1984).

## 2. Learning methodology

The Kolb's experiential learning theory is one of the most widely used educational theories, although, as any other theory in the field, it has its own detractors and critics (Kayes, 2002). The Kolb's theory uses a constructivist approach where, in Kolb's words: "*Learning is a process, in which knowledge is created through transformation of experience*". This knowledge construction is better performed when the student passes through a four-stage cycle. First, the Concrete Experience (CE) stage, where the student observes and therefore catches information from immediate and concrete experiences. Second, the Reflection Observation (RO) stage, where the student decodes that information and starts to construct a mental map of the subject. Third, the Abstract Conceptualization (AC) stage, where the student, by means of inductive reasoning, is able to develop new abstract concepts and generalizations. And finally, the Active Experimentation (AE) stage where the student applies the learned concepts in new situations to contrast and expand his knowledge. Stages one and three correspond to the prehension axis, where new information is grasped. On the other hand, stages two and four conform the transformation axis, where the acquired information is consolidated, rejected, or transformed. Previous models, like Piaget's model (Piaget, 1978), give more importance to certain stages of the process, but Kolb and later authors like

David, Wyrick, and Hilsen (2002) state the importance of providing balanced learning using the four stages of the cycle.

In our proposal, the students perform a practice that comprises two parts. The first is a virtual laboratory phase where the students generate and test the signals corresponding to a Very High Frequency Omnidirectional Range (VOR) and an Instrument Landing System (ILS). VOR is a radio navigation system that provides directional information to pilots, while ILS is a precision approach system that guides aircraft to the runway centerline and correct vertical height during landing. In the previous version, the students recreated the signal using the SciPy library ("SciPy", 2023) and the Python programming language ("Python Software Foundation", 2023). To avoid the difficulties around using the programming language, in this new version we changed to the GNU-Radio ("GNU Radio project", 2023) software that allows creating the signals using only block diagrams. In order to increase the feeling of doing real practices and to intensify the knowledge-construction process according to the Kolb's theory, we added a second part where the students check its designs with real navigation equipment. The fit of the overall process in the Kolb's theory can be viewed at two levels in a fractal way. One inner level where the first part of the practice goes through all the Kolb's stages, and another outer level where the first part act as the first three stages of the cycle and the real laboratory part corresponds to the fourth stage.

*Figure 1. Kolb's Experiential Learning Cycle.*
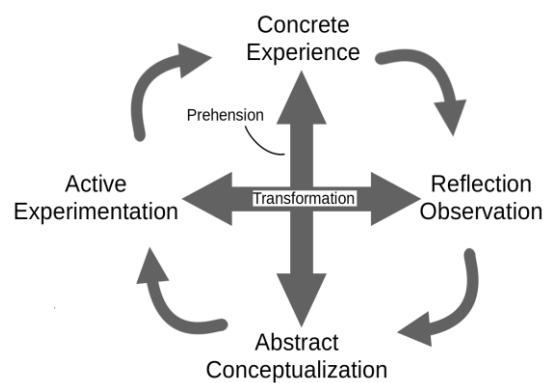


The first implemented Kolb's cycle, the inner cycle, corresponds to the virtual laboratory. It starts in the Concrete Experience phase, but some prior knowledge is assumed as the students must previously have studied the subject Radiometry of Navigation Systems. In this Concrete Experience phase, the professor demonstrates step by step how to create the GNU-Radio diagrams for the basic radio modules (AM modulator, FM modulator, up-converter, filters, etc.) and requests the students to do it by themselves. For the second stage, Reflective Observation, we perform a questionary with the twofold intention of verifying assumed previous knowledge and stimulating the reflective reasoning in the construction of the radio diagrams. The third stage, Abstract Conceptualization, corresponds to the principal task that consists of designing the complete diagrams for the VOR and the ILS. The students should be able to generalize and connect the individual concepts with minimum guidance from the professor. The outcome of this phase is the input for the subsequent, Active Experimentation, where the students verify its implementation using virtual instrumentation.

The second Kolb's cycle, the outer cycle, assumes that the previous part of the practice covers the CE, RO, and AC phases. Once finalized the first part, the students had constructed the knowledge that conforms the prehension axis of the outer cycle. This strategy of using a virtual laboratory to develop the prehension axis and leaving for the real laboratory only the Active Experimentation phase is also found in other similar works like (Abdulwahed & Nagy, 2009). By maximizing the use of virtual laboratories, this scheme optimizes the utilization of the physical laboratory, which typically has limited availability due to tight time constraints. The first part, without time restrictions, allows enough variation and repetition to consolidate the knowledge (Kirschner, 1988) in contrast to the single demonstration scheme used typically in real laboratories.

## 3. Laboratory description

The laboratory can be divided into the virtual laboratory part, used for the first Kolb's cycle and the physical laboratory, used in the final phase of the second cycle.

### 3.1. Virtual laboratory

The virtual laboratory is based on the GNU-Radio software. GNU-Radio is an open-source package for signal processing and Software Defined Radio (SDR) management. It provides implementations of many signal-processing algorithms as reusable blocks. These blocks are configured and connected in diagrams, as shown in Figure 2.

*Figure 2. GNU-Radio intermodulation example.*
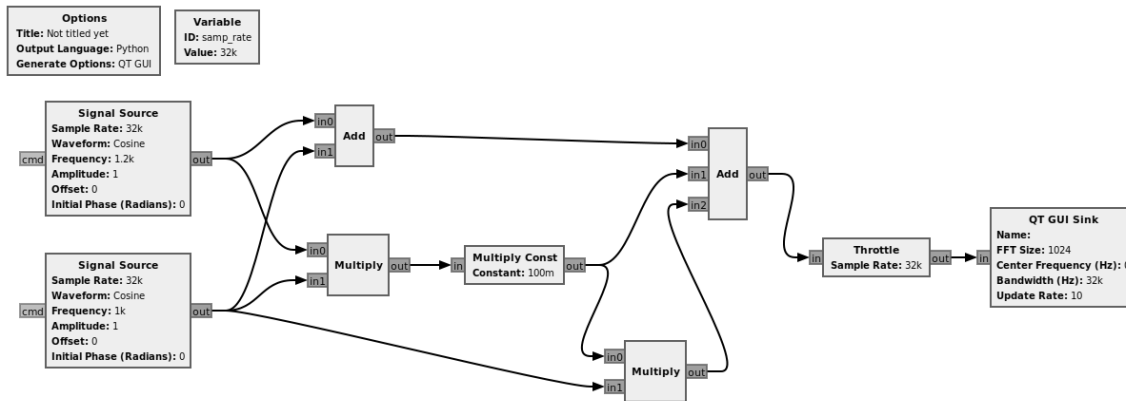


Along with the signal generation and processing blocks, GNU-Radio also includes instrumentation blocks that can be used to check, measure, and represent the signal characteristics in the time or in the frequency domain. The students use those instrumentation blocks to check their designs and analyze the effects of variations in the block diagrams. Hence, these tools are particularly useful in developing the transformation axis of the Kolb's cycle, especially in the extension extreme. The software is easy to install on any personal computer (PC), allowing the students to perform this part of the practice on their own PCs without time constraints.

### 3.2. Physical laboratory

The laboratory equipment allows to synthesize the radio signal from the student's GNU-Radio diagrams. It comprises a Linux computer, a software defined radio (HackRF One), a navigation receiver (Bendix-King KN53), a VOR/ILS indicator (Bendix-King KI203), an oscilloscope (Rigol DS1054Z), a spectrum analyzer (Siglent SSA3021X), and a panel deck with test plugs connected to the instrument's internal signals. The design philosophy is to make its use as simple as possible. Moreover, the professor assists in handling the oscilloscope and the spectrum analyzer during the session. Otherwise, the limited amount of time per student in the physical laboratory is dedicated to learning instrumentation details or following step-by-step instructions instead of interacting and reflecting on the VOR/ILS concepts.

*Figure 3. Laboratory setup.*
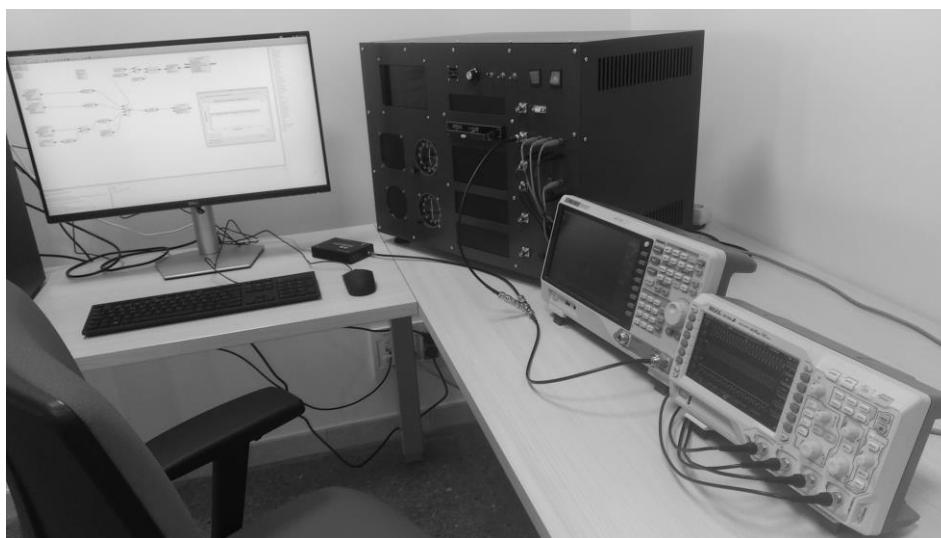
## 4. Pedagogical effectiveness evaluation

The pedagogical effectiveness of the enhanced practice was evaluated by several competence tests. The evaluation process starts with a first competence test to assess their previous knowledge. After teaching the theory and finishing the Concrete Experience phase of the inner cycle, the students repeat the competence test and respond to additional questions that stimulate the Reflection Observation stage. Next, they perform the practice and submit their assignments. When the assignment's due date expires, they repeat the competence test to measure the overall progress and fill out a final questionnaire to appraise the practice and express their opinions. As part of the students is following the course online, the students are divided into two groups by making the physical laboratory part optional. In this way, the differences related to learning are evaluated between the students who only performed the inner cycle and those who performed both cycles.

One target of the enhanced practice was to avoid the difficulties around using a programming language. The students evaluated the difficulty of installing the GNU-Radio software as low and the difficulty of using it as medium (Figure 4). In contrast, in the previous practice design, the results showed a bi-modal distribution, with half of the students considering using Python easy and half considering it difficult.

*Figure 4. Difficulty assessment.*
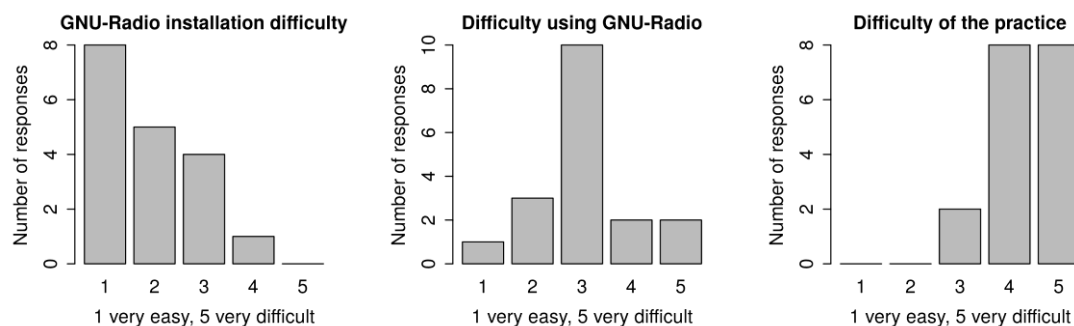


Although the target of avoiding difficulties using the technology was successful, the students still considered the whole practice hard or very hard (with a score of 4.33 on a scale from 1 to 5, similar to the score of 4.5 in the previous design). The students reported complications and a lack of guidance on how to combine the canonical blocks into a completely functional design. This part corresponds to the Abstract Conceptualization stage of the inner cycle. We consider this stage a key part of the whole practice, as it requires a solid understanding of the individual concepts and the overall picture. This process requires hard work and effort, as students must revisit their previous knowledge, actively seek new information and infer how to obtain the desired navigation signals. Without this effort, knowledge remains superficial and disconnected, lacking the deep understanding and integration that comes from active engagement. On the other side, going through this process can generate frustration in students, as some reported in the satisfaction test. One way for students to mitigate this frustration is through the final practice in the laboratory, where they can fix their own mistakes. Students who did not participate in laboratory practice are provided with a tutorial class explaining the final solution.

The successive competence tests, which results are represented in Figure 5, show significant learning, particularly for students who participated in the final laboratory practice. In the initial competence test participated 22 students while in the subsequent tests participated 18. The students started with a mean knowledge level of 2 over 10. Once the theoretical lessons are explained, the mean knowledge level increased to a mean value of 2.8. The final score was 4.3 for the students without the second cycle and 7.8 for those who performed the whole practice. The competence test was intentionally designed to be difficult, including some tricky questions. Even without the final laboratory practice, a clear progression in learning is noticeable, but the remarkable improvement occurs when performing the whole practice. The superior learning outcomes achieved through laboratory practice justify its inclusion and allow us to validate the proposed enhanced design.

*Figure 5. Competence tests.*
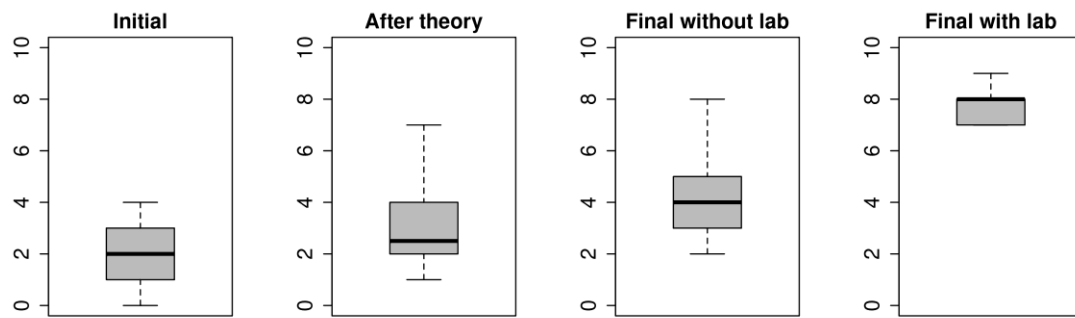
## 5. Conclusions

In summary, we have applied Kolb's experiential learning theory to a practical case in engineering studies, designing a laboratory that minimizes difficulties related to non-essential knowledge and allows students to focus on VOR and ILS concepts. By separating the learning into two cycles, we achieved greater learning and maximized the utility of the real laboratory. The pedagogical evaluation has demonstrated an increasing degree of learning through the competence tests at different stages, particularly for students who completed both cycles, although the practice was considered challenging, especially in the Abstract Conceptualization stage. Particularly, students who completed both cycles reached significantly higher qualifications than those who did not. As a final conclusion, separating the learning into two cycles achieves a greater learning and maximize the usage of the limited laboratory assets. Furthermore, it is possible to infer that using only virtual methodologies should be avoided (at least in engineering and technical courses) to maximize learning outcomes.

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# THE DEVELOPMENT OF A METHOD FOR TEACHING EXTENDED CELLO TECHNIQUES USING FREE IMPROVISATION

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## Abstract

Throughout the history of music learning, teaching methods have been a useful tool to explain how an instrument works based on the performance demands at the time. These methods have adapted to the musical style and the interpretative needs around them. They have been used as a reference by performers, composers, musicologists, and scholars to identify the evolution of a certain instrument, teaching technique or stylistic regard. This research is based on explaining the creation process of the method *El violonchelo desde una mirada contemporánea* (The cello from a contemporary perspective) and its usefulness in teaching and learning contemporary music at the university level. The product is a didactic tool that facilitates the learning process of extended techniques on the cello by using free improvisation as a guide.

The project rested on the fulfillment of three specific objectives: the description of twenty extended techniques for the cello, the elaboration of ten free improvisation exercises with extended techniques from the researcher's personal experimentation, and the design of a method based on the information collected. This research was supported under the theoretical framework of practice-based research methodology which in Latin America is referred to as artistic research. As a result, the investigation created a method with a brief explanation of twenty extended techniques for cello and ten exercises focused on teaching these techniques with free improvisation.

The aim of this method is to contribute to educational practices, in the sense that it facilitates the development of contemporary music playing and composing skills for both students and teachers at the university level. It also points out the lack of contemporary music teaching in Colombia. The next phase of the project will be to validate its usefulness with music teachers and students in various cities of the country.

*Keywords:* *Musical teaching method, practice-based research, contemporary music, extended cello techniques, free improvisation.*

## 1. Introduction

What is the meaning of contemporary music, extended techniques, and free improvisation?

Students from the Music Program at the Universidad Autonoma de Bucaramanga (UNAB) pondered this question after a visit from the Chilean composer Jeremías Iturra who premiered his work for strings, *Estudio sobre un itinerario terrestre* (Iturra, 2019) at the University in 2019. For two weeks, the composer led rehearsals of the piece, a process which due to the lack of experience in contemporary techniques by the conductor and orchestra members, necessitated explanation of how to execute several elements written in his work. Iturra also offered conferences related to this type of music as well as other related subjects such as free improvisation and extended techniques.

The lack of knowledge in these subjects pointed out a gap in the teaching of contemporary music in higher education institutions nationwide. The experience led to the research question: how to facilitate an approach to extended techniques on the cello from free improvisation? The goal of this project was to create a musical teaching method for extended cello techniques using free improvisation as a guide.

The following specific objectives served as a basis for creation of the method: the description of twenty cello extended techniques, the elaboration of ten free improvisation exercises with extended techniques from the researcher's personal experimentation, and the design of a method based on the information collected. The research was developed using the methodology of practice-based research known as artistic research in Latin America and research-creation in Colombia.

## 2. Literature review

This research is pertinent in the field of music education, specifically at the bachelor's level in Colombia since it intends to be useful in the teaching and learning of contemporary music for both

university students and teachers. Correspondingly, the project provided the method called *El violonchelo desde una mirada contemporánea* (The Violoncello from a Contemporary Perspective) (Russi Guzmán, 2021) as a didactic element that facilitates educational processes.

The project is current within the field of academic music as it is part of a problem previously worked on by other studies internationally. An example is the thesis *Educación y música contemporánea: encuentros y desencuentros entre compositores* (Education and Contemporary Music: Meetings and Disagreements Between Composers and Teachers) by Ana Urrutia Rasines and Maravillas Díaz Gómez (2013). The researchers list projects that have focused on the lack of contemporary music teaching in different countries and educational levels. They show research carried out from 1982 to 2011 in countries such as Spain, Portugal, Brazil, and France. They concluded that this has been a subject of pedagogical interest around the world and that teachers, while manifesting a lack of knowledge, have an interest in learning the topic and could give courses and conferences on contemporary music after training.

One of the papers that contributed to the creation of the method was Ellen Fallowfield's PhD thesis called *Cello map: A Handbook of Cello Technique for Performers and Composers* (Fallowfield, 2009). This document focused on the presentation of new and traditional techniques to define a "global technique". The author started from the explanation of physical actions that modify the sound of the cello and then sought to connect them, hence the term "map". The relevance of the text relies on the association between the actions carried out by the instrumentalist and the sounds that they produce on the cello.

Another referent was the doctoral thesis by Valerie Welbanks *entitled Foundations of Modern Cello Technique: Creating the Basis for a Pedagogical Method* (Welbanks, 2016). This text focused on presenting extended cello techniques as a linear progression of traditional technique and the contribution to a methodological approach to contemporary music. This document provided an explanation of the origin, development, and interpretative suggestions for the execution of the techniques, as well as part of the definition of the term extended techniques.

## 3. Methodology

This project begins with a brief definition of the term "extended techniques", describes a selection of twenty extended techniques for cello and includes an explanation of how each technique is notated and performed. Next, the term "free improvisation" is defined and an explanation of the creation of the method *El violonchelo desde una mirada contemporánea* is explained. This section is divided into four parts: writing a draft, individual experimentation, indirect self-observation and feedback and finally, corrections. Ultimately, the last section entailed compilation of all the prior information into the official design of the method.

### 3.1. Definition of extended techniques

The term "extended techniques" has been adopted in recent decades due to its importance in contemporary compositions. Current discussions look for technical differences between artistic periods to delimit them. At the moment, the term does not have a standardized definition since two aspects must be considered: an explanation of the idea to be defined and a list of the techniques that would be considered "extended". Although the term is vernacular among contemporary music specialists and well known within the profession, there is still no consistent definition supported by musicological texts (Fallowfield, 2009, p.27). In the doctoral thesis *Foundations of Modern Cello Techniques: Creating the Basis for a Pedagogical Method* (Welbanks, 2016, pp. 32-33) the author indicated that to be able to interpret any repertoire written in the 20th and 21st centuries, the performer must have at least a basic notion of extended techniques.

Accordingly, extended techniques in this investigation were defined as the unconventional execution of an instrument through its manipulation and exploration to achieve new sounds that are outside the traditional catalog of sounds emitted by this instrument. Additionally, the term refers to a group of techniques that regained importance after the mid-20th century and were created to adapt to contemporary composers´ intentions while searching for elements to enrich their pieces.

### 3.2. Free improvisation

Within western academic music, free improvisation is an act of artistic and social creation that reflects a performer´s identity and may involve the public as a participant in the piece. Its beginnings reveal the fickle quality of society from the 1960s to date with music constantly evolving and being in a state of constant innovation. In this way, free improvisation may be considered to be a part of contemporary music based on two arguments. The first, from the definition of contemporary: which is existing, belonging, and relative to the temporality of another person or thing. The second argument is made by Wade Matthews, in his article *¡Escucha! Claves para entender la libre improvisación* (Listen! Keys to Understand Free Improvisation (2001). He states that free improvisation inherited the musical changes that occurred from the end of the 19th century to date.

### 3.3. Creation process of the method *El violonchelo desde una mirada contemporánea*

The creation of this method was divided into two phases: elaboration of the ten exercises followed by a period of testing their applicability. Both activities focused on the experimentation carried out by the researcher with the use of autoethnographic elements explained in the book *Investigación artística en música: problemas, métodos, experiencias y modelos* (Artistic Research in Music: Problems, Methods, Experiences and Models) (López-Cano & San Cristóbal Opazo, 2014). This research understands autoethnography as a strategy that describes and analyzes the personal experience of the researcher aiming to identify cultural aspects, phenomena, or events to which he/she belongs or participates.

One of the tasks proposed by autoethnography corresponds to indirect self-observation. This element was used for this research, consisting of observing the subject, in this case the researcher herself, from a video or audio recording that captures the actions carried out and allows analysis and reflection of what is recorded (López-Cano & San Cristóbal Opazo, 2014, pp. 152-153). From indirect observation, the researcher derived four steps to elaborate the exercises.

The first step consisted of writing a draft based on the 20 selected techniques. Each exercise was divided into three levels that progressively increase in difficulty to add a didactic and motivating component to the exercise. Additionally, several of these exercises contain elements of contemporary music in addition to extended techniques. Each level has an estimated length that varies between 20 seconds and two minutes to control the length of the improvisation. Different graphic elements were also used as independent variables to facilitate the creative process and give a context to improvisation.

The second step focused on the individual experimentation of the researcher by reading and executing each exercise. Later, the researcher had to assimilate the instructions and play the levels in the corresponding order. The prior action happened after a period of at least two days from the moment the exercise was written in order to forget the initial intention when created and thus increase the objectivity of the new reading by the interpreter-researcher.

The third step used the indirect self-observation strategy mentioned above, which consisted of the audio and video recording of step two. The recordings were divided into two moments: the reading and experimentation process and then the final improvisation of each level. The first recording made it possible to identify how long it took to read the instructions and assimilate them before starting the experimentation. The second recording showed how long it took to expose, develop, and conclude a musical idea with the requested elements under the time limits.

The last step was feedback and editing based on the review of the audiovisual material. A period between experimentation and review was also expected to ensure greater objectivity. This section sought to reach conclusions regarding whether the wording of the exercise was easy and quick to understand or if it took too long to process and start playing. It also made it possible to delimit a standard duration of the improvisation so that the necessary seconds or minutes per level could be established.

### 3.4. Designing the method *El violonchelo desde una mirada contemporánea*

The method *El violonchelo desde una mirada contemporánea* is divided into four sections: *Datos de la misión* (Mission Data), *Conociendo los aliados* (Meeting the Allies), *Caja de herramientas* (Toolbox) and *Los universos paralelos* (Parallel Universes). The first section serves as an introduction in narrative style where the student acts as an explorer that must navigate through ten different universes represented by each exercise. This section also summarizes all the definitions previously mentioned.

The purpose of the next section is to give a brief explanation of the 20 extended techniques, each of which contains a summarized description and a QR code that redirects the reader to an explanatory video made by the researcher. To avoid language barriers, this material does not contain text and focuses on helping viewers to understand the performance and recognize the technique's sonority.

The third section contains a list and brief explanation of four composing elements common in contemporary music. These do not represent an in-depth description, as they are simply needed to create awareness of their existence and to ensure the exercises' execution as a creative tool for the improvisations.

The last section lists the ten exercises known in the method as Universes. In this segment, each universe requires that the cellist use one of the four contemporary compositional elements while improvising. Each exercise has an Objectives Section and a Levels Section. The Objectives Section seeks to explain to the interpreter two specific functions of each exercise. The Levels Section consist of a three-part division that progressively increases in difficulty through more complex instructions or the incorporation of more elements. Each exercise uses more than one technique as a base.

Levels I and II are designed so that the cellist first improvises with each of the techniques without using all of them at the same time. These levels require the interpreter to learn the execution of each technique individually. Additionally, both levels have a duration between twenty and thirty seconds

depending on the difficulty or discomfort generated by the improvisation. Level III is based on an improvisation that uses all the techniques practiced in Levels I and II. This level lasts for one or two minutes in order to give the interpreter more time to combine all the components, both the extended techniques used, and the compositional element used in contemporary music and indicated in each universe.

## 4. Conclusions

Once the investigation was completed, it was possible to answer the research question: how to generate an approach to extended techniques on the cello using free improvisation? In this case the answer was with the creation of a musical teaching method for cello that uses extended techniques and free improvisation. The three specific objectives proposed by the project were also achieved. Each of them generated their own conclusions.

The first objective focusing on the description of the extended techniques required an extensive bibliographic search, which consisted mainly of academic texts. As most of the items in the bibliography were written in English, the question arises as to what have been the contributions to extended techniques in Spanish speaking countries and can they be accessed with the same ease with which Anglo-Saxon texts are accessed?

The second objective, the elaboration of ten free improvisation exercises, was based on the use of autoethnographic tools, specifically indirect self-observation. This made possible the systematization of a creative activity that was the main element allowing the project to rest in the practice-based research framework. The usage and presentation of the four contemporary music compositional elements brought out questions related to the importance of studying these theoretical aspects both in music theory and instrument interpretation classes and the need to unite theoretical and practical studies when obtaining new knowledge.

The third objective, the design of the method, required a process of synthesis that made it easy to read and understand for the student. It was important to manage a narrative that was attractive to the cellist and to give it a didactic character. The motivation of this objective was to venture into the fusion of extended techniques and free improvisation with teaching since, during the creation of the literature review, no similar element was found on a national level.

Ultimately, the creation of the method *El violonchelo desde una mirada contemporánea*, aims to facilitate learning and teaching contemporary music for Colombian cellists. As a result, the increase in contemporary music studies opens more lines of action for Colombian cellists expanding their area of expertise and supporting the relationship between academic preparation and professional development. This study also aids in the interpretation and dissemination of pieces by composers at a local, national, and international level and seeks to development the contemporary music scene in Colombia, allowing the country to grow musically with the intention of turning into an exponent of this genre worldwide.

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# RECOGNISING SOUTH AFRICAN SIGN LANGUAGE: IMPLICATIONS FOR SOUTH AFRICAN LOCAL MUNICIPALITIES

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## Abstract

This article posits that the implications of Sign Language within the South African local municipalities, remains a challenge, notwithstanding existing attempts by language policies to promote multilingualism. Thus, guard against the use of other spoken languages to perpetuate inequalities which were entrenched by the history of the country. In this article it is argued that the use of other spoken languages as the only communication between South African local municipalities as the only languages of communication, impedes access to effective communication with residents. South African government has recognised eleven plus official languages, inclusive of Sign Languages. For this study, three Free State local municipalities were approached to help with data on the topic, wherein officials involved in an open-ended interview, with a voice-recorder used. Only one local municipality had a translator/ interpreter, and who does not know South African Sign Language. The other two local municipalities do not have a translator or an interpreter at all. Thus, implying that only 33,3% (only one local municipality) partially comply with the regulations as enshrined in the South African Constitution (1996); and the other two with 66,4% (two local municipalities) of the selected municipalities do not comply at all. The findings suggest that most South African local municipalities do not comply with regulations regarding the introduction and development of South African Sign Languages. Thus, this implies that South African Local Municipalities do not communicate with all its residents. Local municipalities are therefore expected to employ people who will help deaf people when the visit their offices to enquire or attend to other problems. The article poses recommendations as to how the apparent linguistic imperialism, which is a human rights violation, can be turned around to linguistic diversity that is based on linguistic justice.

*Keywords: South African sign language, local municipalities, multilingualism, communication, South African Constitution.*

## 1. Introduction

This article discusses the lack of or absence of South African Sign Languages at South African at local municipalities to effectively communicate with their residents, despite the availability of supportive legislative frameworks, such as the Constitution of South Africa (1996), Use of Official Languages Act (2012). South African Sign Language appears to be a smallest recognised language in South Africa. Although some of South African organisations representing the deaf communities claim that more than one million South Africans use this language. Statistics South Africa (2011) survey records only shows 234,655 citizens who use Sign Language and regarded as first spoken language. It should be noted that this number could include naturally hearing children of deaf parents. The key question that this article seeks to answer is: Is it important to promote South African Sign Language at all spheres of government (especially at local municipalities)? The article then poses recommendations as to how the apparent linguistic imperialism which is a human right violation can be turned around to linguistic diversity that is based on linguistic justice.

## 2. Aims

This article aims to: **(1)** Situate the South African Sign Language within the transformation of the country. **(2)** Recommend a multilingual approach by local municipalities when communicating with residents (especially deaf residents).

## 3. Theoretical framework

Jernudd and Das Gupta (1971) posited that the concept of 'language-as-a-resource in which language choices are made on strictly economic grounds in much the same way as any other resource in

the nation's economy are planned and consumed. Theoretical foundation of this article is based on the concept of ***language-as-a-resource orientation*** which stresses the importance of multilingualism, not only as a facilitator of access to different cultures and literature, but also as a door to economic and other related opportunities. Further-more, Ruiz (1984) concurred that the language-as-a-resource orientation was used in the language planning model. Braam (2004; as cited by Ndimande-Hlongwa et al., 2010) argued that language policy as enshrined in the South African Constitution (1996), and Language Plan Task Group Report (LANGTAG, 1996), assumes a particular paradigm, namely, that South Africa is characterised as a country of diverse languages (inclusive of Sign Language), which are a resource that should be developed like any other economic resource. Cluver (1996) postulated that multi-ethnic could be unified into a single political state through linguistic freedom, and added that language should not be viewed as an impediment but a linguistic resource that facilitates successful business transactions. Hornberger (1991) mentioned that language-as-a-resource approach is designed to stimulate and build upon the skills and resources that individuals from different linguistic backgrounds bring to the world.

## 4. Qualitative analysis

This study adopted a qualitative approach or analysis. Punch (2013) refers to qualitative analysis as a collection and analysing of non-numerical data (e.g., text, videos, or audio) to understand concepts, opinions, or experiences. Further-more, qualitative analysis is about emotions or perceptions of people, what and how they feel. It is concerned in gaining insights, reasoning, and motivations. The interviewer used the voice-recorder, to conduct the interviews with respondents. For this study, the interview was informal and unstructured-conversational, wherein most open-ended questions were asked spontaneously.

## 5. Population and sample

Polit and Beck (2017) defined population as the complete combination of cases in which the researcher is interested, wherein a population is not chosen for the purpose of generalisability, but rather to establish the kinds of individuals that are suitable to take part in the study. For this study, the target population comprised of South African local municipality officials mostly. Polit and Beck (2017) refers to sampling as the procedure of selecting a subset of the population to represent the whole population. This study managed to interview three officials responsible for languages in the three selected local municipalities from the Free State Province, South Africa.

## 6. Ethical considerations

Mark (2015) referred to ethical considerations as a branch of philosophy that deals with the conduct of participants and guides norms or standards of behaviour of participants and relationship with each other. Moral behaviour must be considered upon conducting research. The researcher indicated that at no stage will his participants be known to any person and their rights and privacy will be considered and protected, permission will be obtained to record the session and hence they will have an option of disclosure or non-disclosure of their identification. Should they feel offended at any point, they are free to discontinue the research, as they took part willingly. Participants were also requested to fill in the consent forms. The ethical considerations are not limited to the above-mentioned only.

## 7. Data analysis

Wiid and Diggines (2013) defined data analysis as how the researcher spells out the purpose and logic of analysing, explaining the way gathered information will account for variations in some quality of responses. Further-more, Saris and Gallhofer (2014) maintained that data analysis is a process conducted to sift, reduce, organise, and give purposeful meaning to data, helping to respond to research questions. The Statistical Package for the Social Science (SPSS) version 19 was used to perform the analysis of the data.

## 8. The value of sign language

Approximately 25 different languages are spoken in South Africa, of which 11 have been granted official status in terms of section 6 of the Constitution (Act No. 108 of 1996), on the grounds that their usage includes about 98% of the total population. The 11 official languages are isiNdebele, isiXhosa, isiZulu, and siSwati (referred to as the Nguni language group); Sesotho, Sepedi, and Setswana (referred to as the Sotho language group); Tshivenda, Xitsonga, English and Afrikaans. South Africa is therefore a multilingual country. A striking characteristic of multilingualism in South Africa is the fact that several indigenous languages are spoken across provincial borders; shared by speech communities from different

provinces. To-date, management of linguistic diversity in post-apartheid South Africa has been made problematic by the lack of a clearly defined language policy, leading to the use of English and Afrikaans as the most dominant languages in the socio-economic and political domains of our society. The indigenous languages and language varieties of the African people and of other marginalised groups, including the Deaf and the Blind – enforcing negative stereotypes of the African languages, which are held not only by English and Afrikaans speakers, but even by many of the speakers of the African languages themselves. The situation is compounded by the fact that, owing to short-sighted and bureaucratic attitudes against implementing multilingualism public and private institutions tend to take ad hoc language decisions that negate the Constitutional provisions and requirements relating to languages. A person's language is in many ways a "second skin": a natural possession of every normal human being, with which we use to express our hopes and ideals, articulate our thoughts and values, explore our experience and customs, and construct our society and the laws that govern it. It is through language that we function as human beings in an ever-changing world. The right to use the official languages of our choice has therefore been recognised in our South African Bill of Rights, and Constitution acknowledges that the languages of our people are a resource that should be harnessed.

## 9. Barriers in language policy implementation

Skutnabb-Kangas and Phillipson (1996) argue that the role of language is seldom considered when policies are agreed upon. Kamwangamalu (2004) postulated that, interestingly so, South Africa decided to opt for multilingual policy in 1996 as enshrined in the Constitution, during its language policy planning process to avoid any possible long-standing ethno-linguistic strife among custodians of the various Indigenous African Languages, while on the other hand, and English and Afrikaans-speaking white communities on the other hand. Surprisingly, it is saddening to note that the same languages that were used as languages of instruction during the colonial era, are still dominant languages in the democratic dispensation. In South Africa language policy implementation has progressed at a snail's pace, and in some cases, nothing has been embarked on at all. In this regard, Beukes (2008) argued that it seems as if government lacks a commitment to its own language policy framework, and this reflects a disjunction between policy and delivery. The implementation of language policy has been characterised by a lack of progress since the introduction of the new constitutional dispensation. Heugh (2006) asserted that the government is to blame for slowing down and stalling progress in implementing this potentially empowering policy. Thus, this failure has impacted negatively on the achievement of many Indigenous African Languages (especially the South African Sign Language). Colonialism and apartheid played a key role in creating an official space that inferiorised Indigenous African Languages through policies that promoted languages that aided the oppression. Beukes (2008) posited that despite efforts by the democratic government to redress the colonial ills, evidence shows that the elevation of indigenous languages remains in its infancy. It becomes evident that the democratic tone of language policies which suggests practicality and choice rather than enforcement, the acceptance of the English language as the official policy language, and government's move to reform rather than deconstruct apartheid language policies are key obstacles to policy implementation.

## 10. Multilingualism and legislative context

Section 6 of the Constitution provides the principal legal framework for multilingualism, the development of the official languages and the promotion of respect and tolerance for South Africa's linguistic diversity. It determines the language rights of citizens, which must be honoured through national language policies. The Constitution emphasises that all official languages must "enjoy parity of esteem" and be treated equitably, thereby enhancing the status and use of indigenous languages, with government taking "legislative and other measures" to regulate and monitor the use of disadvantaged indigenous languages. The Constitution mandates change to the language situation throughout the country, giving social and political recognition to hitherto disadvantaged language groups based on the expressed needs of communities and interest groups. Section 6(2) of the Constitution requires mechanisms to be put in place to develop these indigenous languages. Section 6(3) and (4) contain language-related provisions for national and provincial governments, whereby government departments must use at least two of the official languages. To promote linguistic diversity further, Section 6(5) provides for the establishment of the Pan South African Language Board (PanSALB) to promote multilingualism and see to the development and use not only of the official languages, but also of the Khoi, Nama, and San languages, as well as SA Sign Language(s). Other relevant provisions pertaining to language matters are made elsewhere in the Constitution. Section 9(3) protects against unfair discrimination on the grounds of language, while sections 30 and 31(1) refer to people's rights in terms of cultural, religious, and linguistic participation and enjoyment. Section 35(3) and (4) refer to the language rights of arrested, detained and accused persons, with a particular emphasis on the right to fair trial with proceedings conducted or interpreted into the

language of that individual's choice. The Constitution and related legislation clearly advocate the promotion of multilingualism in South Africa. Thus, the Constitution of South Africa caters adequately for the harmonisation of language policy at all three levels of government and articulate clear policy positions on the status and use of the indigenous official languages in all nine provinces in South Africa. The language policy takes cognisance of the constitutional provisions on multilingualism and is in concert with government's goals for economic, socio-political, and educational growth.

**Multilingualism** aims to:

Promote the equitable use of the 11 official languages. Facilitate equitable access to government services, knowledge, and information. Ensure redress for the previously marginalised official indigenous languages. Initiate and sustain a vibrant discourse on multilingualism with all language communities. Encourage the learning of other official indigenous languages to promote national unity, and linguistic and cultural diversity; and promote good language management for efficient public service administration to meet client expectations and needs.

## 11. The promotion of multilingualism entails the following:

Promoting multilingualism in South Africa requires efforts that do not discount the knowledge that exists in societies where indigenous official languages are prominent. This will be facilitated by the use and involvement of communities as participants in the processes of language development. It will be expedient to engage language specialists to assist the process of developing functional multilingual programmes through research and the dissemination of findings. Facilitating cooperation and the sharing of responsibilities among SADC member states will accelerate language development. It will be necessary to conduct policy reviews at reasonable intervals to monitor progress towards a fully multilingual South African society. A community-based approach to the promotion of multilingualism is the most viable one, given South Africa's highly pluralistic society. There must be a decentralised and participatory approach to language planning and policy implementation, which harnesses technical expertise for the transfer of knowledge and skills.

## 12. Local government and language preferences

Local governments will determine the language use and preferences of their communities within an enabling provincial language policy framework. Upon determination of the language use and preference of communities, local governments must, in broad consultation with their communities, develop, publicise, and implement a multilingual policy. The official languages will be used in all legislative activities, including Hansard publications, as a matter of right as required: provided that in the case of provincial legislatures, regional circumstances will determine the language(s) to be used. ***Working language(s)/language(s) of record***: By consensus, each government structure must agree on a working language(s) (for both intra and interdepartmental communication purposes); Provided that where practically possible no person will be prevented from using the language(s) of his or her preference. For the purposes of conducting meetings or performing specific tasks every effort must be made to utilise language facilitation facilities such as translation and/or interpreting (both consecutive and simultaneous, as well as whispered interpreting) where practically possible. ***Communication with members of the public:*** For official correspondence purposes, the language of the citizen's choice must be used. All oral communication must take place in the preferred official language of the target audience. If necessary, every effort must be made to utilise language facilitation facilities such as interpreting (consecutive, simultaneous, telephone and whispered interpreting) where practically possible. ***Government publications:*** A publication programme of functional multilingualism should be followed by national government departments in those cases that do not require publication in all 11 official languages. Where the effective and stable operation of government at any level requires comprehensive communication of information, it must be published in all 11 official languages and, in the provinces, in all the official languages prescribed in the province. In cases where government documents will not be made available in all 11 official languages, national government departments must publish documents simultaneously in at least six languages. ***The selection of languages will be made as follows:***

1. At least one from the Nguni group (isiNdebele, isiXhosa, isiZulu, and siSwati);
2. At least one from the Sotho group (Sepedi, Sesotho, and Setswana);
3. Tshivenda;
4. Xitsonga;
5. English;
6. Afrikaans.

**A principle of rotation must be applied when selecting languages for publishing government documents in the Nguni and Sotho groups.**

## 13. Recommendations / implications

Considering the purpose/ aims of this paper, the researcher recommends the following: **(i)** Local municipalities are encouraged to create a Language Unit (probably to be headed by a qualified and professional language practitioner). **(ii)** This Language Unit should be responsible to ensure multilingualism (inclusive of Sign Language) at local municipalities. **(iii)** South African local municipalities are expected to allocate funds to implement and promote multilingualism. Funding should not be used as an excuse not to implement multilingualism. **(iv)** South African local municipalities need to encourage language advocacy and litigation that will seek to promote multilingualism. **(v)** Advocacy and litigation are important, as implementation of multilingualism is not going to happen all by itself.

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# THE SOCIO-MUSICAL BRAIN:
# STUDY OF A MUSIC EDUCATION EXPERIENCE

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## Abstract

Musical practice has positive effects on human development in general, involving cognitive, emotional, motivational and social aspects, which imply changes in brain processing. The number of Music Education Program (MEP) focusing on young populations in social vulnerability has grown in Brazil and in the world. The aim of the present study was to investigate the impacts of a MEP on psychological aspects of its students, more specifically self-esteem, social skills and executive functioning. Data collection was carried out in a MEP in the city of Ribeirão Preto - Brazil and in regular schools. The participants were 69 children and adolescents aged between 10 and 17 years, divided into the Beginner Group (BG), students with up to 12 months of enrollment in the MEP; Experienced Group (EG), students enrolled in the MEP for more than 24 months; and Control Group (CG), students without any involvement with music learning. The participants answered the psychological tests Rosenberg Self-Esteem Scale (EAR), Matson Evaluation of Social Skills with Youngsters (MESSY) and Stroop Test. Semi-structured interviews were also carried out with all students from the BG and EG groups, with ten newly enrolled MEP students, with six legal guardians of these students and twelve MEP professionals. Statistical analysis of the psychological tests showed that the participants in BG and EG did not differ among themselves for any of the study variables. The CG had lower scores than BG and EG for Self-Esteem and higher scores for Loneliness and Social Anxiety, indicating that involvement with MEP can lead to gains in these skills. Analysis of the interviews indicated that participation in the MEP is related to positive impacts on participants' self-esteem, social skills and executive functioning. The results were discussed seeking to inter-relate them in order to integrate the data collected through the psychological tests and through the interviews. It is concluded that participation in MEPs with a focus on the social rescue of vulnerable populations has an influence on the development of children and adolescents, indicating that the use of music education characterizes an important social intervention strategy.

*Keywords: Music education, social vulnerability, young, self-esteem, social skills, executive functioning.*

## 1. Introduction

Musical activity involves cognitive, emotional, motivational and social aspects, supporting the activation of neurobiological processes (Bueno, 2012; Immordino-Yang & Damasio, 2007). Due to these characteristics, music appreciation seems to be the product of a specific cerebral organization, which gives support for the existence of a musician-specific neural network (Peretz & Zatorre, 2005). The notion of the socio-musical brain (Bueno, 2012) refers to the interrelation of the various aspects that make up the musical experience and points to the need to understand the music education experience as something that generates human development, implying and integrating psychological, biological and social aspects (Bueno, 1997). The functioning of the socio-musical brain is evident in social intervention actions that use music education methodologies.

The use of music in the school curriculum is common in Western societies, however, frequently, methodologies are based on what common sense or the media suggest as educational (Bueno, 2012). It is necessary that curricula be designed based on methodologies that respond to social and educational demands. Music can be combined with education, child development and social transformation, but it is necessary to use structured programs designed from the needs identified in community environments, in order to respond to the difficulties of these places, using their potential. In this way, this perspective points to a notion of music education that cannot do without taking into account the multiple components of the musical experience.

In children, there is ample evidence that the benefits of musical training are not limited to musical performance, but are also transferred to cognitive domains (Hallam, 2010; Moreno et al., 2011; Trehub, 2003). Studies on the effects of musical training on brain plasticity highlight the potential of using music as an aid in the developmental process of children and adolescents. For Allan (2010) and Majno (2012), art has the potential to challenge exclusion practices and, in this logic, Music Education Programs (MEP) can bring diverse gains to those involved, since they use music as a way of social rescue of children and adolescents in situations of social vulnerability. There is, therefore, a need for studies that address the interrelationship between the development of psychosocial and biological aspects in MEPs.

The MEP "El Sistema", created in 1975 by the maestro and economist José Antônio Abreu, is a Program of social rescue and profound cultural transformation designed for the entire Venezuelan society without any distinctions, but with emphasis on the most vulnerable and threatened social groups (Abreu, 2009). Success in fulfilling the objective of social rescue is based on an intervention that operates in three spheres: personal/social, family and community, in the same sense as proposed by Freire (2003). Until 2015, they already existed in Venezuela more than 400,000 students enrolled in "El Sistema" (http://fundamusical.org.ve, retrieved on December 20, 2015). Many countries in the world have programs related to Venezuelan (Booth; 2013; Cline, 2012; Poloni, 2012; Uy, 2012). In an extensive review of studies and MEPs based on the "El Sistema" model around the world, Creech et al. (2013) found several effects of these MEPs on students' abilities. Hikiji (2006), in a study on Projeto Guri MEP of the State of São Paulo-Brazil, which also focuses on the social rescue of children and adolescents in situations of social vulnerability (http://www.projetoguri.com.br/, recovered in 20, December, 2015), discusses the impacts of performance on students. Programs such as Projeto Guri and "El Sistema" promote student presentations from the first months of participation in classes. For the author, the performance gives visibility to the students and the institution, in addition to providing the "performers" with the possibility of experiencing new social places. The immersion and joint practice of orchestral music promoted by "El Sistema" generate results that permeate the three spheres of intervention, culminating in the musical excellence of the Program's musicians (Abreu, 2009). For the founders, the main consequences that can be observed in students are, in particular, the development of self-esteem, social skills and cognitive skills. It is noteworthy that the students' families and the communities surrounding the MEP are also affected by it, since the participation of these instances in the Program's daily life is considered a basic prerequisite.

The literature points to the existence of positive correlations between self-esteem and social skills (Rubin et al., 2004) and also indicates the development of cognitive gains from involvement with music education (Schellenberg, 2005). It is necessary to carry out scientific studies that aim to verify the impacts of the interventions proposed by the MEP on the target populations. The Master Dissertation of Moisés (2016) investigated the impacts of a MEP on the psychological aspects of its students, more specifically self-esteem, social skills and executive functioning. For this, two experimental groups were formed with children and adolescents enrolled in the selected MEP and a control group with young people of the same age, without musical practice and coming from the same regular schools. Psychological tests were used to measure the aspects mentioned in the objective of the study. In addition to the tests, semi-structured interviews were carried out with MEP students, their legal guardians and MEP professionals in order to obtain reports of their experiences and opinions about the impacts of MEP on their lives.

## 2. Method

The project was approved by the Research Ethics Committee of the Faculty of Philosophy, Sciences and Letters of Ribeirão Preto, Universidade de São Paulo (CAAE No. 31434914.6.0000.5407). Data collection was carried out in a MEP in the city of Ribeirão Preto – Brazil and in two regular schools, one private and the other public. Prior consent was obtained from the institutions' management, and acceptance from the participants and parents of minors. The study included 69 children and adolescents aged between 10 and 17 years, divided into three groups (n= 23): Beginner Group (BG), composed of students with up to 12 months of enrollment in the MEP; Experienced Group (EG), composed of students with more than 24 months of enrollment in the MEP; and Control Group (CG), consisting of participants without any involvement with music learning.

Participants in the three groups individually responded to the following psychological tests: Rosenberg Self-Esteem Scale (EAR), Matson Evaluation of Social Skills with Youngsters (MESSY) and Stroop Test. Then, semi-structured interviews were carried out with all the students from the BG and EG groups, ten MEP students who did not make up any group because they did not have the required enrollment time prerequisite. Semi-structured interviews were also carried out with 16 other participants, including professionals from Projeto Guri and legal guardians of minors.

## 3. Results

Psychological test scores were compared among groups of participants by analysis of variance ANOVA and Tukey's test, or Kruskal 's test Wallys when at least one group did not follow the normal distribution. There are differences between the scores of the CG and the BG and EG groups. The mean EAR scores of the BG and EG groups are higher than those of the CG. On the other hand, the average scores of factor 4 (Loneliness/Social Anxiety) of the MESSY scale of the BG and EG groups are lower than those of the CG. No differences were obtained among the scores of the groups with the Stroop Test and MESSY factors 1 (Aggressiveness/Antisocial Behavior), 2 (Social Skills/Assertiveness) and 3 (Vanity/Arrogance).

The analysis of interviews allowed the peer interviews construction of three coding categories: "Interpersonal relationship", "Development of intrapersonal skills", with reflections by students about the perceived changes in their behaviors related to involvement with Projeto Guri, and the category "Engagement with music and human development", with considerations from students' professionals and legal guardians. The students reported impacts on interpersonal relationships resulting from participating in Projeto Guri, addressing sociability, interpersonal exchanges and the exercise of living with other people. The students highlighted that their involvement in the classes and in the daily activities of the MEP helped them to learn to live together in a group, exercising tolerance and negotiation and providing relational gains, such as an increase in the number of friends and the consequent development of a social support network. The activities at the MEP led to the appreciation of teamwork, the ability to assess one's own performance and the feeling of confidence in the face of a mastered task. The development of intrapersonal skills was described by the students interviewed in terms of how they perceive their own bodies, the ability to concentrate, studying discipline, exercising critical and aesthetic sense, and training to build Life Projects. Professionals and legal guardians pointed out, as effects on the development of students, that involvement with music entails "*lifelong*" consequences, such as motor coordination and emotional experience, provides benefits to students' health, improves self-esteem and gains in the context of of interpersonal relationships, and promotes the creation of Life Projects linked, or not, to music. Professionals also reported that the institutional development of the MEP affected the relationship between the community and professionals, producing personal transformations that generated new ways of acting and thinking in personal and professional life.

## 4. Discussion

According to the results of the psychological tests, it was verified that the students of Projeto Guri have higher levels of self-esteem and lower levels of loneliness and social anxiety (MESSY factor 4), corroborating the findings of the interviews. It is inferred that the MEP environment, because it is organized in a welcoming way based on pro-social contacts and with a focus on teamwork and quality musical teaching (Abreu, 2009; Creech et al., 2013), triggers a series of personal transformations in students, which can also impact the environment outside the MEP. The interviews carried out indicated a series of transformations that occurred due to the involvement with Projeto Guri, such as changes in the body, in the way of relating with people and with the environment and, also, in the perspectives for the future, involving the construction of Projects of Life. In this way, the interviews supported the differences found through the analyzes of the psychological tests, leaving them with more solid contours.

Still in the same sense, the effects indicated by the EAR and by the MESSY factor 4 (Loneliness/Social Anxiety) at the personal-relational level, have parallels with neural substrates that were identified in the interviews and find support in the scientific literature (Butman & Allegri, 2001; Frewen et al., 2013; Jurado & Rosselli , 2007; Northoff et al., 2006). Stroop Test and factors 1 (Aggressiveness/Antisocial Behavior), 2 (Social Skills/Assertiveness) and 3 (Vanity/Arrogance) of MESSY did not show statistically significant differences between the groups of participants, which may sugest a certain homogeneity among populations. With regard to the fact that the Beginner Group does not differ from the Experienced Group, it can be assumed that this is due to the criteria used to form the experimental groups.

This research contributed to studies in the area, by use adapted and standardized psychological tests for the studied population, aiming to measure the factors indicated by Abreu (2009) as influenced by involvement with "El Sistema". The use of MESSY, specifically, was original since no study with these characteristics was found in the surveys carried out for the elaboration of this research. According to Bueno (2012), psychology plays an important role in the development of tools to help develop indicators of the effects that EMPs generate in communities and individuals.

Interviews with professionals and legal guardians of minors showed that Projeto Guri is a MEP that is constantly changing to adapt to the fulfillment of its human development mission. Educational investment made since 2015 in the Social Development Board, one of the bodies responsible for the Projeto Guri, could mean a greater approximation with the method proposed by "El Sistema", which is based on the individual-family-community tripod. The studied MEP has developed its own intervention methodologies, adapted to the realities in which its activities take place, which configures a big step when it aims to train people and intervene in the community. It should be noted that several studies with experiences of adaptation of "El Sistema" around the world already point to this need (Booth, 2013).

The changes pointed out by the tests and interviews related to individual aspects of the participants, such as body perception and specific skills, seem to be related to broader aspects of the social environment in which the MEP is inserted, such as schools, homes and communities. New configurations of the organization of the Nervous System can still be inferred, referring to behavioral changes presented by the students. In this way, the functioning of the socio-musical brain proposed by Bueno (2012) was evidenced by the results of the present study insofar as the integrated development between psychological, biological and social aspects of children and adolescents involved in a Music Education Program was identified with a focus on rescuing socially vulnerable populations.

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# EXPLORING INCLUSIVE CULTURE AND PRACTICE: THE PERSPECTIVES OF MACAO TEACHERS IN INFORMING INCLUSIVE TEACHER EDUCATION PROGRAMMES IN HIGHER EDUCATION

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## Abstract

The inclusion of children with diverse learning needs and/or disabilities in regular classrooms has been identified as crucial to the provision of educational equity and quality for all students. In this, teachers play an essential role, as they strongly impact student educational attainment. Whilst the adoption of inclusive practice is increasing, with potential benefits for the teaching profession, there is also a rise in the level of its challenges in Macao as many more students with learning disabilities are now being included in general education classes. Consequently, there has been a significant focus on teacher professional development to ensure that teachers are adequately prepared to teach in inclusive classrooms that give access to diverse students. Major changes in teacher education will need to include more inclusive education content and equip teachers with the necessary skills in the area of inclusive practice. This paper draws on data from in-depth interviews with 20 teachers that explored teachers' views of support, challenges, and barriers to inclusive practices at the school and classroom levels. Thematic analysis was utilised to determine significant themes within the data set. Several themes emerged and served to illustrate the identified barriers and the potential value of effective teacher education. Suggestions for increased professional development opportunities for inclusive education specific to higher education institutions are presented, and the implications for practice and teacher education are discussed.

*Keywords: Inclusive education, inclusive practice, teacher education, higher education, Macao.*

## 1. Introduction

In response to movements towards creating more equitable education systems, many schools in Macao have assumed the practice of inclusive education based on the recommendations from the new Administrative Regulation (No.29/2020). The revised regulations stipulate that regular schools should support equal access to all learners and provide provision for learners with special education needs, including gifted students and those with physical and mental disabilities, adequate service and support (Education and Youth Development Bureau, 2022). The Macao Education Bureau's framework for action in inclusive education recognises the need to increase financial aid, resources, and collaboration between stakeholders and parents, and to strengthen the professional development of teachers.

Many schools in Macao now place a strong emphasis on including students with diverse needs and disabilities and require that teachers use inclusive pedagogies or strategies that accommodate different learning for students and understand the policies governing inclusion to support the participation and learning of all students. In addition, teachers are required to participate in ongoing professional development in inclusive education. Although there continues to remain diversified schooling approaches, inclusive education is now a predominant approach to teaching and student learning in Macao. Among the 75 schools in Macao (67 private and 8 public), 56 schools now offer inclusive education.

The new administrative regulation has implications on teacher development and initial teacher training and calls for restructuring teacher education and professional development courses. Since teachers are expected to play a crucial role in implementing inclusive education, they will need to adapt or change their educational practices to meet the needs of diverse students. Teachers will need to modify curricula, use differentiated instructional strategies and classroom management techniques, alternate assessment, and collaborate with other teachers, paraprofessionals and parents.

Teacher preparation for inclusive education is essential to ensure that teachers are equipped with the knowledge and skills needed to support the learning and development of all students, including students with special educational needs (SEN) and diverse backgrounds. A number of studies (e.g., Agbenyega, Ikegami, & Rivalland, 2021; Finkelstein, Sharma, & Furlonger, 2021; Kurth, Allcock,

Walker, Olson, & Taub, 2021; Rowan, Kline, & Mayer, 2017) have emphasised the importance of providing teachers with adequate training and support in inclusive education, incorporating diversity and social justice concepts in teacher education curricula, essential requisite skills and dispositions, encouraging cooperation and teamwork among teachers, and measuring of teacher's practice in the classroom. By providing teachers with the information and skills needed to support inclusion, schools could foster social integration, equity, and equal opportunities to facilitate a full range of learners.

Teacher preparation for inclusive education in Macao is currently offered either as part of an initial teacher education curriculum offered by four higher education institutions or as ongoing professional development. The Macao Education Bureau offer 30-hour and 100-hour courses for teachers in inclusive education. In the 30-hour course, teachers are introduced to teaching and learning strategies to support differentiated instruction. The 100-hour course offers training in thematic topics on children with specific types of needs and more severe learning disabilities. Many principals encourage all teachers to complete the 30-hour course but it is generally not a requirement for all teachers, whilst only those that work directly with students with SEN are required to complete the 100-hour course so that they can support the participation and learning of students with disabilities and register as resource teachers.

Despite the provisions in the administrative regulations on inclusive education, many schools in Macao still face difficulties in achieving inclusion. Among these challenges are attitudes and beliefs toward diversity, school leadership, inflexible curricula, teacher support, home-school collaboration, and lack of skills of how to teach students with disabilities (Correia, Teixeira, & Forlin, 2021; Monteiro & Forlin, 2021). One of the most significant barriers includes teachers' and other professionals' appropriate knowledge and training. While most teacher education programmes in Macao have changed in recent years to integrate content about inclusion, many newly qualified teachers and in-service teachers still feel unprepared to teach in inclusive schools (Monteiro, Kuok, Correia, Forlin, & Teixeira, 2019).

Research has shown that teachers face many difficulties and barriers when adopting inclusive education in their classrooms (e.g., Finkelstein et al., 2021; Qu, 2022; Sharma, 2020; Zagona, Kurth, & MacFarland, 2017). Research by Sharma et al. (2019) highlighted common barriers that teachers identified, including a lack of understanding of the concept of inclusion, inadequate teaching skills, and a lack of resources to fully implement inclusive practices as significant obstacles to adopting inclusive education. Indeed, Ryndak, Jackson, and White (2013) advocate that the best way to support students with SEN is to ensure they have greater access to the general curriculum and to improve the capacity of teacher preparation programmes to ensure teachers have the expertise to implement effective practices in inclusive classrooms. Other studies have shown that teacher education has the potential to contribute strongly to inclusive practices and the training of teachers strengthens the quality of learning experiences of all students (Main, Chambers, & Sarah, 2016). Thus, professional development and training have been seen as one of the most essential factors in promoting access and learning for students with diverse needs.

There is still a need to provide robust curricula for the professional development of teachers to fulfil the need for all teachers to possess a mastery of inclusive practices to support a range of diverse learners. Thus, this study aims to aid the identification of gaps between teacher preparation and inclusive practice and offer suggestions for better educational practices and improved learning results for students with SEN and disabilities. The purposes of this study were to: (1) examine and review current inclusive cultures and practices in Macao inclusive schools; (2) identify emerging challenges and barriers to quality inclusive education; and (3) use the identified challenges to develop recommendations to support teacher professional learning to enhance the efficacy of inclusive practice and to feed the findings into university course development to improve inclusive teacher graduate outcomes.

## 2. Research method and design

The study employed a qualitative research approach with semi-structured and in-depth interviews to understand teachers' perspectives of their schools' inclusive culture, practice, challenges, and barriers towards inclusive education. The interviews were conducted by research assistants in either Cantonese, English or Portuguese according to the participant's preference. Each interview lasted approximately 60 minutes and was audio recorded. The audio files in Chinese or Portuguese were all transcribed and translated into English by the research assistants and cross-checked by the authors. Thematic analysis was used to analyse and interpret interview data patterns. It involved a systematic data coding process in developing thematic categories and emergent themes. The participants were 20 in-service teachers working in 20 different private inclusive schools. Purposive sampling was used to obtain rich and detailed information from the respondents. Ethics approval was obtained by the Research Ethics Committee of the University of Saint Joseph before the commencement of the study and prior to the interviews, informed consent was obtained from all the participants.

## 3. Results

Thematic analysis of the interviews identified four major recurring categories, namely: inclusive cultures, inclusive practice, challenges, and barriers, with each category depicting several emergent themes. Table 1 demonstrates the four main categories and 18 key emergent themes.

*Table 1. Emergent Themes from the Interview Data.*

| Categories | Emergent Themes | |
|---|---|---|
| **Inclusive culture** | ▪ Education for all<br>▪ Respect for diversity | ▪ Bullying |
| **Inclusive practice** | ▪ Types of student assessment<br>▪ Test accommodations | ▪ Inclusive education pedagogy<br>▪ Differentiation |
| **Challenges** | ▪ Emotional and behavioural problems<br>▪ Parent expectations | ▪ Different attitudes toward inclusion<br>▪ Long IEP process |
| **Barriers** | ▪ Lack of specialists and human resources<br>▪ Lack of adequate teacher training<br>▪ Lack of teacher collaboration<br>▪ Insufficient time | ▪ Lack of teaching materials and resources<br>▪ Insufficient practical knowledge<br>▪ Lack of teacher standards |

### 3.1. Inclusive culture

Overall, the teachers expressed positive views on how their schools generally promote a secure, accepting, and collaborative community where all students are valued and accepted into the schools. Most of the teachers felt that the schools shared inclusive values that were conveyed to staff, students and parents. These are reflected in comments received from the teachers; for example, one teacher remarked, "Our school provides support for all students with learning difficulties and disabilities and also provides the infrastructure to support students with physical disabilities. Materials and facilities are provided to accommodate students" (T2). According to several teachers, students in their schools appreciated one another regardless of their abilities and cultural background. This is reflected by one teacher's comment: "Our school is quite inclusive because the students respect diversity. Our school has many students that come from other countries and that have different cultural backgrounds. Students learn to be sympathetic to one another despite their differences" (T4). One teacher also reported that bullying was less likely to occur in school as students often look out for one another, and the likelihood of marginalising specific students was uncommon in their school.

### 3.2. Inclusive practice

Many teachers acknowledged that they were not fully trained and prepared to teach mixed-ability classrooms and reported needing more training in inclusive education. Some teachers expressed the need for more knowledge in differentiating the curriculum to help students with SEN improve their learning. Two teachers (T11 and T15) indicated that they spent much time preparing extra worksheets for students with SEN so that they could catch up with the rest of the class. This indicates that teaching is still mostly didactic and that expertise in differentiated instruction is still limited. Many teachers indicated that the main form of assessment was summative and that tests were commonly used to assess students learning. Several teachers also remarked that they adjusted test papers for students with SEN.

### 3.3. Challenges

One prominent theme that emerged throughout the interviews for challenges was dealing with emotional and behavioural problems. One teacher indicated that behavioural problems were challenging to manage, especially when all attempts failed, and the student could not control his or her behaviour. One teacher remarked, "Behavioural problems can be challenging, especially when a student suddenly becomes unhappy or is in a bad mood, fails a test or suddenly begins to throw things. I cannot always stop my teaching to assist them. Therefore, I find this aspect difficult to handle" (T2). Another teacher remarked, "I once had a student who was anxious and agitated for a long period and I was unable to help him. I feel I do not have sufficient experience and skills to deal with situations like this" (T7).

Teachers also mentioned they occasionally encounter parents who refused to have their child assessed even after their child had been suggested for assessment. For instance, one teacher reported, "It may take a long time for some parents to agree to do the assessment. Sometimes parents feel that their child has problems but think there is inadequate evidence. Parents generally take a long time to make a decision about the assessment" (T6). Teachers also indicated that they usually involve parents in discussions of their child's learning difficulties but some parents feel that it is the school's responsibility to handle all academic issues.

Some teachers also identified issues with preparing the Individualised Education Plan (IEP) for students with SEN. They felt that it was a long process that involved many steps and many groups of people. The process was also seen as problematic due to different attitudes toward inclusive education.

## 3.4. Barriers

The teachers indicated several barriers, such as lack of time to prepare for differentiation, more work responsibilities, lack of specialists and human resources, inadequate teacher training, insufficient practical knowledge, lack of teacher collaboration, lack of teaching materials and resources, and lack of teacher standards. These are reflected in the comments received from the teachers:

*It would be better if teacher training is held in schools. I find it helpful when specialists in inclusive education share their experiences. I can develop knowledge in the area and learn how to handle different situations we encounter in inclusive classrooms. Our working hours in school are long, which makes it difficult to allocate time to attend training outside of school.* (T2)

*Some teacher training courses only teach theoretical concepts. As a resource teacher with more than ten years of experience, these general concepts are not useful for me. I would like to learn more about real cases in real classroom settings.* (T3)

*The teacher professional development courses on inclusive education generally focus too much on theory and very little on practical knowledge and practice.* (T20)

*One barrier is the difference in ideologies of inclusive education since teachers have different knowledge and experience. They will have their own standard and views towards inclusive education. Teachers may have different ideas about one student and this may cause some conflict between them.* (T6)

*When the number of students with SEN increases, the resources available to each student will decrease. In the past, there were constraints on the number of students with SEN the school could accept and the class sizes were relatively small but now there are many fewer resources available to students because of the increased number of students in class. We sometimes have ten students with SEN in a class, making it challenging for us to support them and other students.* (T7)

Several teachers also expressed the importance of working together with other staff members and paraprofessionals whose contributions were regarded as essential to the creation of individualised planning for students with SEN and disabilities. In promoting inclusive culture and practice, the teachers also stressed the need for, and value of ongoing professional development and more specialists, in particular, peripatetic staff and speech therapists.

## 4. Discussion

The findings indicate that many schools in Macao are embracing inclusion and diversity and have taken several steps to foster cohesive school cultures that support inclusive beliefs and ideologies. Schools are working to improve learning opportunities for students and teachers and are taking measures to provide education for all. Like previous studies (e.g., Sharma, 2020; Zagona et al., 2017), this study shows that teachers face many challenges in implementing inclusive education in their classrooms, including the lack of resources, time constraints, inadequate training, lack of collaboration, and different attitudes towards inclusive education. The results of this study support earlier findings that many teachers need more training to implement inclusive practice (Rowan et al., 2017). There is a need to provide ongoing quality professional development opportunities for teachers to increase their knowledge and skills around inclusive education. This calls for higher education institutions to provide relevant, up-to-date and practical teacher education programmes and professional development to better prepare teachers to work in diverse classroom environments. Based on the data, the following four recommendations are made to support professional development in higher education institutions to aid future development of inclusive schools and reduce barriers to inclusion:

1. **Provide practical knowledge and skills**. University coursework should translate into practical knowledge and skills that teachers can use in their teaching, especially how to translate theory and research findings into developing teaching, learning, assessment, and student support.
2. **Build strong models of teacher education**. University-based teacher education programmes can develop curricula that help teachers develop the dispositions to continue to seek solutions to challenging issues they encounter in a variety of classroom environments by offering essential knowledge and skills that teachers can use to inform their teaching practice as well as to learn from their practice.
3. **Incorporate graduate attributes.** Programmes should include graduate attributes that are engrossed in inclusive values and practice. For students to graduate, universities could demand that they achieve the fundamental competency standards for inclusive practices.

4. **Embed inclusive concepts and values.** Universities can align initial teacher education programmes with inclusive policies, and include current research and inclusive values in all courses within a programme and not only in stand-alone inclusive education courses.

## 5. Conclusion

The study shows that teachers play an integral role in the effectiveness of inclusive education. Inclusive education in Macao is developing, and there is clear evidence that inclusive cultures and practices are already taking root in many schools. Bringing the process to scale in every school for every student is the main challenge. This challenge could be addressed through targeted professional development, adequate resources, and effective ongoing collaboration with stakeholders towards inclusive education to ensure all students irrespective of their developmental profile receive equitable and quality education. Careful attention must be paid to the relationships between universities, schools and families to support schools that offer inclusive education. These partnerships are essential in equipping teachers with relevant knowledge and skills to teach in diverse classroom settings.

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# UNDERSTANDING HOW THE CYBERCULTURE HAS INFLUENCED LEARNING STRATEGIES CHOICES BEFORE AND DURING THE PANDEMIC

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## Abstract

The research project *Collaboration, Learning Strategies and Digital Literacy in Language Teacher Development* attempts to combine equity, resistance, and collaboration. The project aims at helping learners who have a lower level of English succeed in their ELT graduate course. Besides language development, the study attempts to promote learning strategies and methodology awareness, mainly related to the use of technology for teaching languages. This qualitative study may be considered a participatory action research (Brandão & Streck, 2006; Kemmis & Wilkinson, 2011), as all the participants (teachers and students) are part of the study, breaking barriers between researchers and subjects. It is a long-term study which began in 2014, and this presentation is only a part of it and focus on a better understanding of learning strategies choices. To do so, we conducted narrative interviews (Jovchelovitch & Bauer, 2015) in 2020 and 2023, in which participants were invited to talk about their study habits before entering university and the ones at their graduate course. Other instruments used were videos prepared by these learners and their participation on virtual learning environment (VLE) forums. Based on their narratives, we were able to compare their learning strategies choices before and during the Covid pandemic. The results indicate the following assertions: (a) Learners are not aware of what learning strategies mean, but they mentioned at least some of these strategies during the interviews; (b) Before the pandemic, they used technology mainly for research, as a resource of materials, and for social communication; and most of the strategies employed were (meta)cognitive and (meta)social ones. (c) During the pandemic, work and study depended on technology, so besides the learning strategies they already used before that period, they had to develop or adapt others, mainly (meta)affective strategies and (meta)motivational strategies. Based on these findings, we are now revamping the activities used in the project. The theoretical framework of the research includes discussion on learning strategies (Cardoso, 2016; Oxford, 1990, 2017, 2019); cyberculture (Santos & Weber, 2018); and the influence of the pandemic on education (Liberali, 2020)

*Keywords:* Learning strategies, cyberculture, social identities, teacher development, pandemic.

## 1. Introduction

This main objective of this presentation is to discuss the influence of the cyberculture on learning strategies choice, by comparing the ones employed by a group of students before the pandemic and during the pandemic. This participatory action research is part of the project *Collaboration, Learning Strategies and Digital Literacy in Language Teacher Development,* which attempts to combine equity, resistance, and collaboration. Equity because the main aim of the research is to help learners that have a lower level of English succeed in their ELT graduate course. As for resistance, as most of these learners have less privileged conditions and come from substandard quality schools, staying at university many times is much more difficult than entering it. As far as collaboration is concerned, the project consists of a participatory action research, in which all participants, teachers and learners, work together, searching for answers to our common challenges. Besides, as these participants are (future)teachers, another main objective is to develop methodology awareness and to discuss effective ways of using technology for the teaching of English.

## 2. Learning strategies

As mentioned by Cohen (2019, p. 31), "the construct Language learning strategies (LLS) has been defined – and consequently researched – in numerous ways over the years." Based on previous studies (Cardoso, 2016), my current working definition of LLS is the following: "conscious or automated actions carried out by learners in search of enhancement in the process of understanding, learning or retention of information" (Cardoso, 2016).

Just as it is difficult to reach a consensus on the definition of LLS, their classification is no less complex. For many years, I have adopted Oxford's (1990) classification, which resulted from compiling an extensive list of strategies identified in her previous studies. In this classification, the LLS are divided into two groups: direct strategies (directly linked to the learning process) and indirect strategies (also contribute to the processes of understanding or production, but not directly linked to them), as summarized in the following table:

*Table 1. A summary of Oxford (1990) LLS Classification.*

| LANGUAGE LEARNING STRATEGIES (LLS) | |
|---|---|
| **DIRECT STRATEGIES** | **INDIRECT STRATEGIES** |
| **Memory strategies** => responsible for creating mental links, applying images and sounds, efficient reviews and the use of actions. | **Metacognitive strategies** => responsible for centralizing learning (search for priorities), ordering and planning learning, as well as for evaluating the process. |
| **Cognitive strategies** => responsible for receiving and sending messages, for practice, for analysis and reasoning, for the creation of structures for reception (input) and production (output). | **Affective strategies** => linked to the decrease of anxiety, self-encouragement and emotional "temperature" control. |
| **Compensation strategies** => linked to intelligent guessing and overcoming limitations, both in oral and written production. | **Social strategies** => seek a good interaction with other students by asking questions, trying to cooperate with their colleagues and develop a good relationship with them. |

More recently, based on studies on self-regulation, the complexity theory and motivational strategies, Oxford (2017) presented a new classification of strategies. In this case, there are only four strategies (affective, cognitive, motivational and social). All with their corresponding metastrategies (meta-affective, metacognitive, metamotivational and metasocial).

Oxford (2017) states that there is no rigid division between these strategies. Sometimes, the same action demonstrates the use of more than one strategy. For example, on an exam a student might be nervous because they can't understand the instructions for one of the activities. After a while he decides to ask the teacher for help. The request for help is social, but it is still affective (trying to calm down).

Another important point is that language use strategies often overlap with learning strategies. For example, if a student tries to understand the meaning of a word through the context, she is using a cognitive strategy of reading (of use), but also of learning.

Also influenced by studies on the complexity theory, especially by the works of Larsen-Freeman and Cameron, Oxford (2017) nowadays considers the importance of context in choosing learning strategies (ecological view). To represent this ecosystem, which recognizes that the student is inserted in different contexts and that these contexts also influence the choice of strategies, she uses the Bronfenbrenner's model presented in Figure 1 (Oxford 2017, p. 106).

During the pandemic, the change in the macrosystem was huge and urgent. We were obliged to isolate ourselves at home and at the same time increase the use of digital technology to work and study. The change in the macrosystem affected the institutions, such as schools and universities (exosystem) and the interaction between learners and other learners and their teachers (mesosystem) which directly affect their physical and mental health (microsystem). The most important strategy during the pandemic was focused on survival. Finally, the chronosystem corresponds to the time system. And time operates across all systems.

*Figure 1. Bronfenbrenner's theory of contexts (Oxford, 2019, p. xxix).*
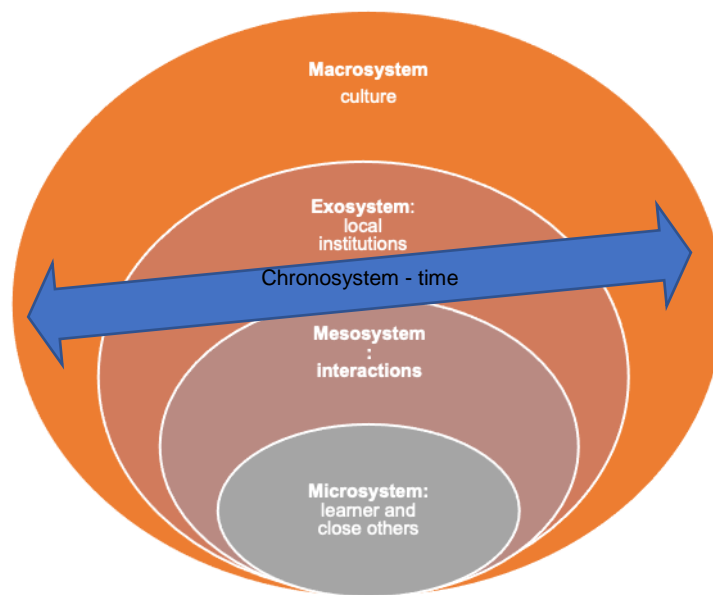


## 3. Cyberculture and Covid the pandemic as macrosystems

Santos & Weber defines cyberculture as "contemporary culture mediated by networked digital technologies in cyberspace and cities" (Santos & Weber, 2018). In this new digital culture, it is almost impossible to live without new technologies. Technologies transform not only our lifestyle, but our cultural relations of knowledge production. According to Bronfenbrenner's theory, cyberculture could be considered a macrosystem, which may affect all the other systems.

However, the pandemic made us realize that cyberculture is not yet true for everyone, or that at least some are much more affected by the digital division. The pandemic brings not only disease and death (more than 700,000 in our country), but also joblessness, hunger and unequal access to education. The problem already existed before Covid, but the pandemic opens up social differences. Liberali (2020), discussing the concept of necropolitics (in the case of the pandemic of having to choose who lives to die), argues that we cannot admit necroeducation (who will have access to education and who will not). In many moments of this pandemic, necro-education linked not only to hunger, but also to digital exclusion, became very clear. Another point that became clear was that many of the teachers (perhaps most of them) were not prepared to work remotely. It was in this context that this study was developed.

## 4. Methodology

This study adopts a qualitative approach that seeks to reflect on the language acquisition process. Therefore, the influence of different factors in this learning process is considered. In the present phase of the research, we would like to focus on three factors: teaching and learning strategies, digital technologies, and the importance of the students' socio-historical context. The idea is to understand how these factors influence each other and, consequently, the language learning process.

Considering that cyberculture we live in and that the physical distance caused by pandemic forced us to use digital technologies, we would like to answer the following questions:

- How has the use of digital technologies) influenced learning strategies choices before and during the pandemic?
- How can digital literacy help in the development of a more collaborative, critical reflective approach to the language teaching practice, and consequently, to the language learning process?

In attempt to answer these questions, this ongoing study has been conducted since 2020.

### 4.1. Participatory action research

We consider the present study as part of a participatory action research project (Brandão, 1981; Brandão & Streck, 2006), since "researchers and researched are subjects of the same common work, albeit with different situations and tasks" (Brandão, 1981, p.11), being an attempt to know the practice itself to try to transform it, as we believe that practice and theory must go hand in hand. Research

participants are not simple users of knowledge produced by an external researcher, but knowledge producers who seek to improve pedagogical practice and/or their own learning process. For Kemmis and Wilkinson (2011, p. 41-43), in addition to the spiral circle of self-reflection cycles (planning, action and observation, reflection, re-planning and so on), participatory action research presents other fundamental characteristics: it is a social process; it is participatory; it is practical and collaborative; it is emancipatory; it is critical and it is recursive (reflexive, dialectical). We believe that reflection is not an isolated moment and that all phases of research require reflection, critical view and collaboration.

### 4.2. Participants and procedure

The research instruments consisted of narrative interviews (Jovchelovitch & Bauer, 2015) Virtual Learning Environment forums, questionnaires, and videos.

The first phase of the research was mainly that of choosing participants and planning the next actions. For the second phase, we interviewed six students in 2020: three who had worked as interns or monitors and three who were beginning to participate in the project. During the research (2021-2022), the last three ones prepared reports and videos about their experiences and answered a feedback questionnaire in 2023. In 2023, we also interviewed four participants of the project and finally they answered a feedback questionnaire.

The choice of participants to take part in the project was based on indications from professors, tests or the student's own interest in looking for monitoring or the project directly. During the narrative interviews, we mainly talked about their experiences studying languages before college and what they expected from the Literature course and/or the project (See Table 2).

*Table 2. Script for the narrative interviews.*

| Time of the interview:<br>Interviewer(s):<br>(Describe briefly the project.) | Date:<br>Interviewee: | Venue: |
|---|---|---|
| **Information** | **Objective (Try to make them...)** | **Possible prompts** |
| **Personal information** | Identify the participant | *Please, tell us/me your name, if you are still a university student and what is relation to the project.* |
| **Studying English before university** | Get to know their history before university as far as language learning is concerned. | *Tell us a little how you studied English before you entered UERJ.* |
| **Information about their experience at UERJ** | Make them narrate their experience at university. | *Now tell us about your studies during college.* |
| **Exmanent and/or immanent questions (extra questions)** | Mention the project, the use of digital technologies and/or language learning strategies (if they haven't already mentioned it/them. | *Talk a little more about the resources and/or strategies used in addition to those already mentioned, if you used them, of course.*<br>*Tell us about your role in the CEALD project / how you found out about the CEALD project.*<br>*(Other questions that may arise)* |

For data analysis, we used the model proposed by Bortoni-Ricardo (2008): analysis by assertions. Bortoni-Ricardo (2008, p. 53) defines assertions as "an affirmative statement in which the researcher anticipates the revelations that the research may bring." These assertions may be modified during the research, depending on the progress of the study, and may also be divided into sub-assertions. In the case of the current study, we had the following initial assertion:

- The pandemic contributed to the recognition of cyberculture, as students and teachers were forced to establish new relationships with digital technologies, which consequently influence the choice of language teaching and learning strategies.

The analysis procedure consists of identifying in the narratives and responses of the participants references to the following interpretation themes: learning strategies, digital technologies and collaboration, always seeking to confirm, modify, or discard each of this initial assertion.

### 5. Findings and future work

After analyzing learners' narratives in the interviews and their comments on the VLE forums it was possible to subdivide the original assertion in the following sub-assertions: (a) Learners are not aware of what learning strategies mean, but they mentioned at least some of these strategies during the interviews; (b) Before the pandemic, they used technology mainly for research (i.e., checking the meaning of words and expressions and finding information about a specific topic), as a resource of

materials (i.e., reading texts, listening to podcasts, downloading music and videos), besides social communication (social networking), and most of the strategies were (meta)cognitive and (meta)social ones. (c) During the pandemic work and study depended on technology, so besides the learning strategies they already used before that period, they had to develop or adapt others, mainly (meta)affective strategies and (meta)motivational strategies; (d) During the interview another issue arose: social identities influencing learners' motivational and affective strategies

Something we can't help but realize is that the pandemic has completely changed many of our habits. Therefore, now it would be interesting to see how this pandemic period influenced our relationship with digital technologies and, consequently, with the strategies we use (we will use) in the post-pandemic period. During the pandemic, one of the most used ways to communicate was social media. The only way to study was via digital technologies, so very possibly we will never be the same after this period. And, therefore, this becomes one of the focuses of my future studies.

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# EDUCATION FOR SUSTAINABLE DEVELOPMENT.
# PERSPECTIVES ON INEQUALITIES THROUGH A DIGITAL SERIOUS GAME IN HIGHER EDUCATION FOR STUDENT TEACHERS

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## Abstract

The background of our project is the 2030 Agenda of the United Nations, which was published in 2015 in the document "Transforming our World". The UN's 17 sustainable development goals are part of the 2030 Agenda, including gender equality, quality of education and climate protection.
ESD and Global Learning have been developed accordingly. They also aim at transformative learning. ESD has received a lot of attention in recent years. It is now a crosscutting task for all teachers in schools in Germany, as they are expected to integrate ESD into their teaching, but this makes it clear that future teachers will have to acquire relevant competences and acquire specific expertise related to ESD in the course of their training. After all, they will be the ones who make future generations co-creators of a sustainable society. ESD is therefore an enormous challenge for the education sector. This is exactly where our project comes in. In an interdisciplinary teaching and research project funded by TU Dortmund University, we are developing a digital Escape Room in which students have to solve puzzles that map dilemmas from SDG 10 (Less Inequality). The BNE[Room] cartography simulates a school building or a classroom in which the students act out different situations. The avatars are student teachers who are confronted with concrete tasks and dilemmas from SDG 10 that can only be solved in an interdisciplinary small group. This is achieved by designing the Escape Room like an adventure game or treasure hunt. SDG 10 is the biggest educational challenge for us, as many students in Germany are disadvantaged. As the students come together from different disciplines, we use the opportunity for interdisciplinary exchange of student teachers, combined with the aim to raise awareness of social inequalities (poverty, inclusion, gender, etc.) in the school context.
Key milestones are:
1. The development of a digital Escape Room (BNE[Room]) for student teachers - including the conception of the BNE[Room] and the development of the storyline. 2. The testing and implementation of the BNE[Room].
2. Testing and implementation with the students, embedded in the seminar context, and
3. The academic monitoring and evaluation of the project.
In summary, this interdisciplinary project aims to implement ESD more strongly in teacher education. A special focus is on the development, implementation and evaluation of the digital Escape Room. The results of the evaluation are based on tests and can be adapted for most relevant SDGs and the interactive Escape Room will be further developed.

*Keywords:* Teacher education, education for sustainable development, Escape Room, SDG 10, inequalities.

## 1. Introduction

Due to the current geopolitical, economic and ecological situation, the topic of sustainable living is increasingly becoming the focus of various levels of society. In this context, special importance is attached to education for sustainable development. With regard to the current discussion on Education for Sustainable Development (ESD), approaches and considerations that have already been developed and discussed are used. This can be exemplified by Wolfgang Klafki's critical-constructive didactics. Thus, in connection with the definition of a new concept of general education, he stated that it is of great importance to "gain an awareness of central problems of the present and, as far as foreseeable, of the future, insight into the common responsibility of all in the face of such problems and the willingness to participate in overcoming them" (Klafki 2005, p. 4, translation by the author). In a shortened form, he summarizes this under "epoch-typical key problems" (1996, p. 53) such as "war and peace", "socially

produced inequality", etc. In Klafki's sense, ESD comprises "epoch-typical key problems" that must be "solved" globally, interdisciplinary and morally (Klafki 1996 p. 60 ff). Teachers are ascribed a central role here, as they act in a double didactic sense: On the one hand, the perception of societal transformation processes, and on the other hand, the teaching of future-oriented skills and abilities that enable students to shape their own future. However, this role is never free of contradictions, because people act against their better judgement when they show the will for sustainability but do not act sustainably. On a higher level, this ambivalence is also found in education policy programs, such as the shortage of teachers in Germany, which is to be remedied by low-threshold expansion strategies. At the same time, the postulate of professionalization and quality offensive is being pushed. This contradiction is called the "Attitude Behavior Gap" (Prothero et al. 2011). When arguing from a sociological perspective, the question must be asked how the goal of an explanation of action and an action can be intentional. This requires a reflexive engagement of the subject with the object of sustainability, or as will still be argued here: with the object of social justice. The importance of action (Krieg 2016) becomes all the more virulent the more intensively the issues have arrived in social discourse (Seifi et al. 2012). The debate is thus both a societal task and one that concerns the education system, as societal problems and the transformation to sustainability are only conceivable together (Brocchi 2019 p. V). It is thus a matter of achieving the sustainability goals adopted by the UN and of raising teachers' awareness of social inequalities and developing viable strategies that enable students to effectively shape their lives in a contradictory environment. This raises the question of what is meant by social inequality and why it is important to discuss this in the context of Education for Sustainable Development.

## 2. Social inequality and (in-)justice

Questions about the causes and effects of social inequality are not new and were discussed even before Karl Marx and Friedrich Engels (ibid. 1848). It should be noted that unequal and thus unjust distribution of life chances has always existed in all historical and modern forms of life. However, the interconnectedness of ecological, economic and social challenges is particularly evident in the current crises. Solga et al. "speak of social inequality whenever people (always understood as members of social categories) have unequal access to social positions and these social positions are systematically linked to advantageous or disadvantageous conditions of action and life" (Solga et al. 2009, p. 15). However, the way in which the unequal distribution of resources (material, such as property, or immaterial, such as power) is viewed depends on the respective epoch (Burzan 2011, p. 7). This is also accompanied by reproductions of inequality structures that manifest themselves in principles of superiority and subordination and are considered socially accepted. Associated with this are recurring questions:

"Is social inequality unjust and must be overcome if possible, or is it at least partly, under certain conditions just and even necessary for social coexistence [...]?" (Burzan 2011 p. 9, translation by the author). Is it enough to know the causes of social inequality in order to point out corresponding solutions for politics, education and society? It becomes clear that if school is not understood as a social space (cf. Bourdieu 1979); structures of inequality are maintained or reproduced largely. Consequently, it is necessary to discuss how prospective teachers are enabled to free themselves from these hegemonic "certainties" in order to be able to deal with them. Furthermore, issues of social justice and social inequality are linked to economic growth on the one hand, but also show up on another level. The findings on child poverty in Germany by the Bertelsmann Foundation 2020 make it clear that more than one in five children under the age of 18 grows up in poverty: "Growing up in poverty restricts, shames and discourages the lives of children and young people - today and with a view to their future." (Bertelsmann Foundation 2020 p. 1, translation by the author). Social participation is thus only possible to a very limited extent, especially since the data suggest that child poverty is establishing itself as a constant factor in the life course of children and young people (Tophoven et al. 2017). However, if one understands school as a place that seeks to reduce social inequality in parts, aspects such as social participation (against the background of the child poverty record) and knowledge about global resources and climate change in school contexts come to the fore. For this, a look at the Whole Institution Approach is suitable in order to perceive contradictions on the one hand and to be able to act despite contradictions on the other.

3 The Whole Institution Approach and the "BNE^Room" research and teaching project

The Whole Institution Approach (WIA) can be mentioned as one way of addressing the ambivalences and challenges already outlined at the institutional level. The holistic approach of a WIA starts with changing a school culture that focuses on participation, transparency, mindfulness and the individual potentials of the students (Birkel 2021, p. 120f). Crucial for a change in the educational context is the teachers' scope of action to enable participation and cooperative collaboration of teachers in the

school system and thus also in relation to the students (Birkel 2021 p. 123f). In the medium and long term, not only the school system but also actors in non-school education, politics and civil society need to be taken into account. This is because social inequality, if one takes the common social structure analyses as a basis, is a mixture of class characteristics, gender, ethnicity, age, religion, etc., which are theoretically treated in their respective references but have little relationship to each other (Schwinn 2007 p.88). WIA must therefore take into account the context of a diversity-sensitive society if it is to live up to its claim of striving for sustainability as a development goal at all organizational and institutional levels and thus anchor it in social processes, negotiations and discourses. However, WIA must not remain on a theoretical-discursive level - it is about empowering people in organizations and institutions to act in the spirit of sustainability. This applies in a double didactic sense: education for sustainability as a topic and with regard to a sustainable organizational culture, such as resource use, diversity or an appropriate culture of participation. One approach on how this interweaving can be established is the project "BNE$^{Room}$", which is presented in the following.

## 3. Interdisciplinary research and outreach project: "BNE$^{Room}$" and the structure of an Escape-Room-Based teaching unit and research approach.

For this interdisciplinary project, we are developing a digital Escape Room. An important aspect of the project is to bring the future teachers together across disciplines. They draw on different knowledge bases and try to work on the tasks set in dialogue. In the accompanying research, we focus in particular on the negotiation processes of the student teachers. The following research questions are guiding:

1) Which different educational and learning processes can be triggered in the students with BNE$^{Room}$ (subject-related, didactic and action-oriented transformation processes in relation to ESD)?

2) How can mechanisms of action of BNE$^{Room}$ be identified in terms of processes (different measurement points)?

In order to answer the research questions adequately, we follow a social constructivist logic. Since all three-project leaders come from different disciplines, both content-related and interdisciplinary prerequisites are given. In the "BNE$^{Room}$" project, the seminar structure will consist of three parts. In the first part, the topic will be introduced to the respective teacher training programs from a subject-specific or educational science perspective. The students will work within their subject discipline (in our case theology, vocational education and educational science). Then the whole group is divided into interdisciplinary seminar groups. The Escape Room is used and explored, with the students complementing each other due to their different disciplines. The third part consists of reflection in seminars in their own subject. Here, the student teachers have time to exchange ideas and clarify what worked well and what did not. At the same time, the experiences with the Escape Room are used to derive initial ideas for conceptual and pedagogical-didactic action in the school and to establish a reference to an emancipatory ESD. Within the framework of the accompanying research, a Designed-Based-Research approach (DBR) is applied, which enables the further development of teaching-learning arrangements and a discrepancy experience in pedagogical practice is important as a starting point for the approach (Reimann 2022). It is precisely this focus on a school problem that is taken into account in the development and evaluation of the Escape Room with the theme SDG 10 "Reduce inequality". The Escape Room enables student teachers to learn together how to deal with challenges on this topic. It can therefore be understood as an intervention within the framework of the accompanying research. In educational science, DBR can be classified as developmental research in the field of practice research, so that its goals are often bipolar, according to Lehman-Wermser and Konrad (2016). On the one hand, it aims to solve relevant problems from educational practice (here: reducing inequality of opportunity in the education system) and, on the other hand, to produce results that contribute to theory building (here: Benefits and limitations of implementing a digital escape room on ESD in teacher education). In order to evaluate the digital Escape Room, students will be surveyed with questionnaires in a pre-post design. In addition, the students will be filmed while using the room and during the subsequent group discussions about the results of the Escape Game. This is done in the "Labprofil" of the TU-Dortmund (https://doprofil.tu-dortmund.de/labprofil/), which has the appropriate technical equipment. The aim of analyzing this data is to evaluate how effective the dilemma situations are for the empowerment of the students. At the same time, insights into the inner structure of the students' negotiation skills are to be gained and the (interdisciplinary) knowledge they claim is to be recorded. Against this background, the evaluation will be evaluated according to the documentary method (Bohnsack 2021).

## 4. Conclusion and outlook

In summary, the interdisciplinary project "BNE^Room" in teacher education aims to anchor ESD more firmly in teacher education. In doing so, it takes into account the fact that ESD changes school and university educational processes. Accordingly, teacher education must also change in order to provide future teachers with the skills and abilities they need to meet the challenges in education. Interdisciplinary exchange contributes to this just as much as sensitization with diverse categories of difference. A first questionnaire survey among all participating students has already shown that the topic of ESD is classified as underrepresented in the study programme. We can thus confirm the results of Rieckmann and Holz (ibid. 2017). In addition, all respondents are of the opinion that ESD is particularly important as a subject. When asked who is responsible for the implementation of ESD, an overwhelming majority shows that the implementation should follow a top-down strategy. It also shows that the student teachers surveyed have little to no competence in dealing with digital Escape Rooms, which on the one hand increases the willingness to participate in the project and on the other hand underlines the urgency of linking educational offers and digitally. The first evaluation shows the importance of the project on almost all levels and therefore encourages us to continue working on it.

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# ACCEPTANCE OF CHILDREN WITH SPECIAL NEEDS – THE KEY TO UNIVERSAL ELEMENTARY EDUCATION

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## Abstract

The number of children with learning disabilities is on the rise. The latest data from UNICEF estimates the number of children with disabilities to be over 240 million. In India, 1.67% of the 0-19 population suffers with disabilities of one or the other kind. 35.29% of disabled people of world are children. Only 1% of children with disabilities have access to schools and one-third of most disabilities are preventable. But as on date a fully comprehensive data on this topic in India remains incomplete. Statistics aside, it is a fact that there is an increase in the number of Children with Special Needs (CWSN). The reasons are many. But society's lack of responsibility towards this cannot be denied. There are many socioeconomic factors that cause disability in children. Again, it is the society's attitude that acts as an impediment in helping a child overcome such disabilities and be a part of the mainstream. In most areas of development, a CWSN is disadvantaged compared to children without disabilities. Be it education, nutrition, protection from violence, exploitation, and accessibility, these children do not enjoy equal rights with other mainstream children. The Right to Education Act 2009 in India speaks of ensuring Free and Compulsory Elementary Education for all children. Universal Primary Education set as the 2nd Millennium Goal by UN was to be achieved by 2015 and this objective was also taken up by Samagra Siksha Abhiyan in India, Equal right to education has been assured by the Rights of Persons with Disability Act 2016. Yet, out of 78.64 lakh children with disability in India, three-fourths of those aged five years don't attend any educational institution, according to a 2019 UNESCO Report. The situation has been further aggravated by the pandemic and consequent lock downs. It has been globally realized that integrated education is essential in bringing these children to school, develop their intellectual capability, generate their self-sufficiency, social skills and to open avenues for employment. Social barriers in the mainstream regarding disability, lack of awareness and empathy, lack of relevant infrastructure for such children in most schools, and majorly lack of acceptance are some of the reasons behind the exclusion of these children from mainstream education. The objective of this paper is to analyse the road blocks to the inclusion of these children into education to suggest possible solutions to remove them and ensure their acceptance.

*Keywords:* Acceptance, inclusion, awareness.

## 1. Introduction

Education today, is one of the most important means for improving the personal qualities of an individual, for capacity building, for overcoming difficulties and in the process to bring about sustained improvement in the quality of his life. The role of education to meet basic learning needs of every person in order to shape human development has been emphasized through several cross-cultural studies. Development economists have shown through their studies that one generation of educated parent can bring about changes in the quality of life of the next generation, their health and well-being.

Therefore, Universal Elementary Education has been one of the Millennium Development Goals of the United Nations. The target date for achieving this was 2015. However, this could not be achieved. The Sustainable Development Goal 4 of the United Nations, also aims to ensure "inclusive and equitable quality education" and to promote lifelong learning opportunities for all. This also could not be reached.

### 1.1. Objective

While the immense impact of COVID-19 on education of children is cited as a major cause of this, the objective of this paper is to highlight the lack of acceptance of Special Needs Children in India as a vital reason why this target will always be difficult to achieve.

## 1.2. Present status of school education

According to a Report published by UNESCO and Tata Institute of Social Sciences, dated 3rd July 2019, out of 78.64 lakhs children with disability in India, three fourth of those aged five years and one-fourth of children aged between 5 to 19 do not attend school. It further states that only 61% of them attended an educational institution, 12% had dropped out while 27% had never been to school at all.

There is difference among different types of disabilities. 20% of children with visual and hearing impairment do not attend school, whereas more than 50% of those with multiple disabilities, mental diseases and mental retardation do not attend school.

There are fewer girls than boys found in schools. What is most appalling out of the total population of disabled children in India, 45% failed to attend literacy. The impact of COVID-19 has made it worse.

In India, access to even quality life for Children with Special Needs has been historically limited. There was a time when the birth of children with disabilities was considered a curse of God. Also, it was believed that persons with disabilities were complicated and harmful, like Manthara in the Ramayana and Shakuni in the Mahabharata. Therefore, a negative attitude towards disability grew in the minds of people over centuries. Even standing now in the 21st century we find remnants of such thoughts in the minds of people. Therefore, in addition to lack of resources, access to schools, inadequate architecture and understanding of their unique learning needs these children face barriers in accessing education due to lack of acceptance.

## 2. Accepting the CWSN

At every step a child with disability faces the lack of acceptance. The immediate reaction of parents on the birth of such a child is one of denial. They find it difficult to accept that their child has a difficulty. In case of uneducated parents, they remain indifferent to the difficulties of the child and take it as the will of God.

Finally, when the parents go for medical advice and receive the diagnosis it cuts like a double-edged sword. On one side the parents face the fact of their child's disability and on the other the pain of their child's exclusion by family members and the society. It is here that a very difficult journey starts for the parents. They must reorient themselves to the current need of the child reorganize and make fresh plans. Parents are confused with not much of help coming from the immediate surroundings. Stress leads to spousal misunderstanding. The parents often cannot come to an understanding as to what is the best way to cope with the situation, where to go, from whom to seek help?

They need support, understanding and above all trust to go ahead. This is a point where they often lose hope or give up thinking there is no salvation. The opportunity of early intervention is often lost. Those who overcome go a long way in developing their child.

## 3. Lack of acceptance and exclusion – case studies

Lack of acceptance is one of the major impediments to inclusive education. It is a common phenomenon that parents of neuro-typical children react to Disabled children being in the same class room.

In July 2022, three neuro-typical children, siblings, came for admission to Blooming Dale Academy School, a reputed inclusive school in Kolkata. While they were completing their worksheet for assessment, few disabled children came down the stairs for their Physical Education class. The father reacted to the fact that the school "admits such children" and refused to even let his children complete their assessment and left.

A mother whose child has autism and is in Blooming Dale Academy broke down in tears as she related how other mothers withdraw from the park when she takes her child to play there because he is "different".

Sometimes schools are not sensitive to the needs of a child with disability. Sourya, a child with learning disability was held in strong criticism by the teachers in a school he attended in Kolkata. He started resisting going to school. When his mother met the teachers and tried to draw attention to this she was not heard. "They said I was insane!", she said. Yet despite being a slow learner Sourya is good at elocution, a quality the school did not even explore.

Sudha Madhavi, whose child, Raju has epilepsy, autism and a learning disability said in an interview on 15th July 2022 at Bangaluru that nobody accepted her child in a mainstream school and she had to teach her son at home all by herself. "I am alone fighting for my child," she said.

Another parent from Bengaluru not willing to disclose her identity, whose daughter had cerebral palsy said that two schools refused admission to her child because she was not normal (Agarwal, 2023; The Wire, 2022).

A sample survey was conducted in February 2023 among a cross section of parents of children in special needs, from different countries in an Institute in Mumbai where they had come for the neuro-rehabilitative therapies of their children. The parents were from Nigeria, Tanzania, Kenya, Canada, USA, and Mauritius.

It was revealed that they received complete support from the government, the school, the family, and the society. Most of them never faced a situation of exclusion or isolation. So, they could concentrate on the development of their children.

David (name changed), now 16 was diagnosed with autism when he was three years old. He progressed well and was doing his academics but the lockdown had an adverse effect on him. He stopped socializing, withdrew into himself and refused to leave his home to go anywhere, when all attempts to send him to school failed, the teachers would come home on a regular basis to teach David. The mother got full family support in her efforts to guide David out of his difficulty.

Mary (name changed) from Kenya is the mother of a triplet. All have autism. The diagnosis came when they were two. It was difficult to manage them as they would break everything, did not sleep, and did not sit still for long. Mary went into a depression, became suicidal. But it was with family support that she could stabilize and concentrate on the development of her children. The children attend school, now at the age of eleven they are doing better. She came to Mumbai for the neuro rehabilitative therapy of her children as she found it less expensive and effective here and expressed her gratitude to her husband for supporting her.

A similar survey was conducted among parents of special needs children in Kolkata in January 2023. The picture revealed was different. In most cases not only the children but the parents face exclusion from the society. Most of the children could not fit into mainstream schools for lack of empathy and understanding of their problems. Though acceptance by the immediate family has improved to a large extent there are still cases of gross intolerance by the father. They are mostly not aware of the facilities available from the Government so do not avail them. Due to lack of proper awareness the parents do not know what is the path ahead of them.

Srinjoy is autistic with severe OCD. The mother and the uncle are sincerely working on the development of the child by admitting him in an inclusive school and by regularly taking him for neuro rehabilitative therapies. But there is no acceptance from the father. Srinjoy is often beaten up and ill-treated by the father which causes severe setback in his development.

Aryan (name changed) took admission to Blooming Dale Academy in Class IV with severe autism. He had attention deficiency, and would not settle down in the classroom. He started to like the school environment and his teachers. His performance in his academics improved too. After the lockdown his behavioural problems increased. When he was in Class IX he was withdrawn from school because his family felt that he was not fit for mainstream education. Later the mother confided that she did this under family pressure.

Inclusive education is the only path that would lead to Universal Elementary Education but the prevailing condition makes it obvious that the main impediment to inclusivity is lack of acceptance of disability by the society, the mainstream schools, teachers, and parents.

This is even though there are strong legislations laid down by the Government of India in form of the Right to Education Act 2009 and the Persons with Disability Act 2016.

## 4. Legislation

The Right to Education Act 2009 speaks of Free and Compulsory Education for all. It has made provisions for Resource Rooms and Resource teachers. The Rights of Persons with Disabilities Act, 2016 (RPWD Act) states that educational institutes should "provide reasonable accommodation according to the individual's requirements and provide necessary support, individualised or otherwise, in environments that maximise academic and social development consistent with the goal of full inclusion,"

But these legislations still have certain gaps which reduces its effectiveness in making inclusive learning successful. There is a lack of harmony between the main legislations that govern inclusive education in India. For example, even though the RPWD Act makes inclusive education a statutory guarantee, the Right of Children to Free and Compulsory Education Act, 2009 (RTE Act) does not even define inclusive education.

The Right to Education Act mandates enrolment, but does not make provision of resources needed for the actual education of a child with disabilities. Provision of home-based education is not strong, and so in rural India if a child opts for home-based education the child may not be getting any

education at all. Laws relating to right to education and disabilities have certain ambiguities too. For example, it does not specify where the children with disability must study. There are gaps in terms of appropriate norms and standards applicable to all educational institutions. The availability of Government Resource Centres and Resource Teachers are inadequate and so they cannot cater to the needs of the children with disabilities.

The National Education Policy (NEP) came about in 2020. By 2030 the NEP aims to "provide inclusive and equitable quality education and encourage opportunities for lifelong learning for everyone". Children with benchmark disabilities as defined by the Right to Persons with Disabilities Act 2016 has been included in the NEP and it recommends the option of attending regular schools or special schools, resource centres as well as home schooling. It also says thar special teachers and trainers will be available for the various rehabilitation and educational needs of such students.

The NEP talks of Universal Design for Learning which may be curriculum, teaching and assessment tools designed to meet the needs of all learners including those with disabilities. It recommends the use of assistive technology, like screen readers and speech softwares.

Individual Education Plan is recommended for the Special Needs Children to be prepared in consultation by parents, teachers and other professionals and reviewed period.

The NEP recommends disability friendly infrastructure in schools with facilities of ramp, elevators etc.to offer easy access to the Special Needs children. It recommends teachers' training, collaboration between regular schools and special schools to provide support to the Special Needs Children. In fact, these guidelines are in line with the global trends towards inclusive education. However, the NEP in a way ignores the reality. As of now not only are most teachers unprepared for such specialized teaching, but most Indian schools are severely understaffed. The strategy also makes no mention of how it intends to build individual-accessible alternative home-schooling systems. In a recent survey conducted by the Delhi Child Rights Commission, 60 percent of schools claimed having no pupils with disabilities, while another 28 percent reported having less than 1%. The new strategy does not include a plan for how to access to education or what changes to the curriculum will be made to ensure that students with learning problems are not left out in today's highly competitive Indian educational systems (Sharma, Chari, & Chunawala, 2017).

The legislation, policies and recommendations in recent days make it clear that we are not oblivious to the requirement of Special Needs Children but where we are falling short is in the area of implementation. Even though concepts like equality, equity, and inclusion appear several times in the policy statement, there are numerous gaps that need to be addressed. For example, reservation of seats for the Special Needs Children has been laid down. But it is applicable to Government schools. Private schools are not bound by this and so their doors are not readily opened for a Special Needs Child.

This again brings us to the point of acceptance/ Unless there is acceptance in our heart no amount of research or legislation will bring about a change in the status of inclusion of these children in education.

## 5. Recommendations

- A detailed data in the Government portals regarding the number of disabled children according to the category of disability. After the Census Report 2011 no data appears to be available.
- Concentrated awareness programs to generate consciousness regarding the rights of the children with special needs and their acceptance in the mainstream society. The institutions may organise initiatives to raise awareness of and acceptance of diversity as an element of human existence.
- Regular surveys by local bodies and NGOs to identify such children in the locality and bring them to schools for admission.
- Structural, funding and attitudinal changes to ensure that no child is left out of the right to education.
- Changes in teaching methods to aid the inclusion of diverse learners. There should be regular training in the use of teaching learning materials
- Establishing a coordinating mechanism under the Ministry of Human Resource Development for effective convergence of all education programs of children with disabilities
- Centers for counselling of parents which they can approach for guidance when they are struggling for a way forward.
- More Resource Centers across the country specially in remote areas
- Sensitization of the society in matters of acceptance through workshops and programs and discussions in the mass media

- Government support to NGOs and private institutions which are working for inclusion and acceptance of the Special Needs Children. It is also time that the attitude of acceptance and inclusion is taken up by the Government in its Institutions more seriously.
- Effective implementation of the Right to Persons with Disability Act. 2016 with initiative from the Government and civil bodies. For example, this Act specifies that any act or comment which may cause the dignity of a disabled person to be hurt is punishable even by imprisonment. But in reality, there are incidences of isolation and ostracism which causes hurt to the person and the family. Most of the parents are not even aware of the facilities/specified in this Act for their children.
- The objective of all who are working for this cause is to find the Special/need children an equitable place in the mainstream

## 6. Conclusion

Despite all the difficulties when parents accept the challenge and mobilise their child ahead with optimism and determination they meet with success.

If we look around, we will meet persons in every walk of life who have succeeded in overcoming their disability and are doing well for themselves.

This is as true as the fact that many children with special needs drop out of education. The difference is brought about by a difference in attitude. And this difference is in terms of acceptance. In terms of having faith in their capability and in terms of their acceptance as a part of the mainstream society.

Acceptance can only ensure that these children are entitled to their rights to free and quality education. We as teachers., parents and members of a civil society must wake up to the fact that by including them we can make our society stronger because they are rich in possibilities. And if they are not included Universal Elementary Education will just remain a distant dream.

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# YOUTH CYBERBULLYING – UNDERSTANDING CONTEXTUAL PATHS TO PREVENTION AND RESILIENCE

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## Abstract

The purpose of this project is to explore cyberbullying processes in youths from 12 to 24 years old in relation to their surrounding environmental systems or assemblages. We aim to contribute to a better understanding of cyberbullying processes among young people in the chinese society, and its mental health, well-being, and psychosocial impacts (e.g., anxiety, depression, suicidality, and aggression). Youths are located within specific socio-ecological contexts and, therefore, are affected by their surrounding environmental systems. Accordingly, young people's interactions with their online environment, associated online risks, and experience of harm are shaped by a complex interplay between them and their wider social environment (Görzig & Machakova, 2015). Bronfenbrenner's socio-ecological framework considers the individual as the locus of analysis within a larger socio-ecological setting composed of different levels. We apply that framework to cyberbullying by considering different levels of the socio-ecological system, namely the: (1) micro and meso systems, such as family, school, peers, as proximal contexts which directly influence the situational context of cyberbullying processes; (2) exosystem, which involves the process external to the immediate environmental setting, such as the community, and mass-media or digital technology; and (3) macrosystem, nested within broader contexts, such as institutional policies, support frameworks, and online culture. To apply a socio-ecological perspective (Bronfenbrenner, 1979, 2005), we used a quantitative approach, collecting data from youth, but also from key-stakeholders involved in the larger context. We adopt the quantitative approach by using the self-response survey data from young people. A total of 327 research participants (207 college students and 120 middle school students) in this study. The finding showed that youth involved in the exerpeience of cymberbullying victimization is assoicated with cyberbullying perpetation behaviors. Implications for practice and policy are discussed.

*Keywords: Cyberbullying prevention and resilience, youth psychosocial well-being, depression, interdisciplinary research.*

## 1. Introduction

Daily, over 175,000 children go online for the first time. With that first exposure to the cyber world, young people become potential victims of cyberbullying. Cyberbullying is a new field of research; it is considered a public health issue closely related to youth' behaviour, mental health, and development (Zhu et al., 2021). Cyberbullying may lead to adverse effects, such as isolation, sleeping disorders, anxiety, depression, and even suicide (Waller et al., 2018). Similares insights were found in Hong Kong by Wong and colleagues (2014). The perpetation and victimization of cyberbullying negatively correlate with adolescents' self-efficacy, empathy level, and psychosocial conditions.

The increasing integration of digital technologies into young people's lives means more avenues are available for their online victimization, making them vulnerable to online risks. Cyberbullying is a complex multilayered process, that involves both the individuals and their families, but also the educational community, institutional agents, and the technology sector. Therefore, an overall picture of cyberbullying, its impacts, and how to prevent and deter it, can only be achieved by combining different fields of knowledge.

In Macau, research on cyberbullying is scarce, with a couple of empirical studies of traditional school bullying in Macau (Weng et. al., 2017; Wong & Choi, 2006). Using a sample aged 10 to 20 years old, Weng and colleagues (2017) indicated that victims experienced the strong feelings of anxiety, depression and negative affectivity, and expressed the low satisfaction with life. More recently, Wan Ali et al. (2018), surveyed 2.185 young people from Hong Kong, Macao and Guangzhou, and found that 71%

of participants had been victims, and 63.7% had been perpetrators. This shows that cyberbullying has an impact in the Greater Bay Area.

Increasingly, in local news, cyberbullying is presented as a serious problem which raises public health concerns. However, existing literature on this topic in Macau and the Greater Bay Area of China is limited in several ways. First, previous studies of cyberbullying in the Chinese contexts are limited in scope and number. Second, little is known about the gender differences and psychosocial impacts of cyberbullying in Chinese societies. Research is needed to update the field's understanding of the Macau situation and the Greater Bay Area. Third, most studies in the greater bay area only focus on the traditional school bullying of children and adolescents (Weng et. al., 2017; Wong & Choi, 2006).

## 1.1. Objectives

The purpose of this project is to explore cyberbullying processes in youths from 12 to 24 years old. The objectives of this study are to

1. contribute to a better understanding of cyberbullying processes among young people in the Chinese society, and its mental health, well-being, psychosocial impacts (e.g., anxiety, depression, suicidality, and aggression), and family factors.
2. explore the role gender plays in cyberbullying perpetration among youths.
3. provide a better understanding of the potential factors influencing cyberbullying behaviors, and can lead to more service initiatives enabling young people in Macau and Guangzhou to live better in the Greater Bay Area.

## 2. Theoretical framework

Bronfenbrenner's socio-ecological framework (1977: 2000) considered the individual as the locus of analysis within a larger socio-ecological setting composed of different levels. We applied that framework to cyberbullying by considering different levels of the socio-ecological system, namely the: (1) micro and meso systems, such as family, school, peers, as proximal contexts which directly influence the situational context of cyberbullying processes; (2) exosystem, which involves the process external to the immediate environmental setting, such as the community, and mass-media or digital technology; and (3) macrosystem, nested within broader contexts, such as support frameworks, and online culture.

## 2.1. Cyberbullying

Cyberbullying happens when one person, or a group try to hurt or embarrass others, using a computer or a mobile phone (Wensley & Campbell, 2012). It can include posting hurtful comments, excluding someone intentionally, sending derogatory or threatening messages, distributing embarrassing photos, and spreading rumors or secrets, through devices, such as mobile phones or the internet (Ehman & Gross, 2019). Hinduja & Patchin (2014) considered cyberbullying as a "willful and repeated harm inflicted through computers, cell phones, and other electronic devices." In sum, the perpetrator's intention is essential, the bullying behaviour was repeated over time, and perpetrators conduct behaviours through electronic devices.

## 2.2. Prevalence of cyberbullying

A high prevalence of cyberbullying has been found in Hong Kong, ranging from 12% to 72% for victimization and 13% to 60% for perpetration; while males seem to be slightly more involved in cyberbullying compared to females (Wong et al., 2014). Xiao and Wong (2013) found that perceived social acceptance of cyberbullying behavior, internet self-efficacy, motivations, and experience of cyberbullying victimization were strong predictors of cyberbullying perpetration behaviors in Hong Kong.

## 2.3. Capabilities for well-being and resilience against cyberbullying

A growing literature, has indicated that youth cyberbullying victimization is influenced by micro-level individual-level factors (e.g., gender, age) and family situation. The cyberbullying social context, beyond perpetrator and victim, has received less attention in research. To date, research has revealed mixed findings regarding gender effects in the cyberbullying context. For instance, Wong et al. (2014) found that males are more likely than females to engage in cyberbullying; Xiao & Wong (2013) noted that girls are more likely than boys to experience cyberbullying; while other studies have reported no gender difference in cyberbullying behavior (Hinduja and Patchin, 2014). Family cohesion has been reported to be negatively associated with cybervictimization (Accordino & Accordino, 2011; Ortega-Barón et al., 2016); There is also research indicating that families with a lower level of cohesion may increase the probability of adolescents being the target of electronic bullying (Buelga et al., 2017;

Makri-Botsari & Karagianni, 2014). Buelga and colleagues (2017) also found that family cohesion was associated with the perpetration of cyberbullying. The role of adaptability in cyberbullying is yet known (Arató et al., 2021). Adaptability refers to the ability of the family to change the power structure, relationship of roles or the rules to respond to situational or developmental stress (Phillips et al., 1998; Place et al., 2005). Ybarra and Mitchell (2004) compared the family's characteristics of cyberbullies, victims and youth that were not involved in cyberbullying. The bullies had the highest percentage of reported poor emotional bonding with their parents.

This component focuses on the individuals at the center of cyberbullying situations, as perpetrators and victims, to explore their profiles, perceptions, experiences, and capabilities towards wellbeing and resilience. The inquiry will be framed around the following research questions.

RQ1.1. How do the perceptions of risk of online sharing, motivations, power dynamics, and sociocultural norms shape cyberbullying victimization?

RQ1.2. How is cyberbullying experienced by youth? How do experiences vary by different age, and gender and what implications does this have for the experiences of harm? How do these relate to risks in the offline environment?

RQ1.3. What are the main predictors and outcomes of cyberbullying for perpetrators and victims?

## 3. Methodology

Quantitative: self-response questionnaires targeting youth, the age ranges from 12 -24 years old. One survey is for middle school students in Macau; the other is for colleges/universities in the Greater Bay area. The questionnaire spplied pre-validated measures using likert scales to assess: 1) cyberbullying experiences (e.g., frequency; role as perpetrator and victim); (2) personal and family factors; (3) cyberbullying related attitudes and behaviors (e.g., subjective-well-being, monitoring, and quality of relationship with youth); and (4) sociodemographic.

### 3.1. Sampling strategy

The geographic locus of this project is the Greater Bay Area of China, including Macau SAR and Guangzhou. This study used convenient sampling strategy by recruiting participants age from 12 to 18 to participate, which refers to form 1 to form 6 in Macau local schools. 120 participants was recruited into the sample. At the same time, we established contact with colleges/universities in the Greater Bay Area, Guangzhou to replicate the cyberbullying situation, collecting self-response questionnaire data from youth in different cities in the region. We intended to contact colleagues and universities by adopting the convenient sampling, and in the Greater Bay Area, leveraging connections with the community to recruit the different groups of participants, collecting self-response questionnaire data from youth to compare the phenomenon in different cities in the region. The project examines the cyberbullying situation *per se*. 207 participants were recruited into the sample using this strategy.

### 3.2. Measurements

*Cyberbullying Behavior:* The Cyber Bullying Inventory was revised by Topcu and Erdur-Baker (2010). The scale has two parts with 14 identical statements providing scores for being a bullying perpetration and a victim for the past six months. *Family adaptability and cohesion:* FACES II is a practical tool to assess families and is one of the most widely used instruments in the world (Kouneski, 2000). *Depression, Anxiety, and Stress:* The Depression Anxiety Stress Scale-21 (DASS-21) is a reduced version of the Lovibond and Lovibond (1995) scale used for the assessment of depression, anxiety, and stress. The highest score of the percpetion of cyberbullying behaviors, family adaptation and cohesion, and the depression anxiety determines more severe outcomes. **Socio-Demographic Variables** include age, sex, education, household, family structure, language used at home, education of parents, the time spent on the internet, the reason of surfing the internet.

### 3.3. Data analysis strategy

Descriptive statistics, including frequencies, means, and percentages, were generated to observe and summarize the parent characteristics in the sample. Regression analyses were used to address the research questions and determine whether and the extent to which the independent variables of family adaptation and cohesion and Depression, Anxiety, and Stress, predicated two dependent variables: experience victimization cyberbullying and perpetration cyberbullying behaviors. T-tests and ANOVA can provide further information to help understand the means difference among groups.

## 4. Findings and discussions

The aim of this study is to provide a better understanding of the potential factors influencing cyberbullying behaviors, and can lead to more service initiatives enabling young people in Macau and Guangzhou to live better in the Greater Bay Area. A total of 327 research participants (207 college students and 120 middle school students) in this research. The finding showed that youth involved in the exerpeience of cymberbullying victimization is assoicated with cyberbullying perpetation behaviors. The reults are aligned with the existing literature in Hong Kong (Xia and Wong, 2013).

The descriptive statistics of the middle school students' characteristics give a fully understanding about the participants. There was a total of 120 participants, with 72 (60%) girls and 48 (40%) boys between the age of 12-18. Of the 120 participants, 45.8% spent time on the internet 3-6 hours, and 29. 2% spent time on the internet 6-9 hours. In the sample of college stdents, there was a total of 207 participants, with 124 (40%) females and 83 (60%) boys between the age of 18-24, in particular in the Freshment year. Of the 207 participants, 31.9% spent time on the internet 3-6 hours, 32. 9% spent time on the internet 6-9 hours, and 22.7% spent time on the internet above 9 hours. College students may spend more time on the internet than adolescents. The majority of college students (73.9%) surfing on the internet is using social media platforms, such as QQ, WeChat, WhatsApp, Facebook, or Instagram, etc while 65.2 % of the participants play games online. In the sample of adolescents, 61.7% of the participants using social media platforms and 62.5% of the participants also watching videos on YouTube, TikTok. Compared with the college students, middle school students pay more online games (71.7%). In the sample of adolescents, the means of experience victimization cyberbullying is 1.19 and perpetration cyberbullying behaviors 1.13 while the means of experience victimization cyberbullying in the college students is 1.16 and perpetration cyberbullying behaviors 1.24 accordingly.

As much of the scholarly attention on cyberbullying has focused on adolescents, it is of interest to examine gender differences in cyberbullying among college students. Interestingly, the finding of this study found that the effect of males youth including adolescentes and colleges students engaged more in cyberbullying than females youth. Male youth are more likely than female to be both victims and perpetrators of cyberbullying, in particular for the experience of cybervictimization. The results are the same as the exisiting literature (Slonje & Smith, 2008; Wong et al., 2014). The finding provided schools with insights into gender at the school-level which contribute to preventing cyberbullying. As gender information about individuals is relatively easy to obtain, practitioners can effectively use such information to design appropriate interventions in the fight against cyberbullying.

Aspects of the role of parents and its family relationship between family adaptability and cohesion, there has no significant predictor of cyberbullying. We failed to find significant diferences that the bullied youth tend to have poor relationships with their parents (Bjereld et. al., 2017) nor children who are victims comes from a family with less cohesion and higher level of control and perceives a less positive father and more positive mother.

The results showed statistically significant association between cybervictimization and depression, anxiety, and stress. Results indicated that experiencing cyberbullying in school setting is associated with the lower psychological adjustment years later as university students. College students who were cyberbullied in the past currently score significantly higher on depression. These results support the need for psychosocial interventions from a broader perspective, addressing the different dimensions of this phenomenon and its impact on victims.

## 5. Conclusion

In summary, the current study is motivated by gaps in evidence and knowledge of the prevalence, risk factors, and drivers of cyberbullying in the Greater Bay Area, Macua and Guangdong. The research thus makes contributions to address these gaps and to enrich the related academic discourse. Baed on the research to date, the finding of this study contributed with actionable insights and outputs for the technology industry. In addition, the finding provids a nuanced understanding of the cyberbullying ecosystem and recommendations to the technology industry on design considerations to support better prevention, detection, and reporting of cyberbullying. Moreover, on the macrco-level, the local government, law enforcement, and policymakers, we provide evidence-based policy and practice recommendations for the improvement of local interventions and the strengthening of institutional coordination and stakeholder collaboration in the prevention of cyberbullying.

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# A COMPARISON OF GOAL ACHIEVEMENT OF STUDENTS IN A SOCIAL RESEARCH METHODS CLASS DURING COVID

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## Abstract

From 2020 to 2022, the module, social research methods was taught online to third-year undergraduate students whilst lockdown due to Covid was in place. Goal achievement was assessed with the Goal Achievement Questionnaire (GAQ) measuring several constructs: Pathway, Goal setting efficacy, Resilience, Optimism, Agency, Absence of state despair and External locus of control. The GAQ was developed to indicate goal-orientated behaviour based on underlying psychological resources such as agency and resilience. Goal achievement is not only a cognitive activity but involves multiple levels of human psychological functioning. Mastery and performance goal orientation were also assessed, and the relationship between psychological constructs and academic performance was determined. The academic performance of the three-year groups (N = 1643) was compared to those that completed the GAQ (N = 175). Although academic performance showed significant differences between the three-year groups $(F(2, 1327) = 11.67, p < .001)$, no significant differences were found for levels for the Goal Achievement constructs for the selected sample. A significant relationship $(r = .2, p < .05, n = 137)$ between academic performance and Goal setting efficacy was found. A significant difference between Semester and Exam Marks, four GAQ constructs and performance-approach goal orientation for ethnic groups (African, Indian and White) was found. The results are compared to previous findings by the authors: the African group regarded performance goals as less important than the White group. The implications of the findings are discussed.

*Keywords: Goal achievement, academic performance, social research methods, mastery and performance goals, Covid.*

## 1. Introduction

It is well known that Covid had a deleterious effect on mental well being of students although academic performance might not have suffered as much. In some instances, it was found that students performed better which might have been an effect of the online environment. Examining performance, causes and experiences is required on many fronts as we move out of the restrictions Covid imposed on academic institutions (Ramlo, 2021).

The first author taught a third-year social research methods class (RES320) before and during Covid where the mode of delivery was drastically changed within the year Covid struck. The course was changed to a largely online course, assessments were increased from two to five but also in an online mode and the exam was also virtual. The authors developed an instrument assessing goal achievement (Locke & Latham, 2006; Senko et al., 2011) some years ago and determined the relationship between the various dimensions with academic performance of students (Maree & Maree, 2013). This exercise was repeated with the RES320 class in order to investigate the effects of the Covid-induced restrictions on the goal achievement of students and their academic performance. In addition, their growth-mindset was also assessed by means of four dimensions of how students might view goals. A distinction can be made between performance and mastery goals (Grant & Dweck, 2003). Mastery refers to the focus of a students on the enjoyment of learning, while performance refers to the focus on performing well and high achievement. In time both goals were categorised as avoidance and approach goals to accommodate the positive and negative effects of achievement orientation (Elliot & McGregor, 2001). Approach refers to achieving the goal to gain an advantage such as mastering a skill or performing well for the sake of doing well. Avoidance refers to achieving those goals for the sake of avoiding negative judgement, such as performing well in an exam as to avoid being regarded as a failure.

## 2. Sampling

Year groups for the Res320 module were invited to participate. The number of students in each realised/class sample were n = 89/654 (2020), n = 28/480 (2021), n = 58/509 (2022). The total realised/class sample was 175/1643 The sample was thus voluntary and not random.

## 3. Design

A survey design was utilised at three time periods, namely, 2020, 2021 and 2022.

## 4. Ethical clearance

Ethical clearance was obtained from the Faculty of Humanities' Research and Ethics committee in 2020 for the continuing project, number HUM006/1120.

## 5. Methods

Two measurements were utilised, namely academic performance for the RES320 module and scores on the dimensions of the GAQ, as well as performance/Approach goals.

### 5.1. Instruments

Three marks are usually obtained, namely, a semester mark, exam mark and final mark as the average of the two. The exam mark is usually significantly lower than the semester mark reflecting a more accurate estimate of knowledge.

The GAQ was developed in South Africa some years ago (Maree et al., 2008a, 2008b). It went through two revisions and the factor structure was revised (Maree & Maree, 2013). The analysis of the second versions was based on Rasch modelling and dimensionality analysis. There are 7 sub-dimensions, namely, Pathway, Goal setting efficacy, Resilience, Optimism, Agency, Absence of state despair and External locus of control. The rationale of the instrument is to provide an estimate of a person's goal clarity, orientation and achievement. Example items are provided in Table 1. The response scale is (A) definitely false, (B) mostly false, (C) mostly true, or (D) definitely true. Reliability for the sub-dimensions ranged from .71-.83 and .63 for Optimism.

*Table 1. GAQ dimensions (Adapted from Maree & Maree, 2013).*

| Label | Sample Item | Description | Low score | High score |
|---|---|---|---|---|
| Pathway | There are many ways to solve a problem | The belief that one can find ways to solve problems and reach goals | Indicates an inability to find ways to a goal | Indicates a strong belief on one's ability to find ways to achieve goals |
| Goal setting efficacy | I am able to set goals for myself | Inclination to be internally motivated to set and achieve goals. | Indicates a tendency to set goals without achieving them. Can also indicate lack of goal setting behaviour | Can set goals but also tends to achieve them |
| Resilience | I can cope despite past difficulties | The belief that one is able to accomplish things despite difficulties | Lacks belief that one can do better despite difficult circumstances | Ability to prevail despite past or present difficulties |
| Optimism | I believe I have a good future despite difficulties | Expectation of good things to happen (instead of bad) | Lack of optimism or belief in a better future | Staying optimistic despite difficulties |
| Agency | I am responsible to make things happen | Actively responding to events | Not acting or taking responsibility | Taking control in response to events |

| Label | Sample Item | Description | Low score | High score |
|---|---|---|---|---|
| Absence of state despair | I feel depressed | Experiencing feelings of despair, helplessness and self-blame | Experiencing despair, self-blame and feelings of depression and pessimism | Lack of despair and self-blame. Lack of these feelings does not imply a positive mood. |
| External LOC | Circumstances influence me easily | Close to learned helplessness | Experience feelings of helplessness, not in control and delivered to external events | Lack of learned helplessness. Lack does not imply efficacy or control. |

Goal mastery and performance were estimated with 12 items. An example item for performance approach goals is "It is important for me to do better than other students" and for performance avoidance: "I just want to avoid doing poorly in this class."

### 5.2. Analysis

For the academic marks, GAQ, and Mastery and performance goals, the descriptive statistics for the three year groups are provided namely number of students, mean and standard deviation. In addition, the number of items, Cronbach Alpha (based on the total sample) are indicated for all except the academic performance.

Two scores were used for academic marks, namely a semester mark which was the average of the best four semester tests. Each test had 50 online items, randomly chosen for each student from a large item bank and students had 120 minutes to do the tests. The exam consisted of 150 items and students had 180 minutes to complete the exam. The best items (based on reliability contribution and discrimination value) were chosen from the items done during the semester tests. The exam thus consisted of a fixed set which means the items would have been encountered by different student. The time limit increased the difficulty level of completing the exam as the difference between the means for the semester test and exam mark showed (**Error! Reference source not found.**).

The difference between the scores for the three years groups and three ethnic groups were determined by a one-way ANOVA with post hoc comparisons using a Bonferroni adjustment. In addition, the GAQ and Goal instruments were correlated with academic performance.

# 6. Results

*Table 2. Descriptive statistics of scales by year.*

| Variable | 2020 | | | 2021 | | | 2022 | | | N of items | α | F | DF1 | DF2 | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | N | Mean | SD | | | | | | |
| Semester Mark | 84 | 81.08 | 9.09 | 23 | 83.26 | 8.36 | 45 | 82.47 | 7.57 | | | 0.766 | 2 | 149 | 0.467 |
| Exam Mark | 84 | 62.86 | 16.56 | 23 | 65.00 | 15.31 | 45 | 67.53 | 13.50 | | | 1.339 | 2 | 149 | 0.265 |
| GAQ Pathway | 78 | 3.03 | 0.48 | 25 | 3.10 | 0.46 | 54 | 3.07 | 0.46 | 6 | .82 | 0.268 | 2 | 154 | 0.765 |
| GAQ Goal-setting efficacy | 78 | 3.22 | 0.42 | 25 | 3.14 | 0.50 | 54 | 3.12 | 0.45 | 7 | .81 | 0.93 | 2 | 154 | 0.397 |
| GAQ Resilience | 77 | 3.34 | 0.47 | 25 | 3.33 | 0.48 | 54 | 3.31 | 0.49 | 8 | .84 | 0.057 | 2 | 153 | 0.945 |
| GAQ Optimism | 79 | 2.75 | 0.51 | 26 | 2.83 | 0.56 | 54 | 2.67 | 0.51 | 5 | .62 | 0.866 | 2 | 156 | 0.423 |
| GAQ Agency | 77 | 3.52 | 0.33 | 24 | 3.47 | 0.51 | 54 | 3.48 | 0.42 | 8 | .77 | 0.227 | 2 | 152 | 0.797 |
| GAQ Absence of state despair | 79 | 2.21 | 0.64 | 26 | 2.21 | 0.63 | 54 | 2.26 | 0.60 | 8 | .84 | 0.129 | 2 | 156 | 0.879 |
| GAQ External LOC | 78 | 1.78 | 0.41 | 25 | 1.83 | 0.49 | 54 | 1.80 | 0.46 | 8 | .74 | 0.124 | 2 | 154 | 0.883 |
| Mastery Approach | 89 | 3.52 | 0.44 | 27 | 3.52 | 0.59 | 58 | 3.36 | 0.58 | 3 | .73 | 1.885 | 2 | 171 | 0.155 |
| Mastery Avoidance | 88 | 3.28 | 0.54 | 27 | 3.12 | 0.76 | 58 | 3.19 | 0.72 | 3 | .70 | 0.713 | 2 | 170 | 0.492 |
| Performance Approach | 89 | 3.30 | 0.63 | 28 | 3.42 | 0.56 | 58 | 3.19 | 0.72 | 3 | .80 | 1.201 | 2 | 172 | 0.303 |
| Performance Avoidance | 89 | 3.36 | 0.68 | 28 | 3.43 | 0.75 | 58 | 3.26 | 0.74 | 3 | .88 | 0.638 | 2 | 172 | 0.53 |

*Table 3. Descriptive statistics of scales by ethnic groups.*

| Variable | Black | | | Indian | | | White | | | F | DF1 | DF2 | p | Group Bonferroni |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | N | Mean | SD | N | Mean | SD | | | | | |
| Semester Mark | 47 | 78.28 | 9.41 | 10 | 86.20 | 6.30 | 89 | 83.09 | 7.88 | 6.69 | 2 | 143 | 0.00* | I,W>B |
| Exam Mark | 47 | 58.02 | 15.47 | 10 | 69.30 | 14.83 | 89 | 67.09 | 15.01 | 6.09 | 2 | 143 | 0.00* | W>B |
| GAQ Pathway | 47 | 2.86 | 0.49 | 9 | 2.93 | 0.45 | 95 | 3.15 | 0.43 | 7.14 | 2 | 148 | 0.00* | W>B |
| GAQ Goal-setting efficacy | 47 | 3.03 | 0.46 | 9 | 3.05 | 0.33 | 95 | 3.24 | 0.42 | 4.28 | 2 | 148 | 0.02* | W>B |
| GAQ Resilience | 47 | 3.26 | 0.48 | 9 | 2.99 | 0.80 | 94 | 3.38 | 0.41 | 3.58 | 2 | 147 | 0.03* | W>I |
| GAQ Optimism | 49 | 2.78 | 0.59 | 9 | 2.51 | 0.63 | 95 | 2.72 | 0.47 | 1.08 | 2 | 150 | 0.34 | |
| GAQ Agency | 45 | 3.39 | 0.43 | 9 | 3.26 | 0.43 | 95 | 3.56 | 0.36 | 4.90 | 2 | 146 | 0.01* | W>B |
| GAQ Absence of state despair | 49 | 2.35 | 0.58 | 9 | 2.49 | 0.55 | 95 | 2.15 | 0.64 | 2.48 | 2 | 150 | 0.09 | |
| GAQ External LOC | 47 | 1.86 | 0.44 | 9 | 1.86 | 0.47 | 95 | 1.78 | 0.43 | 0.60 | 2 | 148 | 0.55 | |
| Mastery Approach | 55 | 3.42 | 0.58 | 12 | 3.50 | 0.64 | 100 | 3.49 | 0.48 | 0.30 | 2 | 164 | 0.74 | |
| Mastery Avoidance | 54 | 3.20 | 0.64 | 12 | 3.00 | 0.78 | 100 | 3.26 | 0.63 | 0.96 | 2 | 163 | 0.39 | |
| Performance Approach | 55 | 3.07 | 0.67 | 12 | 3.42 | 0.67 | 101 | 3.37 | 0.63 | 4.35 | 2 | 165 | 0.01* | W>B |
| Performance Avoidance | 55 | 3.33 | 0.78 | 12 | 3.11 | 0.70 | 101 | 3.38 | 0.67 | 0.76 | 2 | 165 | 0.47 | |

## 7. Discussion

Although academic performance showed significant differences between the three-year groups $(F(2, 1327) = 11.67, p < .001)$ for the larger group, no significant differences were found for levels for the Goal Achievement and the Mastery/Performance Goals constructs for the sample that completed the GAQ and related (n = *)(**Error! Reference source not found.**). Interestingly, no significant difference was found for Exam Marks for the selected sample $(F(2,149) = 1.34, p > 0.05)$ for the three years.

The variables were also examined for the three largest ethnic groups, namely, Black (n = 55), Indian (n = 12) and White (n = 101). As can be seen from **Error! Reference source not found.**, White performed better than Black students although the mean scores in the sixties. In addition, White scored higher than Black students on Pathway, Goal-setting efficacy, Agency, and Performance Approach goals. White had higher scores for Resilience than Indian students. It must be noted that the average scores for the scales range from just below average to slightly above average (2.8 to 3.4), thus indicating average levels on the scales. No group scored 2 and lower or 4 or higher on the scales except for External locus of control which means that students felt exposed to external events and experienced loss of control. This tendency is supported by low scores on optimism, and state despair (both below 3 and closer to 2).

The Pearson correlation between the scales and academic performance showed a significant relationship between Exam scores and Goal setting efficacy $(r = .2, p < .05, n = 137)$.

## 8. Conclusion

In sum, the selected group experienced feelings of low optimism, exhibited state despair and feel their external circumstances are difficult to manage and control. These tendencies probably reflect the experience of students in the covid and lockdown situation where they hardly feel in control of their lives. Despite these tendencies, they were able to set clear and achievable goals and in fact, perform well academically. The ethnic group differences are interesting and show an opposite trend found some years ago .

However, the study's main limitation is the small, realised sample and very unbalanced groups. It would be interesting to compare students' perceptions from 2023 onward and compare with the current sample. The realised sample might be strongly influenced by students experiencing feelings of lack of control brought along by Covid, thus it is a highly self-selected sample.

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# FUTURE TEACHERS' ATTITUDES ON E-TEACHING IN NATIVE LANGUAGE CLASSES AND MUSIC CLASSES

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## Abstract

Classic forms of teaching are increasingly being replaced by modern forms that include e-teaching. The need for e-teaching has become even more pronounced with the appearance and announcement of the Covid-19 pandemic. Despite being forced to learn in these circumstances, students were able to derive both positive and negative experiences from it. This paper examined the attitudes of final-year teacher education students regarding their e-teaching competence and its potential use in future teaching, particularly when it comes to teaching their first language and music. Students in their fifth (final) year of teacher education in Croatia participated in the research, and it was conducted through a survey using a Google form. Responses of the participants were analysed using the *Statistica 14.0.1.25* software.

*Keywords:* E-teaching, Covid-19, learning, native language class, music class.

## 1. Introduction

Technological progress, along with social and political turmoil, necessarily leads to certain changes that then reflect on various social aspects, such as education. Primary education in Croatia involves the implementation of mandatory subjects: Croatian language, Visual Arts, English language, Mathematics, Science, Physical Education, and Music. As this paper focuses on the example of teaching the Croatian language, it is important to note the areas it involves: Croatian language and communication, literature and creation, culture and media, as well as teaching Music – that includes domains that imply: listening and getting to know music, expressing by music and with music (singing, playing, musical games etc.) and music in context (types of music and genres, social, historical and cultural context). All of these areas and domains involve the use of different tools in the implementation of teaching units, and according to the Curriculum for primary schools, at least in view of educational objectives, educational work in primary school should be directed towards the students' full development, taking into account, information and communication technology changes (Curriculum for the subjects Music and Musical Art for primary schools and high schools, 2020; Curriculum for the subject Croatian Language for primary schools and high schools, 2020). In that regard, various forms of learning and teaching can be discussed, including those with the prefix 'e' in front of the word separated by a hyphen, which implies an acronym or adjective for electronic, therefore, the concepts in which that prefix appears are defined in relation to modern information and communication technology (ICT) (Nemeth-Jajić and Jukić 2021: 93). However, it is necessary to define the concepts of learning and teaching. According to Nemeth-Jajić and Jukić (2021: 90-91), "learning is a lifelong process that is achieved through formal, informal, and non-formal learning, which differ in terms of structure, certification, and intention." On the other hand, teaching "refers to the teacher's organization of activities for the student, where by performing these activities on a specific teaching content, the student achieves the learning outcomes" (Matijević, Topolovčan, 2017, cited in Nemeth-Jajić and Jukić, 2021: 91). Similarly, the term e-learning would imply any "form of learning and teaching that is carried out with the help of information and communication technologies" (Jandrić et al., 2016: 6), i.e., "different forms of learning (and teaching) that are enabled or enriched by electronic media, mostly multimedia, the internet, mobile phones, electronic mail, etc." (Matijević, Radovanović, 2011: 376) or "formal, non-formal, and informal learning that is supported by electronic media and e-communication; electronic learning" (Matijević, Topolovčan, 2017: 191). Thus, e-teaching could be defined as "teaching that is enabled or enriched by electronic media, i.e., teaching supported by electronic media and e-communication" (Nemeth-Jajić and Jukić, 2021: 95).

## 2. Previous research

In Croatia, research has been conducted on the attitudes of future teachers towards some segments of e-teaching, primarily distance learning, the use of information and communication technology (ICT), and the like. Kostović-Vranješ, Bulić, and Periša (2021) conducted research on the way in which Teacher Education students and primary school teachers perceive distance learning, finally concluding that teachers perceive the transition from regular teaching to distance learning as statistically significantly more difficult than the students do, and both groups spend the same amount of time preparing for online teaching as they did in traditional teaching (Kostović-Vranješ, Bulić, Periša, 2021: 130). A slightly positive attitude towards online learning was recorded in the years before the pandemic. However, research on the implementation of online teaching during the pandemic generally showed a slightly negative attitude among students (Jurlina, Papo, Potlimbrzović, 2022: 278). Some research has shown that students do not want to completely replace traditional forms of teaching with e-teaching, but rather believe that it would be ideal to find the right balance between the two, resulting in blended learning (Ćukušić, Jadrić, 2012: 71; Jukić, 2015: 57). An interesting research on the attitudes of future teachers and their competence in applying ICT in classroom teaching is presented in Majnarić's research (2020), which concluded that future teachers have positive attitudes towards the use of ICT in classroom teaching (Majnarić, 2020: 45), and even 88% of final year Teacher Education students consider themselves competent (Majnarić, 2020: 47). Future teachers have shown great interest and motivation in implementing multimedia teaching methods, as demonstrated in Horvat's research (2019: 29).

## 3. Research problems and goals

Given the rapid technological advancement which inevitably affects education, the primary aim of this research was to determine the perception of final year (5th year) students of teacher education in Croatia regarding the implementation of e-teaching. The research objectives were also to determine the students' readiness to implement e-teaching in their future work; to identify which subject is more suitable for the implementation of e-teaching (the teaching of the mother language or the teaching of music), and to determine which subject areas in the native language and which domains in music education are more suitable for e-teaching. The main hypotheses were: 1) it is assumed that final year teacher education students/future teachers will positively perceive e-teaching; 2) it is assumed that students who have positively expressed their views on e-teaching will consider themselves competent to implement it; 3) it is assumed that final year teacher education students will implement e-teaching more in music education than in teaching the native language; 4) it is assumed that the area of "culture and media" will be more suitable for the implementation of e-teaching than other subject areas in the native language; 5) it is assumed that the "listening and getting to know music" domain will be more suitable for e-teaching than other domains in music education.

## 4. Method

The research aimed to determine the possibility and readiness of fifth-year (final year) teacher education students in Croatia for various forms of e-teaching in their future work as subject teachers, specifically in teaching the native tongue and music. An online questionnaire was conducted using a Google form to gather general data (the study they are attending) and their attitudes towards e-teaching in general, the assumption of using e-teaching in their future work, the possibility of applying e-teaching in specific subject areas such as teaching the native tongue and music, and finally their assessment of their competencies for future e-teaching activities. The research was conducted among fifth-year teacher education students in Croatia from the following institutions: Department of Teacher and Preschool Teacher Education, University of Zadar; Department of Teacher Education Studies in Gospić, University of Zadar; Faculty of Teacher Education, University of Zagreb; Faculty of Teacher Education, Department in Čakovec, University of Zagreb; Faculty of Teacher Education, Department in Petrinja, University of Zagreb; Faculty of Teacher Education, University of Rijeka; Faculty of Education, Josip Juraj Strossmayer University in Osijek; Teacher Education, Faculty of Humanities and Social Sciences in Split; Faculty of Educational Sciences, Juraj Dobrila University in Pula; Teacher Education, University of Slavonski Brod. The survey was conducted in early 2023, and the responses were analysed using the *Statistica 14.0.1.25* software.

## 5. Results and discussion

From Figure 1, it is evident that the majority of students/future teachers are positive about e-teaching, with 59.8% of them expressing positivity, 24.8% remaining neutral, and only 15.4% perceiving e-teaching negatively. These data are significant given that it is certain that future forms of their work as teachers will require this type of work. This form of teaching became necessary during the pandemic caused

by COVID-19; however, it is interesting that students perceived e-teaching and e-learning positively even before the pandemic, as confirmed by the research conducted by Mikša; Hercigonja-Scekeres; Sikirica (2015) among students of the Business School "Hrvatsko Zagorje", Krapina, which showed that a large number of students, as many as 87%, believe that e-teaching can improve the effectiveness of learning, and generally perceive e-learning positively. The obtained results confirm the first hypothesis.

*Figure 1. Your attitude towards e-teaching in general.*
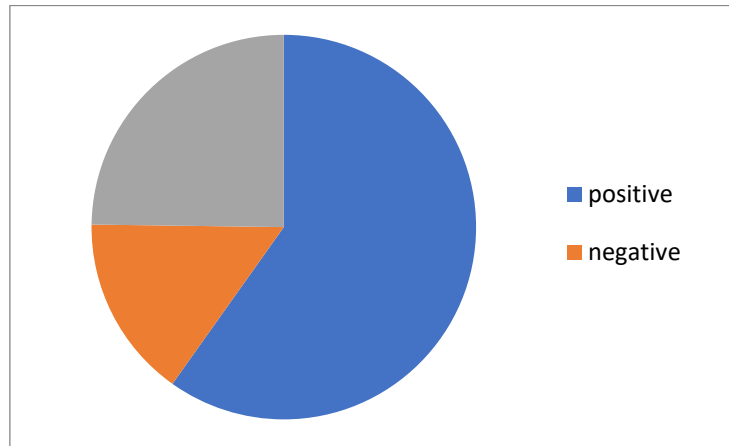


The second hypothesis about the perception of competence regarding the attitude towards e-teaching was tested by analysis of variance (Table 1), which showed that there is a statistically significant difference between students with a positive attitude and those with a negative attitude. The aforementioned study which examined the competencies of using ICT in class teaching (Majnarić, 2020) showed that a large percentage of final year students (88%) consider themselves competent.

*Table 1. Difference in the students' perception of their own competence to conduct e-teaching with respect to their attitude towards it.*

|                    | F    | p    |
|--------------------|------|------|
| Level of competence | 6.06 | 0.00 |

The results of the analysis of variance showed that there is a statistically significant difference between students with a positive and students with a negative attitude towards the implementation of e-teaching, thus confirming the second hypothesis (Table 1 and Table 2).

*Table 2. Post hoc analysis - Scheffe test.*

|            | positive M=3.90 | negative M=3.11 | don't know M=3.48 |
|------------|-----------------|-----------------|-------------------|
| positive   |                 |                 |                   |
| negative   | 0.01            |                 |                   |
| don't know | 0.13            | 0.41            |                   |

One of the problems was to investigate whether students would be more willing to use e-teaching methods in music or language classes. No statistically significant difference was found. Students believe that e-teaching can be equally applied in both subjects. Thus, the third hypothesis was not confirmed. It is clear that, as Lazzarich (2017) stated, new generations of students differ from previous ones because they are growing up in a digital technology environment and therefore require a different approach to teaching, including e-teaching. Therefore, it is certain that efforts will be made to incorporate some forms of e-teaching.

*Table 3. Testing the difference in the readiness of students in the final year of teacher education to conduct e-teaching in music classes compared to native language classes.*

|                                                                          | M1   | M2   | t    | p    |
|--------------------------------------------------------------------------|------|------|------|------|
| Differences in implementing e-teaching between native tongue class and Music Class | 2.39 | 2.34 | 0.44 | 0.66 |

M1 – Native tongue Class
M2 – Music Class

Figure 2 shows that most respondents, when asked which teaching unit in native tongue class can be more easily taught through e-teaching, as expected, even 88.9% of them answered that the "culture and media" area would be more suitable for teaching. Thus, confirming the fourth hypothesis. It is interesting that studies from the seventies already pointed to the functionality of computer use in teaching, i.e., the efficiency of learning content, a high level of teaching methodology, a specific working atmosphere, and increased student motivation (Lazzarich, 2017). However, contrary to the results of our research, Pavličević (1992) conducted an empirical study on the educational effectiveness of computer use in language teaching in the nineties. The study confirmed progress in learning and achieving higher educational outcomes, as well as the thesis that teaching with the help of computers increases students' interest in language acquisition.

*Figure 2. Students' opinions on which area of teaching Croatian language would be more suitable for e-teaching.*
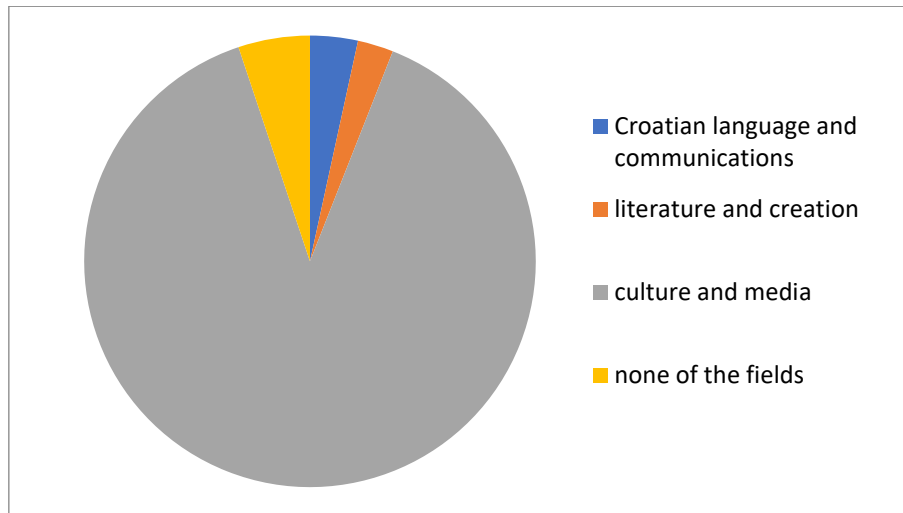


Figure 3 shows that the question of which domain of teaching units in Music Class could be more easily taught using e-teaching forms provided divided responses; 51.7% of respondents said that the domain would be music in context (types of music and genres, social, historical and cultural context), 31.9% of students believe that listening and getting to know music domains are more suitable for processing a teaching unit, while 13.8% believe that no teaching unit can be more easily processed using e-teaching forms. Therefore, the fifth hypothesis was not confirmed.

*Figure 3. Students' opinions on which Music Class domains would be more suitable for processing using forms of e-teaching.*
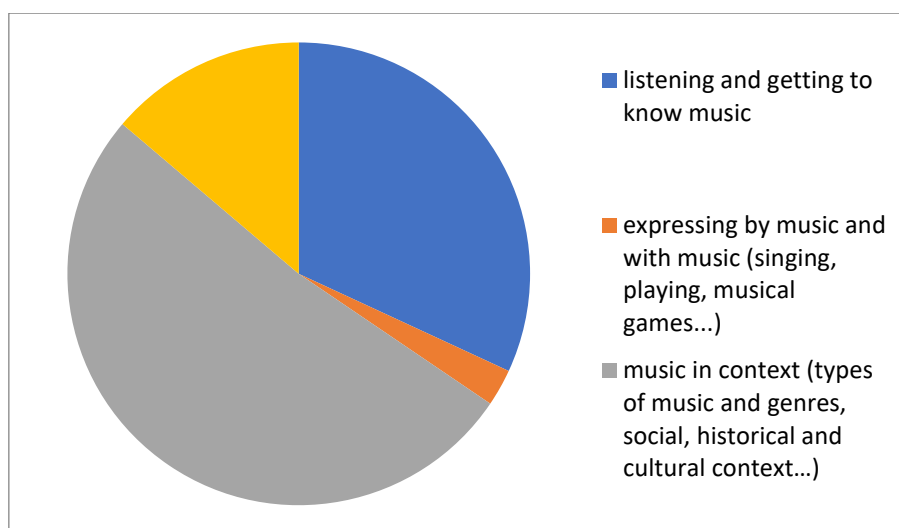
## 6. Conclusion

The aim of this research was to determine the perception of final-year (5th year) teacher education students in Croatia regarding the implementation of e-teaching, and to determine their readiness to implement e-teaching in their future work, using the examples of teaching the native language and music. E-teaching itself involves forms of teaching supported by electronic media and e-communication.

After formulating the hypotheses, it was determined that the majority of students/future teachers had a positive attitude towards e-teaching, with 59.8% of them responding positively, 24.8% did not respond positively nor negatively, while only 15.4% perceived e-teaching negatively, confirming the first hypothesis. The second hypothesis was also confirmed. It sought to determine students' competency perception based on their attitude towards e-teaching. Furthermore, the third hypothesis was not confirmed. It sought to determine whether there was a statistically significant difference in whether students would implement e-teaching more in music classes compared to the native language classes. As expected, the fourth hypothesis was confirmed because 88.9% of the students responded that the "culture and media" area would be more suitable for teaching. Finally, the fifth hypothesis was not confirmed due to the fact that a larger number of students responded that they believed the *music in context* domain was more suitable for teaching than the teaching units of other domains.

Given that final-year teacher education students/future teachers hold generally positive attitudes towards e-teaching and consider themselves competent in its implementation, it is likely that the vast majority will implement e-teaching in their future work, in native language classes as well as music classes.

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# GAME-BASED LEARNING IN HIGHER EDUCATION: A COMPARATIVE STUDY IN TOURISM DEGREES

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## Abstract

New strategies regarding student-centered approaches have emerged in higher education contexts, in order to promote student motivation and engagement towards the learning process. Online quiz platforms such as Kahoot! seem to contribute to the consolidation of learning, particularly through content review.
A quantitative survey was conducted among 86 students from a higher education institution offering undergraduate degrees in the area of Tourism, specifically within the subjects of English and Statistical Analysis. Following a consistent application of Kahoot! quizzes in class for reviewing purposes, the survey was implemented in order to allow for an examination of how the students perceived the usage of this game-based learning tool.
Results show that most students consider the use of Kahoot! in classes to make learning more challenging and dynamic, while positively contributing to content consolidation.. However, the results obtained evidence that further studies are needed to confirm the effect on the use of Kahoot! in student performance.

*Keywords: Higher education, web tools, educational games, motivation.*

## 1. Introduction

In the last few decades, higher education has been faced with a number of substantial changes, which have impacted both students and faculty. On the one hand, the number of students accessing higher education has grown exponentially and, as a consequence, the student-teacher ratio has changed and the student body has become more and more heterogeneous (Olssen and Peters, 2015). This democratization of higher education brought with it many social and economic benefits but aggravated already existing challenges across all education levels regarding student commitment, compromise and motivation (Kember et al., 2021). Another recent major transformation in higher education came as a result of the widespread use of information and communication technologies (ICTs), supported by the advent of the Internet. Technology was adopted in higher education not only at institutional level, through the offer of blended learning or online learning, but also as a means to innovate teaching methods in face-to-face classes (Dečman, 2015). The use of technology in face-to-face classes led to a process of reform and innovation, as it allows the development of student-centered activities that involve cooperation and active participation, thus altering the traditional role of faculty and students (Wang et al., 2009; Guardia et al., 2019). Considering that higher education students are mostly digital natives, known for their dependency on information technology and lower attention span, the adoption of game-based learning platforms can help improve students' learning experiences in higher education (McCoy, 2010; Lister, 2015).

This article includes a reflection on how the use of a specific game-based learning platform, Kahoot!, can improve the learning experiences of students in higher education, especially students in the field of Tourism. Within the subjects of Statistical Analysis and English, the researchers resorted to Kahoot!, accessed by students through their mobile devices, in order to revise contents throughout the semester and to encourage and increase their participation and motivation during classes.

In the case of Mathematics, technology has become essential because the teaching and learning processes are enriched with the use of technologies improving the students' motivation and the students' learning process (Bullon et al, 2018; Zabala-Vargas et al., 2019). ICTs are tools that innovate the way mathematics is taught and they may facilitate students' learning (Scanlon et al., 2005).

As far as English language learning is concerned, game-based learning can help to cultivate positive attitudes and increase motivation level of participants, while allowing for language practice, namely easiness of grammar or lexical revision and  better acquisition of new structures (Michos, 2017).

## 2. Methodology

The aim of this study is to understand how Tourism students perceive the use of Kahoot! in higher education, more specifically within the context of Mathematics and English classes, with three groups of students. Although the specific name of the subject is Statistical Analysis, the contents refer to the general area of Mathematics, so henceforth we mention this particular field in a theoretical perspective and the subject name in the context of the study.

In this case study, the authors used a game-based learning platform in class, namely Kahoot!, which students could access through their mobile devices, with the intention of encouraging them and promoting their participation and motivation. The platform was used in three lecture classes that corresponded to the conclusion of a syllabus topic. Kahoot! quizzes were therefore mainly used for reviewing class content.

A satisfaction survey was used to gather information about Tourism students' perceptions and quantitative data were collected. A few general questions were adapted from Esteves et al. (2017) but other questions were added with the intention of analysing the effect of the use of Kahoot! in the context of Mathematics and English. For those questions a five-point Likert scale was used. For some questions, 1 corresponded to "not at all" and 5 to "very much", while in other questions 1 corresponded to "not important" and 5 to "very important". A statistical analysis of the data was performed using Excel and IBM Statistical Package for the Social Sciences (SPSS) version 26.

Following the general results in a previous article (Pais et al., 2018), a new perspective of data is presented in the current study, in light of the distinction between these two different subjects, so as to to identify the main dissimilarities between them.

### 2.1. Respondents

The respondents of this case study were 86 undergraduate students from a Portuguese higher education institution, in the academic year of 2017-2018. The curricular units (English for Events II, English for Recreation IV and Statistical Analysis) were set within Tourism-related degree courses. In particular, 32 were English students, whereas 54 were Statistical Analysis students.

## 3. Results and discussion

The highest mean score in both subjects is related to item 3 "It was fun using Kahoot!" (English: m = 4.78, sd = 0.491; Statistical Analysis: m=4.65, sd=0.555). Therefore, high scores in both items show that all students, regardless of the Curricular Unit attended find it fun to use Kahoot!.

As far as the lowest mean scores are concerned, results converge in both subjects with item 2 "Using Kahoot! will contribute to having a better grade in the CU". The results were m = 3.75, sd = 1.016 in English I and m = 3.43, sd = 0.983 for Statistical Analysis, as shown in the table below (Table 1). High standard deviation values seem to imply, however, that the students' opinion is not consensual. (English: sd=1.016; Statistical Analysis: sd=0.983). Also, despite being the lowest score, the mean is relatively high, as we can see in table 1.

The survey results corroborate that using Kahoot! provides a less rigid method of learning, makes it more interactive and interesting (Q9), makes classes more active, lively and dynamic (Q10) and that students recommend using Kahoot! (Q6). The results also indicate that the students consider it important for the teachers to resort to different teaching-learning methodologies such as Kahoot! in the classroom. However, this result does not appear to be highly consensual to the English students (sd=0.950).

The results on the platform's contribution to a more positive view of the CU show that, even though the mean is considerably high (superior to 4 in the 3 CUs), students' opinions are not consensual because they present a high value for the standard deviation (English: sd=0.907; Statistical Analysis: sd=1.060). The question "The response time in Kahoot! is adequate" also does not appear to be consensual among the English (sd=0.096) and Statistical Analysis students (sd=0.951), and the question "It facilitates the interaction between lecturer and student" does not appear consensual among the English students (sd=1.045). The average scores for both curricular units show that results are slightly higher in English (4.40) than in Statistical Analysis (4.21).

The survey results are presented in Table 1.

*Table 1. Results of individual survey according to curricular unit.*

| | English | | | Statistical Analysis | | |
|---|---|---|---|---|---|---|
| | Mean (1 to 5) | Std Dev | Median | Mean (1 to 5) | Std Dev | Median |
| 1 - I believe that Kahoot! contributed to consolidate the contents of the CU. | 4.06 | 1.014 | 4 | 4.09 | 0.875 | 4 |
| 2 - Using Kahoot! will contribute to having a better grade in the CU. | 3.75 | 1.016 | 4 | 3.43 | 0.983 | 3 |
| 3 - It was fun using Kahoot!. | 4.78 | 0.491 | 5 | 4.65 | 0.555 | 5 |
| 4 - The response time in Kahoot! was adequate. | 4.31 | 0.896 | 4.5 | 4.04 | 0.951 | 4 |
| 5 - I find it important to be able to see the scoreboard. | 4.25 | 0.803 | 4 | 3.81 | 1.150 | 4 |
| 6 - I recommend using Kahoot! in the classroom. | 4.44 | 0.759 | 5 | 4.41 | 0.659 | 4.5 |
| 7 - It contributes to a more positive attitude towards English/ Mathematics. | 4.38 | 0.907 | 5 | 4.17 | 1.060 | 4 |
| 8 - It makes learning more challenging, interesting and stimulating. | 4.38 | 0.793 | 4 | 4.22 | 0.793 | 4 |
| 9 - It provides a less rigid learning method making it more interactive and interesting. | 4.53 | 0.621 | 5 | 4.37 | 0.623 | 4 |
| 10 - It contributes towards more active, lively and dynamic classes. | 4.56 | 0.564 | 5 | 4.50 | 0.575 | 5 |
| 11 - It facilitates the interaction between lecturer and student. | 4.44 | 1.045 | 5 | 3.98 | 0.879 | 4 |
| 12 - I find it important for lecturers to use different strategies such as Kahoot! in the classroom. | 4.47 | 0.950 | 5 | 4.48 | 0.720 | 5 |
| Average score | 4.40 | | | 4.21 | | |

Regarding the question "Do you consider the use of Kahoot in classes to be important?", results are very high in both subjects (93,8% for English and 92,6% for Maths), with a slightly higher percentage for English.

As for the question "Did Kahoot! help you like the CU better?", results are also high (81,2% for English and 61,1% for Maths), but not as much as in the previous question. Moreover, in this question we can find a more pronounced difference between the two subjects (nearly 20%).

Regarding the general results, other studies show similar conclusions about the fact that higher education students finding the use of Kahoot! as fun and entertaining, particularly in Maths (Bullon et al., 2018).

More specifically, literature shows that Kahoot! can foster and reinforce English learning in undergraduate students, by inducing motivation as well as engagement (Bernal et al., 2018), providing a meaningful language learning experience (Kaur & Naderajan, 2019). In parallel, Maths students find this platform to be beneficial, as it allows them to "self-evaluate their learning process" (Curto Prieto et al. 2019, p. 10).

Furthermore, we can find evidence on how this platform can set up a positive atmosphere in more lively and dynamic classes in these specific subjects: "It was found that Kahoot! had a positive effect on learning both for K-12 and higher education, as well as for language learning, technical and engineering fields, science, math, business, and nursing" (Wang & Tahir, 2020, p. 12).

## 4. Conclusions

One of the main conclusions of this study is that students tend to show a very positive attitude towards the use of technology in general and specifically towards Kahoot!.

With regard to the differences between students' perceptions in two disparate subjects, namely English and Statistical Analysis, the survey results indicate that mean scores are generally similar, although they are slightly higher in English.

In sum, bearing in mind that Kahoot! provides "opportunities to engage with the lecturer, peers and lecture content" (Licorish et al., 2018, p. 21), it is the authors' belief that this study can positively contribute to disseminate new strategies that can impact students' motivation for learning and ultimately their academic performance.

*Acknowledgements*

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# SCHOOL LEADERS OF HIGH-NEED DISTRICTS AND THEIR PERSPECTIVES OF A UNIVERSITY-BASED TEACHER RESIDENCY PROGRAM

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## Abstract

Effective recruitment and retention strategies of teachers remain elusive for school district leaders. This qualitative study examines the pilot implementation of a university-based teacher residency program throughout 4 high-needs districts of a year-long program among 8 residents. District administrators are interviewed about their recruitment and retention efforts, and document how the teacher residents experienced these structures throughout their residency year. Findings have implications for improving residencies as an innovative teacher preparation approach and stem teacher attrition.

*Keywords: School leaders, high-need school districts, initial teachers, teacher residencies, qualitative inquiry.*

## 1. Introduction and objectives

Increasing classroom vacancies (Garcia et al., 2022) beckons innovative solutions to increase teacher supply. This is a salient issue for Texas, which is amid a current teacher shortfall concentrated within underserved districts (Sullivan et al., 2017). Teacher preparation programs (TPPs) should consider alternative methods to preparing and supporting preservice teachers (PSTs), such as teacher residencies programs (TRP). As such, this exploratory study examines two complementary perspectives in such a program guided by the research questions:

1. How do high-needs district administrators approach recruitment and retention of beginning teachers?
2. What are teacher residents' experiences with district recruitment and retention throughout their first year?

## 2. Related literature and conceptual perspective

TRPs are often defined by elongated clinical teaching time (Darling-Hammond, 2010), increased opportunities to connect practice to theory (Zeichner, 2010), enhanced induction (Wang et al., 2008), instructional coaching (Gardiner, 2011), and increased recruitment of teachers of color (Azar et al., 2020). These programs help to stem teacher attrition by improving the diversity of teachers relative to student diversity (Silva et al., 2015).

Although existing research on residencies helps to describe the need, theory, and purpose of residencies (Gist, 2021; Klein et al., 2013), there remains the need for deeper examination of how multiple stakeholders participate in the process; specifically, how districts recruit and support residents as well as the residents' experience within the TRP. The district-perspective has been explored within larger, urban settings, but many studies focus on the logistics of such models (e.g., Zugelder et al., 2021) or identity development (Chu, 2019, 2021) instead of the experience of those involved.

## 3. Design and methods

**Context.** A teacher residency model (RM[1]) program was designed within State College, containing one of the largest TPPs in Texas. RM is designed as a four-year program with post-baccalaureates, where residents sign a 3-year commitment with their placement district, in which they are hired—pending district satisfaction after the resident year—as a teacher of record. Residents are also paid a living wage during this time, which is funded by a Department of Education Teacher Quality Partnership grant. Four partner districts participated in this study and grant, and each is considered high needs according to the grant qualifications, as shown by district demographics in Table 1.

The RM program leverages a 5-point Comprehensive Community Induction Framework (CCIF[©]; Hill-Jackson, 2020) of which general themes address two overarching goals: to provide orientation and activities to familiarize the residents with high-need ISDs and to cultivate professional knowledge, skills, and dispositions.

The vision of TERM[©] is driven by a 5-point Comprehensive Community Induction Framework (CCIF[©]) and is the theoretical foundation for TERM[©] (Hill-Jackson et al., 2020). Born out of the CCIF[©] framework, the initial five strategies were streamlined to the four current strategies of TERM[©], which are:

- **Strategy 1**: calculated recruitment
- **Strategy 2**: meaningful professional learning for TERM[©] residents
- **Strategy 3:** meaningful professional learning for district partner stakeholders
- **Strategy 4:** well-aligned course-to-field residency experiences

**Data Collection.** To learn more about varied recruitment and retention experiences, we conducted semi-structured interviews via Zoom with two separate groups. First, we identified participating district administrators overseeing teacher personnel and held individual 60-minute interviews at the beginning of the 2021-2022 academic school year (see Table 2).

To learn about resident experiences, the investigative team conducted semi-structured focus group interviews at the conclusion of each academic semester allowing participants to build upon each other's thoughts, the potential for similarity of experience, and the reduction of time (Sagoe, 2012). Attendance to these interviews was programmatically required, though all participants consented to the overarching study and voluntarily provided responses throughout. Resident demographics are provided in Table 3, with all residents self-identifying as white.

*Table 1. Participating Districts' Student Demographics.*

|  | AISD | BISD | CISD | DISD |
|---|---|---|---|---|
| # of Schools | 125 | 22 | 4 | 3 |
| # of Students | 74,627 | 16,189 | 1,757 | 862 |
| % Students of Color | 70 | 80 | 51.8 | 92.9 |
| % Students Who Qualify for Free & Reduced-Priced Lunch | 51 | 76.9 | 55.5 | 98.3 |
| % Students Who Speak English as a Second Language | 29 | 27.4 | 11.4 | 17.2 |
| % Students Identified as At-Risk | 47.2 | 72 | 36.6 | 65.4 |

*Table 2. District Administrator Demographics.*

| Pseudonym | District | Role |
|---|---|---|
| AISD | Maddie | Professional Learning Design Coordinator |
| BISD | Sheri | Assistant Director of Human Resources |
| CISD | Suzanne | Director of Instruction |
| CISD | Asher | Superintendent |
| DISD | Timothy | Assistant Superintendent of Curriculum and Instruction |

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[1]Pseudonyms are used for all Independent School Districts, participants, and the RM program.

*Table 3. Resident Demographics.*

| Pseudonym | District | Certification Area |
|---|---|---|
| Ally | BISD | Science Composite (Physics) |
| Bethany | BISD | Mathematics |
| Caroline | CISD | Social Studies |
| Kelly | BISD | Social Studies |
| Krystal | AISD | Biology |
| Richard | AISD | Social Studies |
| Ricky | DISD | History |
| Sal | BISD | Life Science |

**Analysis.** Qualitatively analysis were completed on each set of data separately, reducing the data (Miles & Huberman, 1994) towards the two research goals: recruitment and retention. Data on these two areas were gathered and summarized by district. Similarly, resident interview data were consolidated around their first-year experiences amidst recruitment and retention. The research team considered both focus group interviews collectively, as time was not an important element to this study.

Analytic memos were created separately for each set of data, where we focused on summarizing the data and pulling out salient themes (Miles et al., 2020). A constant comparative method (Glaser, 1965) was then used to go back and forth between the data and our interpretations to ensure our participants' voices were accurately represented.

## 4. Discussion and conclusions

The interviews of residents and administrators form the findings of our qualitative study. Findings have implications for improving this innovative and increasingly implemented teacher preparation structure towards raising the quality of the teacher workforce. During a didactic single-topic presentation the results and two primary implications arose from this study, for the districts and the TRPs, will be unveiled.

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# INTEGRATING DIVERSITY, EQUITY & INCLUSION IN LEGAL EDUCATION: TEACHING WHERE IT'S UNEXPECTED

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## Abstract

In today's multicultural world, young professionals and would-be professionals must understand and be competent to serve people from diverse races, ethnicities, sexualities, and other backgrounds different from their own. Yet ordinarily when we introduce issues of diversity and inclusion in the classroom, we do so in cases and situations that specifically raise the topic like anti-discrimination matters or adoption by cross-racial or same-sex couples. In such explicit matters, it is easy to see that those issues are relevant, significant, and deserving of classroom attention. Unsurprisingly, using cases with a clear connection to fairness and equality is a common technique for ensuring that students see and appreciate historical and social meaning and context to better understand doctrine and how that context affects clients and others who face these situations.

This traditional approach has the advantage of being easily understood by beginning law students, since the diversity issues are visible and concrete.  Nevertheless, not every foundational course or textbook includes cases or legal rules in which race, gender, disability, or other characteristics are central to the doctrinal topic. Indeed, most do not. Rather than defer to other classes or wait for those few times when teachers have cases that call out for equity and bias analysis, this paper recommends an alternate approach: raising diversity and inclusion in cases and contexts where students may not expect it.

This method capitalizes on the nature and context of pre-professional training: students will leave school and work with clients. Even if they are not noted in legal opinions and textbooks, litigants have race, economic status, gender, religion, ethnicity, sexual orientation, physical or mental abilities, gender identity, or some combination of these and many other dimensions. Our apprentice and novice professional students will have clients who also have these features, just as students, their classmates and teachers do. This paper shows how to teach students to see who and what lies hidden behind diversity-blind, neutral doctrine. It also addresses the challenges involved with the method and how to overcome them.

*Keywords: Diversity, professional education, race, gender, inclusion.*

## 1. Introduction

In today's multicultural world, young professionals and would-be professionals must understand and be competent to serve people from diverse races, ethnicities, sexualities, and other backgrounds different from their own. Yet ordinarily when we introduce issues of diversity and inclusion in the classroom, we do so in cases and situations that specifically raise the topic like anti-discrimination matters (Holmes, 2005) or adoption by cross-racial (Papke, 2013) or same-sex couples (Washington, 2011). In such explicit matters, it is easy to see that those issues are relevant, significant, and deserving of classroom attention. Unsurprisingly, using material with a clear connection to fairness and equality is a common technique for ensuring that students see and appreciate historical and social meaning and context to better understand doctrine and how that context affects clients and others who face these situations.

This traditional approach has the advantage of being easily understood by students training to enter their chosen professional, since the diversity issues are visible and concrete. Nevertheless, not every foundational course or textbook includes cases or codes in which race, gender, disability, or other characteristics are central to the doctrinal topic. Indeed, most do not. In US law schools, this concern is magnified because legal education uses the case study method in which students read opinions and decisions issued by courts hearing legal matters that have arisen in the ordinary course US judicial system business rather than study and discussion of academic treatises or explanatory summaries of jurisprudential codes (Patterson, 1951). Accordingly, there are few obvious opportunities to bring

diversity and inclusion matters to the forefront of class discussion. Rather than defer to other classes or wait for those few times when teachers have cases that call out for equity and bias analysis, this paper recommends an alternate approach: raising diversity and inclusion in cases and contexts where students may not expect it.

## 2. Methodology and pedagogy

It is commonplace in US law schools to ask students to recite the facts of a legal case and describe the legal doctrines the court applied in deciding the matter and writing its opinion. Professors then draw students' attention to the legal rules extracted from the specific factual setting and the particular people involved in the case to generate discussion of the principles, rules and policies that should be applied in future situations. Often hypothetical situations are used to demonstrate that these doctrines apply in situations far removed from the original factual settings of the case at hand (Sullivan et al., 2007).

Because this pedagogy moves from the specific to the general, from individual circumstances to broad principles and canons, raising diversity and inclusion matters is frequently constrained by whether those issues appear in the larger doctrine. Where the jurisprudence incorporates diversity matters, relevance to larger legal application flows naturally. Where the jurisprudence does not include those matters, however, the case study method sometimes erects a barrier to including them. Because teachers traditionally are quick to leave the facts of a legal case behind to explore larger doctrinal concerns, they may believe that they are limited in the topics that are suitable for classroom discussion. We may shift this pedagogical paradigm to broaden opportunities to engage students on diversity issues. Raising diversity matters where they may not obviously appear means exploiting the nature of the case method of legal study and professional training rather than fighting against it – using legal cases that seem not to raise diversity and inclusion issues as vehicles for this study in order to emphasize that these concerns are omnipresent instead of only occasionally situational.

The recommended change is not complicated; instead of throwing away the specific facts of a legal matter, teachers can explore the individual parties, their actions, and their motivations. They can ask students why the parties behaved as they did. This method capitalizes on the nature and context of pre-professional training: students will leave school and work with clients. Even if they are not noted in legal opinions and textbooks, litigants have race, economic status, gender, religion, ethnicity, sexual orientation, physical or mental abilities, gender identity, or some combination of these and many other dimensions. Our apprentice and novice professional students will have clients who also have these features, just as students, their classmates and teachers do. This approach enables teachers to encourage students to see who and what lies hidden behind diversity-blind, neutral doctrine.

For example, in a very common textbook on property and legal interests in land one case study concerns a property ownership status called a joint tenancy. In a joint tenancy, two or more people own land together. One important legal feature is that on death of one joint tenant, that person's interest in land simply ceases to exist; nothing is passed to heirs at death or by will. Accordingly, if three people have a joint tenancy, if one person should die before the others, the remaining persons simply continue to own the land just without the deceased person sharing that property. If there are two joint tenants, when one dies the survivor simply continues to own the land as a sole individual. However, if during the life of a joint tenant she transfers her share in the property to another, then the joint tenancy ends as to that share; the property becomes a separate share of the common property that can be or inherited or willed to others at the death of that former joint tenant (Helmholtz, 1998).

In the case in the textbook, in 1981 two brothers, John and William, were joint tenants in a house in a small rural village. John mortgaged his interest in the house to provide money so that a third party, Charles, could purchase a different house in the same small town. After Charles purchased the house, John moved into Charles' dwelling and lived there until John died. John's will left Charles all his property including the joint tenancy interest in the house John owned with his brother, William. Charles and William sued each other to determine whether William owned the former joint tenancy house solely or whether Charles also owned a share in the house because John's will gave his interest in the house to Charles (Harms v. Sprague, 1983).

Doctrinally, the case is simple. The issue is whether the mortgage is considered a transfer of property that would end the joint tenancy as to that share or not. If it was a transfer, Charles would win because he could receive John's share under the will; if it was not a transfer, then John died still owning joint tenancy property and William would be the sole owner. The case presents no doctrinal issues involving race, gender, or other diversity and inclusion issues. Thus, under usual law school pedagogy there would be no occasion to bring them up. Teachers would use the case to discuss the legal question and may apply it to different types of property transfers to see how joint tenancy rules apply.

Nevertheless, consider this alternative approach. After talking about the legal issues outlined above, the professor might ask students what motivated John's behavior. Students may be puzzled since traditionally law professors do not ask about litigants' motives for taking an action, only about the legal consequences of that actions once taken. Nevertheless, the professor may then seek to elicit a deeper understanding of the diversity and inclusion issues masked by the court's and the textbook's presentation of the case.

For example, the teacher might ask students to change Charles's name to Charlotte. In my experience, once that change is made, students almost immediately posit that John and Charlotte were a couple. The professor may then ask students why they saw the possible relationship when the facts appeared to be the actions of a different-sex couple, but not a same-sex one (Brower, 2009). This shift may start a conversation about baselines and how 'neutral' or 'default' rules often assume heterosexual, white, able-bodied, cisgendered, etc. protagonists (Wickberg, 2005). Some students may be surprised that unexamined baselines or assumptions may also affect ostensibly "noncontroversial" legal decisions as well as how those baselines influence their own perspectives and reasoning about cases. But this insight is an important lesson; and one perhaps best taught in a class that ostensibly has little to do with diversity and inclusion.

The professor might also explore whether the parties being same- or different-sex partners would have made a difference in the case. Doctrinally the answer is no. But in 1981 at the time of the case, it certainly would have affected the legal choices John and Charles had before them – both to formalize their relationship and to deal with the property and inheritance consequences of that relationship. The teacher might enquire what options were available in 1981 to same-sex couples to protect the two partners' rights in shared residences. How is that different from the current legal regime where the jurisdiction legally recognizes marriage between same-sex couples? Moreover, although John mortgaged his joint tenancy property to provide money for Charles to buy the new house, only Charles was listed as the legal owner of the new property. Given that decision, what could John have done to continue to live in the house had Charles predeceased him and died without a will, or if they had split up? Finally, the court's opinion that the students read barely mentioned Charles and the effects of the court's decision on him; instead, it focused on William's property rights and those of the holder of the mortgage. Would the court's opinion have emphasized that relationship if Charles had been a woman in a heterosexual relationship? Do those omissions say something about how the court values same-sex relationships or how it sees their relationship reflected in the law?

Finally, this class takes place in a law school, a degree program that serves as training for pre-professionals and is designed to prepare them with the skills to be a competent professional (Sullivan, et al., 2007). Therefore, one follow up line of inquiry might be how will you, the student, address these issues when these persons walk into your office? Will you recognize these issues should they occur in your clients' problems? How, if at all, will you ask your clients about them? These topics speak to the lawyer's role vis-à-vis the people they serve and how to best provide competent and effective counsel. Thus, they are appropriate subjects for law school inquiry in all classes, particularly those where the subject matter may not obviously or naturally present itself for discussion.

## 3. Some challenges and responses

Some teachers might question spending time on hypotheticals or questions that create few or no doctrinal differences. Indeed, professional school students themselves may doubt that approach preferring to focus on what will be tested in class or on the professional entrance examinations. One response is that exploring hypothetical situations and application of changed facts are common law professor tools, often used to expose analytical weaknesses or differences in outcome generated by changing facts or legal doctrines (Thorne, 2011). Part of the purpose of these hypothetical cases is to explore implicit assumptions and limitations.

More importantly, classroom discussions should be relevant beyond the close of the semester or end of law school, but be valuable well into students' legal careers. Indeed, the 2007 Report of the Carnegie Foundation for the Advancement of Teaching, *Educating Lawyers*, criticized American legal education for not teaching law students to develop professional competence and identity, while focusing too much attention on legal principles and theory (Sullivan, et al., 2007). Accordingly, students must realize that diverse people and relationships are part of the legal world. By engaging solely with what judicial opinions choose to make visible, we sometimes ignore the real people behind case captions. The tendency to forget actual litigants in casebooks is exacerbated because US legal textbooks primarily use appellate court decisions (Mashburn, 2007) – a world in which clients have limited roles, one usually relegated to sitting in the audience in the courtroom. Appellate argument is only a very small slice of legal litigation practice, and an even smaller segment of the daily work of a lawyer.

Further, the role of lawyers in the US legal system is different from that of the legal profession in the United Kingdom, for example. There lawyers are divided into barristers who argue before the courts and solicitors who have more direct client contact and who provide legal advice and services predominantly outside the courtroom (Zander, 1968). In the US, lawyers may serve in any of those capacities. They all have the ability to exercise direct client contact and offer legal advice and perform legal services inside and outside of the courtroom (Carson & Park, 2012). Thus, the ability to interact with clients and their life circumstances could and should be taught in US law schools – even in courses that focus on legal rules and doctrine.

Moreover, even if they are not noted in a legal opinion studied in a class, litigants in cases and casebooks have race, economic status, gender, religion, ethnicity, sexual orientation, physical or mental abilities, gender identity, or some combination of these and other dimensions. Clients will also have these salient characteristics, just as students, their classmates, and teachers do (Macrea & Bodenhausen, 2000).

Finally, bringing these issues into classroom where students do not expect to see them may provide students with a richer law school experience, and one that more directly resonates with their own backgrounds or experiences. The language and curricular choices teachers make signal to students the professor's openness or awareness of things that law school sometimes ignores. These bridges between student and teacher are not inconsequential. Scholars have noted the phenomenon of perceptive divergence, whereby outsiders are more likely than insiders to be self-conscious of that difference between themselves and the majority, to view their outsider status as relevant to others' perceptions of them, and to state that their difference contributed to their treatment in a particular situation. That heightened perception of dissimilarity may produce alienation and stress in those students that their classmates do not experience and that may impose barriers to student success. Student-teacher connections can ameliorate that isolation (Feingold & Souza, 2013). By making the real people behind cases visible and seeing them as individuals who have gender, race, sexuality, and other characteristics even when those aspects seem doctrinally insignificant, we remind our students that perceptual divergence can shape clients' options and expectations and possibly their treatment within legal institutions, just as it may affect their own or their fellow law students' experiences.

Perceptual divergence can also mean that people may observe the same event but experience it differently (Steele, 1997), or can read the same case but see different things in it. The classroom should not disregard those divergent perspectives; it could embrace them. If law teachers bring up diversity and inclusion issues only when they are explicit in legal cases studied in class, this suggests that sexuality, race and gender, etc. are not present in casebooks, classrooms nor germane to legal discussions. That conclusion is not only false but may conflict with students' personal history and background (Purdie Vaughns, et al., 2008). Their life experiences and that of teachers, as well as those of the litigants in our casebooks should be brought forward in the classroom. Doctrine and knowledge are important, but they are neither abstract nor do they exist in a vacuum. Law teachers (and educators generally) should insist students see the fields they study as affecting real people and shaping the diverse communities of which they are a part.

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# LEADING TRANSFORMATIVE CHANGE: EXPERIENCES OF FIRST WOMEN OF COLOR PRINCIPAL LEADERS IN HISTORICALLY 'WHITE' SCHOOLS

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## Abstract

Thanks to an apartheid regime, South Africa was demarcated according to race classifications of 'white', 'coloured', Indian and 'black'. Race classifications determined where one lived, went to school, and the possibilities to pursue higher education. For women of color in South Africa interested in a post-schooling education, the state availed bursaries to pursue teaching (and nursing) to control and limit their careers. The backdrop to separate and segregated living and learning for each racially classified group was to socialise amongst themselves, school themselves and obtain careers deemed sufficiently fit by an apartheid government. The transition from apartheid to a more inclusive and less segregated society has been slow and particularly evident in school leadership. This article reports on an empirical case study of the first seven 'coloured' women principals who assumed leadership positions in historically 'white' led schools. The study locates itself in the broader Cape Town area of South Africa two decades into the country's democracy. It has a qualitative research design and uses a case study method for data collection. Following ethics approval, semi-structured interviews served as data collection instruments. Data were analysed thematically, and the findings provided insights into leadership in historically 'white' schools in post-apartheid South Africa.

*Keywords: School leadership, 'coloured' women, women of color principals, transformational change.*

## 1. Introduction and background

The apartheid regime in South Africa (1948-1990) legislated race classifications to create political and socioeconomic power following colonisation by the British Empire. Classifications of 'white', 'coloured', 'black' and Indian enforced separation and segregation between racialised groups. Every aspect of daily life was controlled, determining where people lived, went to school, and where students could pursue post-schooling opportunities. The democratic government continued race categorisations to redress the past. However, equity redress is complex as it assumes that the experiences of individuals in a particular race (and gender) category have the same experiences for all in the category (Mare, 2011). Consequently, it overlooks the successes individuals experience in particular race-gender groups. Women of color is not a common phrase used in post-apartheid South Africa. Instead, there are separated race-gender categorisations of 'coloured', 'black African' and Indian that may carry derogatory meanings from the apartheid era (Jansen & Walters, 2020). The article contributes toward filling the theoretical void of women of color principal leaders (living with the marker of 'coloured') in schools in South Africa.

## 2. Critical race feminism

Successes of 'coloured' women are sparsely reported in South Africa (Kenny & Davids, 2022). We wanted to hear about the lived experiences of the first women of color categorised as 'coloured' in leadership positions at historically 'white' primary schools. Much of what has been written about women of color not only portrays them as problematic but, often, these views are written by authors who are either 'white' females or males (Lugones & Spelman, 1983). We drew on the writings of Lugones & Spelman (1983), who argue that women of color need to own their stories and should not be authored by another who knows very little about their daily lives. We wanted to bring to the attention that not all literature about 'coloured' women needs to be slanderous and derogatory and that there are individuals

living with the 'coloured' categorisation that have been successful in schools, though under challenging circumstances.

There are few studies about women principals in South Africa (Davids, 2018; Khumalo, 2021; Mestry & Schmidt, 2012). While Davids (2018), for example, focuses on the complexities of the leadership identities of principals and how it manifests in a school environment, Khumalo (2021) turns attention to the challenges women face as school principals. We wanted a better understanding of the strengths the women of color principals brought to the schools. We also wanted to know more about how they navigated and strengthened their leadership in historically advantaged 'white' schools. With this in mind, we found Critical Race Feminism (CRF) in education to be a helpful framework to guide the analysis of our empirical study with the view that their lived experiences become the theory (Wing, 2003). Like Carter (2011: 13), this article dares to challenge "discriminatory power structures" that keep the faces of women of color "at the bottom of the well, and stop to help them to the top".

CRF begins with the assumption that race-gender discrimination exists in the schooling system in South Africa and manifests itself differently in the lives of women of color. CRF also brings to attention that race and gender discrimination rarely function in isolation. Intersectionality is, therefore, at the forefront of our study (Cho, Crenshaw, & McCall, 2013). We imagined this to mean that there is no need for us to justify intersectional discrimination and oppression but to focus on the lived experiences of women of color in their roles as school leaders in South Africa. In agreement with Davids (2018), we also acknowledge that there could be (mis)conceptions of gendered leadership in South African schools. However, our thoughts resonate with Wing (2003) that the experiences that shape women of color (in school leadership) are different to the experiences that shape their male counterparts and 'white' women (and men) in the same spaces.

## 3. Research methodology

This study followed on from the research gathered for, Who gets in and why? Race, class and aspiration among South Africa's elite schools (Jansen & Kriger, 2020) in the broader area of Cape Town, South Africa. As women authors living with the marker of 'coloured' ourselves, we wanted to know more about 'coloured' women's experiences in their new principalship positions at historically 'white' schools. In this light, we drew attention to the first seven 'coloured' women leaders at the historically 'white' schools. A qualitative research design lent itself to phenomenological and interpretive paradigms (Cohen, Manion, & Morrison, 2011). We were interested in the views of the women as they had experienced their roles as principal leaders at their respective schools. In this regard, accounts of their lived experiences were valuable. A case study research method was apt for the study, relying on Yin's (1994: 39) conceptualisation of an embedded multiple-case study. We collected the data using semi-structured interviews. All research protocols were adhered to, including confidentiality and anonymity. The data were analysed thematically and, with this conference in mind, leading transformative change is discussed next.

## 4. Leading transformative change

### 4.1. From managing shortfalls to managing privileges

The consequences of apartheid rule meant that post-apartheid schools that had historically accommodated learners from marginalised communities lacked sufficient teaching staff, educational resources, finance, administrative staff and parental involvement with high teacher-learner ratios (Spaull & Kotze, 2015). According to Bush and Sargsyan's (2007: 397), transformation in South African schools "require[d] action at all levels and there [were] limits to what principals c[ould] achieve in the absence of appropriate physical, human, and financial resources". Furthermore, with no official training programme for principals to understand the meaning of transformation in schools, it was left for the principals to work it out on their own (Bush & Glover, 2016). Each of the women in this study was principal leaders at schools that enrolled learners from historically marginalised communities (townships) before they applied for their new principal positions. As Dawn pointed out, it was not an easy time because the education department put enormous pressure on principal leaders for schools to become fully functional and how to do so. Although Bush and Sargsyan (2007) describe transformative leadership as redressing the inequities of the past, its meanings in township schools were tested by managing resource, administrative, financial and staff shortages. Through an interpretivist lens, transformative leadership in a township school means compliance with the education department and being innovative about a school's survival.

On the other hand, 'white' schools were historically well-resourced and academically sound. However, there were challenges that the 'coloured' women principals had not experienced in their township schools. At Dawn's new school, she found that she had greater autonomy; the education department gave her time to acclimate to the school context and decide how she wished to move the school forward. Although the schools appeared to be fully functional, underneath the surface, there were challenges they were unaccustomed to. For example, O' Shea stated, "I had to make a lot of financial decisions that had an effect on the school. I had to make financial changes … we were over-staffed". O' Shea was not accustomed to managing large numbers of School Governing Body (SGB) staff, which "also impacted the school's financial management," she stated. SGB consist of elected parents, staff and school leadership. The SGB decide on the amount of school fees per learner and staff appointments. SGB staff appointments are not paid from the state's purses but from the learners' school fees. Dawn and O'Shea point out that they were unaware of the number of SGB staff in their new schools as, in township schools, SGB posts were slim. Dawn states, "But then I came in here to about 30 plus SGB staff. That is huge! And, I had to manage them as well". The data directs attention to tough financial decisions that had to be made, which affected the employment of some of the predominantly 'white' staff and their reactions to staff redundancies. Therefore, redressing inequities in historically 'white' schools has little to do with managing tangible shortages. Instead, redressing equity in this context meant making financial decisions about re-directing finances in the interests of the schools without the 'interference' of the education department.

## 4.2. Transformation from within privileged schools

Transformation is a common phrase in South Africa, often understood as redressing equity (Mestry & Schmidt, 2012). However, redressing equity through representation does not imply transformation, as issues around equity go much deeper in South Africa, historically and politically. Seemingly, there are missing conversations about what transformation means for staff employed at historically 'white' schools. Belinda made the following observation:

> *A lot of assumptions were also made by not understanding things from a different perspective, not maybe taking the time to understand what transformation looks like. When you start unpacking it from what the teacher needs in the classroom, of what the children need, of the type of conversation and spaces that need to be created for people to unpack all of this. I don't think that was given a priority.*

To this end, transformation begins with difficult ongoing conversations with staff about understanding that privileges may need to be given up to accommodate the needs of those with less. Abels, for example, addressed some difficult issues with her staff members and found that "it was a hell of a battle for the teachers … they couldn't deal with it". Gallie "invited every staff member to come and see me and tell me their story, and I remember there were a few of them who never came". The teachers' absence may imply that face-to-face discussions may work for some and not for others. Gallie adds, "You have to strategically plant the seeds if you want things to change" – to be an agent of change. Another strategy was for an external service provider to unpack deeper meanings of transformation with staff, as was the case for Belinda. In her view, "if you really want transformation, you need to create the spaces for connections to happen [amongst staff]". Still, Dawn affirms, it remained her responsibility as a 'coloured' woman principal to lead on transformation as "we cannot transform from the outside in, you need to be inside to transform outwards", leaning towards the determination and resilience required for transformational change.

## 5. Conclusion

This article highlights the leadership experiences of the first seven 'coloured' women, a category of women of color in South Africa, as they began their principalships in historically 'white' primary schools in the broader Cape Town area. Lived experiences revealed that although the women brought a wealth of leadership and management experiences from their historically marginalised schools, they experienced different challenges in their new schools, which they needed to adapt to. While there may have been a plethora of successes and challenges in these schools, we discovered two variables perhaps overlooked when women of color apply for principalship positions in historically 'white' schools. Firstly, the implications of managing the employment of more than necessary staff. Secondly, doing the 'work' of transformation with staff who reaped the privileges of 'white' spaces. We believe that what is needed in (predominantly 'white') privileged schools is not necessarily transformational leadership in terms of

employment equity redress but to employ principal leaders who can lead transformative change in the schools. While we could not identify what constitutes transformative change and managing the processes thereof, we seeded conversations that all principal leaders should have with their staff if they are serious about school transformation.

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# INSTITUTIONAL MEASURES TO PREVENT AND FIGHT AGAINST SEXUAL VIOLENCE IN UNIVERSITIES - THE CASE OF QUEBEC, CANADA

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## Abstract

The high prevalence of sexual violence within academic institutions has been internationally documented. Furthermore, the phenomenon of under-reporting of sexual violence experiences has been observed worldwide. Official complaints to universities reflect only a very small proportion of sexual violence acts experienced by community members. Thus, understanding how higher education institutions can support victims of sexual violence, including in their reporting process is needed to improve upon current practices. Our results from two consecutive studies conducted in Quebec offer promising measures to stimulate the reflection process of higher education institutions in the fight against sexual violence. Based on a sample of 9,234 students and employees, the first study revealed the high prevalence of campus sexual violence in Quebec. Over one in three individuals have experienced at least one situation of sexual violence and less than 10% of victims had reported to their university. The second study used a qualitative methodology to conduct interviews with 22 victims to explore their experiences of reporting to their home university. Analyses shed light onto central themes, in particular the obstacles identified by victims in their reporting process to the university. These obstacles can be related to structural elements specific to institutions (e.g., specialized services' accessibility, sexual and gender-based policy) and the responses they can provide to victims, as well as elements belonging to the victim's environment and personal characteristics. By adopting actionable measures centered around the needs of victims, higher education institutions can promote a healthy and safe environment for community members, free of all forms of violence. The actual and sustained mobilization of institutional leaders and stakeholders in the fight against gender-based and sexual violence is an essential condition for cultural change in universities, and in so doing, would contribute to an equitable access to education within a social justice context.

***Keywords:*** *Campus sexual violence, reporting, obstacles, institutional response, higher education.*

## 1. Introduction

Sexual violence remains a pervasive social issue. Collective voices such as #BeenRapedNeverReported and #MeToo have brought public awareness to the widespread issue of sexual violence, which occurs in all walks of social life, including higher education institutions. This article examines the prevalence of sexual violence on university campuses (SVUC) in Québec, Canada, and the experiences of reporting these incidents to universities. The Centers for Disease Control and Prevention (CDC) recommends using an inclusive definition of sexual violence to measure its prevalence (Basile et al., 2014). Accordingly, their proposed definition is not limited to experiences of sexual assault (or rape). In this paper, the definition of sexual violence aligns with that of the CDC. It encompasses a wide range of experiences, including sexual assault, exhibitionism, voyeurism, sexual harassment, cyber harassment, unwanted touching, rape threats, sexual blackmail, and other forms of non-consensual sexual behaviors. This definition allows for the conceptualization of sexual violence on a continuum, as many feminist

researchers have advocated since the groundbreaking work of Kelly (1987) and Hanmer (1977). This continuum approach is also in line with the definition of sexual violence adopted by the World Health Organization in its World Report on Violence and Health:

> "Any sexual act, attempt to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic, or otherwise directed, against a person's sexuality using coercion, by any person regardless of their relationship to the victim, in any setting, including but not limited to home and work." (Krug et al., 2002, p. 149).

Despite these recommendations, the rates of SVUC reported in studies vary according to the definition of "sexual violence" (e.g., including non-contact forms of victimization such as sexual harassment or only contact forms of sexual assault) and the reporting period (e.g., the last 12 months or since arriving on campus). Fedina et al. (2016) highlighted these variations in a review of 34 studies published between 2000 and 2015 on the prevalence of sexual violence experienced by college and university students in the United States, excluding sexual harassment. They report that the estimated prevalence varied between 6% and 44% for women and 1,4% and 3,2% for men. In France, the VIRAGE survey indicated that 41% of women and 30% of men reported at least one incident of sexual violence in the past 12 months within the context of university studies, including sexual assault and sexual harassment (Lebugle et al., 2021). In Canada, a large-scale survey by Statistics Canada found that 45% of female and 32% of male students experienced at least one incident of unwanted sexual behavior in a postsecondary setting during the last 12 months, including sexual harassment (Burczycka, 2020). Additionally, some groups are at a greater risk of being subjected to SVUC, including women (Cantor et al., 2015; Fedina et al., 2016), international students (Budd et al., 2023; Fethi et al., 2023), sexual and/or gender-minority individuals (Coulter et al., 2017; Martin-Storey et al., 2018; Potter et al., 2020). Sexual violence is a significant problem due to its prevalence within the university community and its detrimental consequences on individuals' well-being. These consequences include physical and mental health issues, intrusive thoughts or nightmares related to the SVUC event, difficulties in concentrating or fulfilling academic requirements, as well as the intention or decision to leave the university (Burczycka, 2020; Hill & Silva, 2005; Krebs et al., 2016; Paquette et al., 2021). A recent study on sexual harassment revealed that significant adverse impacts could result from it, such as symptoms of depression or panic attacks (Bastiani et al., 2018). Furthermore, despite its prevalence and significant consequences, SVUC remains largely underreported. The underreporting of SVUC has been observed worldwide (e.g., Burczycka, 2020; Krebs et al., 2016; Lebugle et al., 2021) and has been attributed to concerns over confidentiality, fear of not being believed or taken seriously.

## 2. Context & objectives

The situation in the United States highlights the importance of political motivation and leadership. Despite challenges and resistance from the institutions, the Obama Administration had previously demonstrated a commitment to address the issue of sexual violence on campuses by setting federal regulations (e.g., Title IX). In Canada, institutional regulations to address sexual violence differ by province. In the Province of Québec, the government adopted 2017 a framework legislation and an action plan in December 2017 mandating postsecondary institutions to implement effective measures to address SVUC. Presented as the "Act to Prevent and Fight Sexual Violence in Higher Education Institutions," Bill 22.1 calls for the implementation of prevention, awareness, accountability, support, and assistance measures (Gouvernement du Québec, 2017). University administrative leaders had until September 2019 to adopt stand-alone policies to prevent and address sexual violence within their institutions.

This article aims to understand how higher education institutions can support victims of sexual violence in order to improve current practices. To achieve this goal, we first conducted a quantitative study to examine experiences of underreporting, followed by a qualitative study to explore the reporting process of SVUC victims in Québec, Canada. The quantitative study is based upon a large-scale research project titled the ESSIMU Study (Enquête Sexualité, Sécurité et Interactions en Milieu Universitaire). This study was initiated following recommendations made by feminist groups and students who mobilized in response to a series of racist, sexist, and homophobic incidents (for additional context surrounding ESSIMU see Ricci & Bergeron, 2019). This study aimed to measure sexual violence and address three limitations identified in previous studies. First, this study examined the experiences of the entire university, including students, faculty members, and employees. Second, it focused on incidents involving perpetrators affiliated with the same university as the victims. Third, analyses were not limited to incidents within university grounds and included assaults that could have taken place either on or off-campus. The qualitative study we report on in this paper draws upon a research partnership aimed to document current issues related to SVUC prevention, practice, and research. This study is named the VSMES-CRSH partnership project

(Violences Sexuelles dans les Milieux d'Enseignement Supérieur - Conseil de Recherches en Sciences Humaines du Canada). We present research findings to better understand the experiences of victimized individuals by examining their reporting process and their needs for institutional support.

## 3. Methodology & ethical considerations

The results in this paper are derived from two studies: the first is based on quantitative survey data, and the second involves qualitative interviews with SVUC victims. We describe each methodology below. The ESSIMU study was conducted in 2016 at six French-speaking universities in Quebec, members of these universities were invited via flyers, emails from the university, and emails from pertinent student organizations to participate in the ESSIMU. The only requirement to complete the online questionnaire was that participants had to be either employed or enrolled as students at one of the six universities at the time of data collection. A total of 9,284 individuals responded to the online survey. Sexual violence was measured using a French adaptation of the Sexual Experiences Questionnaire (SEQ—DoD) previously used by Fitzgerald et al. (1999). The questionnaire consists of 21 items to assess three categories of sexual violence: sexual harassment (i.e., verbal and nonverbal insults and hostile or degrading behaviors), unwanted sexual behaviors (i.e., verbal, and nonverbal behaviors of a sexual, offensive, unwanted, or nonreciprocal nature, including rape/sexual assault), and sexual coercion (i.e., blackmail involving promises of future benefits related to jobs or studies or reprisal if sexual favors were not given). To assess disclosure of events, individuals who reported at least one incident of SVUC were asked: "Did you report the incidents to university authorities/resources?" Those who did not disclose the events or disclosed only some were asked for their reasons for not reporting, with a choice of 16 statements.

The qualitative study rests upon the VSMES-CRSH project, which began in 2020 with a call for participation widely distributed across all French-speaking Quebec universities. Recruitment was conducted through social media campaigns and dissemination by the project's co-researchers within their respective universities. The inclusion criteria for participating in the study were: having experienced SVUC (regardless of when the acts had occurred) and having reported the situation to a university resource after September 2019 (the deadline for institutional leaders to adopt sexual prevention policies). A total of 22 individuals were interviewed, including students and university employees. Individual interviews explored several themes, including the context of SVUC, the reporting process to the university, the needs and expectations towards the university, and the facilitating elements and obstacles encountered when reporting.

All necessary ethical approvals for the two research projects were obtained prior to the recruitment stage. Data collection and handling adhered to all confidentiality rules. A list of support services and information was provided to participants. Additionally, the research team interviewers received 15 hours of training on sexual violence, victim support, and how to conduct individual interviews.

## 4. Findings

The findings of the ESSIMU study (reported in full in Bergeron et al., 2016) revealed that SVUC is a frequent issue, as 37% of respondents indicated they experienced sexual violence at some point since arriving at university, perpetrated by someone affiliated with the same university. More specifically, 34% experienced sexual harassment, 18% experienced unwanted sexual behaviors, 3% had experienced sexual coercion (one person could report more than one experience). Rates of sexual violence were higher amongst certain groups, such as women (41%), non-binary individuals (56%), LGBTQ community members (49%), individuals with a disability (46%), and international students (42%). Additionally, silence appears to be an important part of SVUC aftermath. The study found that 90% of victims had never reported the incidents to their university. Several reasons have been identified to explain the decision not to report the violence to their institutions, with the following three primarily selected by the respondents: believing the situation was not severe enough to be reported (79%); wanting to put it in the past and not think about it again (30%); fearing the university would not take it seriously (20%). Other reasons suggest a lack of trust in institutions: not trusting existing university authorities or resources (16%), fearing the complaint would not be handled confidentially (14%), fear of negative consequences (13%), including fears for university-related employment, academic fulfillment, or athletic career.

Results from the VSMES-CRSH project offer a more comprehensive understanding of the reporting process by examining the personal experiences of individuals who have gone through this process at their respective universities. These experiences are influenced by multiple factors perceived as facilitators or obstacles. Whether their impact was positive or negative, these factors are on different levels from an individual perspective, then regarding the environment of the person and finally around aspects that are specific to the university. We will explore the aspects specific to the university institutions to identify practices that can be improved to enhance the reporting process. The very existence of institutional policies

to fight against SVUC, and correspondingly the availability of resources for victims within their university, was identified as facilitators, including the access to dedicated services to handle reports. However, the implementation of institutional policies, which raises issues of anonymity, confidentiality, and the administrative and time burden of the process, emerged as institutional barriers. Another aspect relates to the hierarchical structure of academia, resulting in an additional obstacle to the reporting process due to the intrinsic precarity of a subordinate position. The presence of psychosocial resources within the university (e.g., sexual violence intervention and prevention offices) was named as a facilitating element in the reporting process. Lastly, the results emphasize the pivotal role of support, which may act as a helpful factor when present and adequate (i.e., listening, validation, respect, and action in favor of the victim). However, it may become a barrier when insufficient or absent (e.g., lack of initiative or action to protect the victim, minimization). It is important to note that reporting experiences are diverse and multifaceted. Individuals who have filed reports hold various positions within the university, and adequate support may come from different individuals, not just those appointed by the institution within intervention and prevention offices.

## 5. Conclusions & recommendations

Based on research findings and an aim to foster social transformation, the ESSIMU team proposed 15 recommendations for the prevention of SVUC, which can be found in the research report (Bergeron et al., 2016). These recommendations are grouped into six focus areas: 1) framework policy and stand-alone SVUC prevention policy; 2) safe environment; 3) consistent and permanent awareness tailored to different groups; 4) education and training; 5) specialized support interventions accessible to the entire university population; and 6) research. These recommendations aim to provide university community members with a healthy, equal, and safe learning and work environment free from sexual violence. Results from the VSMES-CRSH project highlight the importance of a safe environment and the value of sexual violence education and training – not only for specialized service employees but everyone in the university –to offer appropriate support to victims. To encourage the implementation of institutional policies and effective prevention strategies, a more comprehensive understanding of SVUC is needed, including a description of the dynamics specific to academic settings and the interventions best suited to the institutions (Ricci & Bergeron, 2019). The research discussed in this paper contributes to the production of knowledge on the issue of SVUC in Quebec (Canada). It provides recommendations to raise awareness among government bodies, university management, and social stakeholders about this issue and to implement effective prevention measures for the entire university community.

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# A CONDUCTIVE ALLOY:
# A 'WHOLE INSTITUTION' APPROACH TO STUDENT (MIS)CONDUCT

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## Abstract

Student academic (mis)conduct is a source of significant organizational, strategic, and local risk, both to an educational institution and to the individual. While a university must uphold both its academic standards and its moral responsibilities, an individual student also needs to take responsibility for the originality of their work and the honesty of their degree outcome. The risk for a student can range from a lowered outcome to expulsion, while an academic institution lives or dies by its reputation. However, the general model of managing academic misconduct in a university setting is often fragmented and lacks clear ownership: often teaching and research staff educate their students on disciplinary standards, units for academic literacy provide centralized academic practice provision and can offer remedial support, and an academic standards division will manage the process of penalizing those students whose misconduct has been identified. The realities of large and complex academic institutions, often with high levels of devolved authority, often preclude a more holistic view.

For example, at the stage of reprimand and redress, intentionality is not taken into account: a mistake in referencing or attribution without an intent to mislead is nonetheless still an instance of submitting the work of others for credit. This is a process issue often not appreciated fully by some academics involved in advising students, who focus on the idea of a student having planned or not to deceive a marker. Therefore, at the pre-offence stage, where a student is being inducted into new academic practices, care must be taken to bring the knowledge of the team in charge of imposing penalties directly into the process of training and advising students.

In response to this, the present paper describes work undertaken at the University of Glasgow to develop a new integrated culture to tackle issues of academic integrity across the institution. We describe a partnership between colleagues in academic departments, our academic literacies/Learning Development team, our Student Conduct Team and colleagues from academic standards and policy to focus on a wide-view approach to student conduct, in order to shift the focus from reprimand and redress to 'before the offence'. We therefore propose a joined-up model that brings together this centralized teaching of good academic practice, systems and processes managing academic misconduct cases, and academic staff working within subject areas. This model places academic integrity, ownership of responsibility, and good academic practice at the centre of the student experience.

***Keywords:*** *Student conduct, educational policy, student experience, plagiarism, strategy.*

## 1. Introduction

Writing almost a decade ago, Macfarlane et al. (2014) established that, with the expansion of a global Higher Education market, the debate and discussion around the area of academic integrity was 'a growing area of academic research'. In the United Kingdom, the subsequent rapid expansion of student numbers, alongside changing technology and an increased awareness of the scale of the challenges facing policy-makers and academic misconduct investigators, has brought the issue of tackling 'cheating' to the fore of university and public attention (Ali, 2016; Marsh, 2018). The move to many forms of online assessment and online examination as a result of the COVID-19 pandemic lockdowns further highlighted the need for Higher Education Institutions (HEIs) to have robust anti-plagiarism policies and educational, developmental practices in place (Henderson et al., 2022).

This paper discusses the ways in which the University of Glasgow, a large, research-intensive Russell Group HEI in Scotland, has adapted its approaches to handling student academic misconduct. Drawing on the combined work of subject-based academics, the institution's academic literacies/Learning Development team, the Student Conduct staff, and policy makers, we discuss the ways in which a renewed focus on academic misconduct that aims to shift institutional focus to embed more 'before the offence' provision, reduce numbers of students referred for academic misconduct, and smooth the processes involved in handling cases.

In particular, our paper discusses our theoretical framework and then the practical steps undertaken at the University of Glasgow. Through combining the work of the teams and staff mentioned above, we propose a model that aims to improve the student experience (through targeted educational materials, resources and learning opportunities for all our students) and increase efficiency in dealing with individual cases of academic misconduct (by providing joined-up service provision, a clarity of procedure for staff to follow, and a clear pathway through the process for our students to understand). With the above in mind, our key research question, then, is: to what extent and in what ways does adapting an institution-wide approach to academic misconduct affect student satisfaction, student outcomes, and student understanding of academic misconduct?

## 2. Our framework

We use the terms 'academic misconduct', 'plagiarism' and 'academic integrity' throughout this piece. We take the view that academic misconduct and plagiarism are interchangeable: both refer to our students breaching the University's regulations on academic integrity (see *University of Glasgow - Plagiarism Statement*, 2022). Academic integrity we take to mean the 'values, behaviour and conduct of [students] in all aspects of their practice', notably, their assessed work – in any format – submitted for degrees (Macfarlane et al., 2014) and how student work follows the rules of 'ethical scholarship' as outlined by Bretag et al. (2011). In practical terms, this can 'include cheating in exams or assignments, collusion, theft of other students' work, paying a third party for assignments, downloading whole or part of assignments from the Internet, falsification of data, misrepresentation of records, fraudulent publishing practices or any other action that undermines the integrity of scholarship and research' (Bretag, Mahmud, East, et al., 2011).

We draw further on work by Bretag in how we define our underlying principles when dealing with student academic misconduct. We echo Bretag's view that there has to be an equality of attention to, and provision for:

- student access to policy and procedure details;
- an approach that is consistent in its wording, its action, and its philosophy, and which is consistently applied in all cases;
- a clarity of responsibility for all stakeholders that 'incorporates academic integrity at the individual, organization, education system and social levels';
- a level of easily accessed information on practice, procedure and processes; and
- a range of support systems – academic and pastoral – that encourage best practice in academic integrity (Bretag, Mahmud, Wallace, et al., 2011).

The key priorities of our approach – access, approach, responsibility, detail, support – have, as a result, guided our practice. We detail the ways in which this practice has been enacted below.

## 3. Our approach

The University of Glasgow is a large, complex organization. We have over 35,000 students at undergraduate, postgraduate taught and postgraduate research level. As a research-intensive university, we aim to equip our students with 'skills and newfound knowledge to education, to heal, to fight for justice and equality, to advance global society and to flourish as purposeful individuals with the power to make a difference' (*University of Glasgow - Strategy 2025*, 2020). Promotion of academic integrity is central to this strategic mission. The combination of effort from teams across our large HEI has allowed us to enact the principles outlined above.

Specifically, through work between our subject-based academic colleagues and the Learning Development team, we have been able to provide scaffolded, level-specific and targeted educational pieces that teach our students our rationale and philosophy surrounding academic integrity. This educational piece is crucial to the success of our work: we better equip our students for their studies, their research and scholarship, and their future careers through providing the principles of academic integrity (Bornsztejn, 2022; Parkinson et al., 2022). Through compulsory institution-wide courses run by the

Learning Development team and subject-specific, targeted educational pieces developed between the Learning Development team and the subject-based academics, our students are provided with sector-leading, academic literacies-driven pedagogical approaches to understanding academic misconduct (Lea & Street, 1998, 2006; Street, 2010).

Similarly, work between our Student Conduct team, our Learning Development team and our policy colleagues has allowed us to clarify, explain and detail the nature of the processes involved in cases for academic misconduct. Moving from an opaque system that left many students unaware of their progression through the handling of their case, and oftentimes with little understanding of the underlying errors in their academic conduct, to a clearly articulated and codified process has allowed our students to take increased responsibility for their actions and for their learning. We have, furthermore, been working to lead the institution in the adoption of new assessment practices to design out opportunity for academic misconduct.

## 4. Conclusion

These approaches have allowed for a holistic, institution-wide approach to tackling issues of academic misconduct; utilizing the various areas of expertise from across the university, we have been able to provide increased 'before the offence' educational pieces for our students that better equip them to study and research. Importantly, the approach outlined here allows for us as an institution to bring together often disparate pieces of work – with different areas of the university having different focuses, priorities, approaches and philosophies – into one coordinated and collaborative effort.

Our paper presents discussion on our theory and practice, and aims to encourage ongoing reflection on the process of equipping our students to meet the challenges of researching in an era of fake news, essay mills, and Artificial Intelligence. With this work, we aim to meet the challenges of our institution's Learning and Teaching Strategy, wherein we seek to work on prevention of academic misconduct through enhanced education, through intra-institution collaboration, and through innovative approaches to assessment design. Our paper therefore provides one element of the discussion – but, importantly, not the full answer to – our research question of adopting an institution-wide approach to academic misconduct and plagiarism.

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# WOMEN WORKING AT UNIVERSITIES IN SOUTH AFRICA – A GENDER EQUALITY PERSPECTIVE

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## Abstract

The right to equality is a fundamental human right recognized in both international and local law. However, achieving gender equality remains a challenge in many countries. Women have historically been underrepresented in the higher education sector and continue to face barriers in achieving better-paid, higher status, or decision-making positions. The suppression of women's role in the higher education sector has been perpetuated by patriarchal systems and values, negatively impacting not only women's development but society as a whole. Gender transformation has become an important tool in promoting gender equality and improving development.

This paper reports on a study that examined how female staff in South African universities experience gender equality and gender transformation, and explores potential best practices for achieving gender equality in the sector. Exploratory research methods were employed and combined a literature study, a legal investigation, and an empirical investigation. The theoretical framework relied on the feminist policy analysis framework, examining gender transformation through the feminist lenses of critical theory and intersectionality.

Through a qualitative empirical approach, semi-structured interviews were held with 16 women employed at seven different public universities using a snowballing approach. Thematic analysis was used to condense the data into insights that could contribute to the research objectives. The research findings show that despite policies, regulations, and laws aimed at promoting gender equality, there is still a significant disconnect between policy and women's experiences in the sector. Women face challenges such as the negative impact of gendered division of domestic responsibilities, isolation, and barriers to their career paths. Although progress has been made in bringing more female students and personnel into the sector, women's representation in leadership positions remains a challenge. The study identified a lack of political awareness and implementation, a quantitative and contextless approach to gender change, and the failure to mainstream gender-sensitive approaches as significant factors contributing to the slow progress of gender transformation in higher education.

The findings and recommendations of this study provide a foundation for those engaged in or charged with gender transformation in higher education. The study calls for a more holistic and context-sensitive approach to gender transformation, one that acknowledges the diversity of women's experiences and promotes inclusive decision-making processes. The study highlights the importance of political will and leadership, institutional culture change, and mainstreaming gender-sensitive approaches to achieving gender equality in higher education.

*Keywords: Equality, gender, transformation, higher education, university.*

## 1. Introduction and problem statement

Achieving gender equality is a fundamental human right recognized in both international and local law. However, its application remains elusive, and women continue to face significant barriers in various sectors, including the higher education sector. Historically, women have been underrepresented in higher education, and even in the present, they are particularly underrepresented in better-paid, higher status, or decision-making positions. The suppression of women's role in higher education can be attributed to the historical, political, cultural, and religious advancements of patriarchal systems and values, which have a negative impact not only on women's development but on society as a whole. Gender transformation has emerged as an essential tool to promote gender equality and improve development, and many countries are adopting policies and practices to advance this goal. A report released by the South African Commission for Gender Equality in 2015 indicated that discrimination on the grounds of gender, race, disability, and socio-economic status persists and that unsatisfactory

transformation has occurred at management, staff, and student levels. David (2015: 10-11) and Akala (2018: 229) raise concerns about the slow progress of gender transformation in SA higher education institutions.

Against this backdrop, this paper aims to report on a study that explored how female staff in South African universities experience gender equality and gender transformation. The study examines potential best practices for achieving gender equality in the higher education sector.

## 2. Theoretical perspectives

Gender equality is supported by international instruments such as Universal Declaration of Human Rights, International Covenant on Civil and Political Rights, International Covenant on Economic, Social and Cultural Rights, Convention on the Elimination of Discrimination against Women, and Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa.

Gender equality is defined by the World Health Organization (2002) as the absence of discrimination on the basis of sex in opportunities, resource allocation, benefits, and access to services. Gender equality is a tool to level differences between genders and involves equal conditions for realizing full human rights and contributing to economic, social, cultural, and political development, rights, responsibilities, and opportunities (International Labour Organization, 2015). Gender equality promotes equitable outcomes and representation for all genders, with the fight for equality recognized as a human rights issue in the Universal Declaration of Human Rights (UN General Assembly, 1948). Gender equity and gender equality are correlated, as equity leads to a certain level of equality. The World Health Organization (2002) defines gender equity as fairness and justice in the distribution of benefits and responsibilities between men and women.

Equality is a core pillar of democratic societies and is often associated with non-discrimination. The right to equality is interpreted using two strategies: formal and substantive equality. Whereas formal equality focuses on equal treatment, substantive equality prioritizes outcomes, ensuring fair results and equal opportunities for marginalized individuals and groups. This should be reflected at "both a broad, structural societal level, and in instances of direct discrimination, as is regularly encountered in the workplace" (SAHRC, 2016: 24). According to Albertyn (2007), the concept of "substantive equality" recognizes inequality as the product of group divisions in politics, society, and the economy, and aims to level the playing field for everyone. It takes into account personal differences and aims to accommodate them in a reasonable manner to achieve equality of opportunity and outcome. The case of President of South Africa v. Hugo (1997) illustrates that a substantive equality approach fosters human development while addressing systemic inequality.

Law and policy play a crucial role in gender equality and transformation in higher education. Drawing on the theory of law as a transformative tool (Langa, 2006; Kok, 2008), the interaction between law, policy, and the realization of equality for women in higher education practice can be explored and better understood. Employing critical feminist policy analysis, as advocated by Duncan (2007), allows for a critical engagement with the implementation of law and policy and its impact on the realization of rights in and through education. The authors argue that feminist policy analysis provides a framework for exploring how gender equality and transformation are influenced by law and policy, particularly those policies and laws that aim to bring about societal change, justice, and equality. This approach allows for a better understanding of the role that policies and law play in constructing gender relations in society and different environments in which people find themselves, as well as how law and policy can be employed to effect societal transformation (Kanenberg and Leal, 2019).

Whereas a transformative definition of the right to equality is needed, the implementation of gender equality and the law and policy that drives gender transformation should be supported by theoretical notions suitable for exploring gender equality and transformation issues in higher education. Specifically, the authors suggest that critical and feminist theories, intersectionality theory, critical race theory, and post-colonial perspectives inform understandings and implementation of gender equality and transformation.

Feminist theories, including those of Freire (1971, 1985) and Noddings (1986), are diverse, contextual, and contested. As Radtke (2017) notes, feminist theories are subjective, emphasizing social change, social justice, and equity to overcome the social structures through which women are dominated and oppressed. Critical feminist theories, like those of hooks (1989, 1994), oppose all forms of oppression levelled against women and are concerned with social change, social justice, and equity. These theories may aid gender transformation by helping policymakers, policy implementors and women working in higher education to understand the interplay between gender and equality.

Intersectional perspectives, as outlined by Crenshaw (1989), highlights the complex interplay of different social identities, including race, gender, class, and sexuality, and emphasizes the need to address

multiple forms of discrimination in higher education. This theory suggests that an understanding of the role and position of women in higher education must take into account the different contexts in which their intersectional identities take shape, as well as the ways in which those identities are shaped by specific places and times. Of particular importance in the South-African context is the long-lasting effect of apartheid and colonialism which influence racial identities and experiences. Critical race theory, as articulated by Ladson-Billings and Tate (1995) and Crenshaw (2019), provides a useful lens for exploring the intersection of race and racism with gender and sexism, guiding efforts to address structural inequalities affecting Black women in higher education in Africa. At the same time, post-colonial perspectives, including those of Mbembe (2001) and McEwan (2001), emphasize the need to challenge hegemonic narratives and promote diverse perspectives in higher education. As such, decolonization becomes and important objective in any gender transformation and equality agenda.

## 3. Empirical research methods

The study employed a qualitative empirical approach to describe and understand how higher education institutions respond to gender issues and how female staff members experience gender equality in their work environments (Creswell, 2013). Data collection and analysis were framed by interpretivism aimed at "understanding the beliefs, motivations, and reasoning of individuals in a social situation" as essential to "decoding the meaning of the data that can be collected around a phenomenon" (Nickerson, 2023). For the purpose of this study, female staff members of public universities in South Africa were regarded as the population. Using snowball sampling (Ghaljaie, Naderifar and Goli, 2017: 2) by starting with an initial invitation and then asking existing study participants to recruit or suggest future study participants from their social circles, sampling continued until the data was saturated at 16 participants. Semi-structured interviews (Adams, 2015: 492) were conducted with the 16 women employed at seven different public universities. At first, a Google Form gained consent and participant information and served as an invitation to the semi-structured interviews. Interviews were conducted by means of online video calling (Zoom or WhatsApp). Care was taken to adhere to ethical protocols pertaining to informed consent, privacy, confidentiality, respect, and the principle of no harm. Thematic analysis (Creswell 2009) was used to condense the data into insights that could contribute to the research objectives. Methods suggested by Nowell, Norris, Whit, and Moules (2017: 3) were employed for increased credibility, transferability, dependability, and, confirmability. This included clear audit trails, and reflexivity practiced throughout the research process.

## 4. Findings

The research findings reveal a significant disconnect between policy and women's experiences in the higher education sector, despite policies, regulations, and laws aimed at promoting gender equality. A few participants (n=5/16) stated that they were ignorant of whether their university had any gender equality policies while one participant indicate her institution does not have such a policy. However, the majority of participants (n=10/16) indicated that their universities had gender equality policies. It is the responsibility of each higher education institution to ensure that their staff members are informed of existing policies and to monitor and evaluate staff awareness of policies. The lack of awareness among participants was concerning because gender transformation and advocacy for gender equality require staff members and society as a whole to scrutinize policies and practices that uphold gender inequality and discrimination (Rubery and Koukiadaki, 2016: 8). They cannot contribute to minimizing gender inequality if they are unaware of the policies.

Women face challenges due to the negative impact of gendered division of domestic responsibilities. Although no direct question during the interviews addressed work-life balance, the issue arose, with utterances from participants indicating their experiences with work-life balance, including "men and women are not the same" (n=3/16). The study found that women face challenges due to the negative impact of gendered division of domestic responsibilities, not only when they get home but also because mothering can extend to the workplace for some. Women, especially, have different requirements and degrees of commitment outside their professional lives, and university regulations need to reflect this. For example, they may require more time off work to care for ill children, and possibly less energy and time owing to being overworked with housework. To better support women throughout their careers and maintain more women in the workforce, employers can alter how they view employees who also provide care for others, especially those who look after elderly parents. Policies regarding job protection, access to family leave, and day care options can play an essential role (Baluta, 2014: 229-230). This view is supported by Acker and Dillabough (2007: 313), who note that the 'gender binary and its normative characteristics (e.g., female motherhood versus male-oriented achievement cultures) remain at the heart of

many women's issues, putting a brake on any too optimistic concepts of agency that unavoidably accompany social change.'

One argument made about research involving females is that they are not a homogenous group but individuals with different intersecting identities and contexts (n=5/16). There have always been multi-level and overlapping types of discrimination in the higher education sector. When developing measures and strategies to combat discrimination against women, all overlapping forms of discrimination must be taken into account.

The study's findings highlighted the isolation that some participants (n=4/16) experienced because they dared to speak out against equality or discrimination. For some participants (n=2/16), the discrimination was perpetuated by other women, and had to do with their age because they were younger. Gender inequality is not always visible, and people who experience it as well as those who support it and marginalize others based on their gender may view it from different angles. It can be challenging to prove when there is gender imbalance, and it is frequently easy to doubt why there was discrimination (International Labour Organization, 2017). Participants found themselves isolated and left out due to the lack of tangible proof.

Participants (n=8/16) recalled facing barriers to their career paths. A legal framework promotes equity in the workplace, ensuring that all employees receive equal opportunities and fair treatment from their employers, and protecting workers from unfair treatment and discrimination. Non-compliance with the law was cited as one of the factors that constrained women from fully participating in the higher education sector (Participant 9). Furthermore, the study's results reveal that another reason limiting women in universities is the perception that women are incapable of undertaking any management work, and some are made to feel incapable of doing it (Participant 12).

Women's representation in leadership positions remains a challenge. According to Manzi and Heilman (2021: 257), even though the number of women in top leadership positions remains low, the visibility of the few women in these male-dominated positions is sometimes thought to foreshadow the closing of the gender gap, leading many to conclude that women are finally "shattering the glass ceiling". Participants indicated that they saw more females/women in both staff and student positions (n=8/16) but warned that women should not be seen as tokens (n=2/16) or checkboxes, but rather as contributors.

This study reveals a significant disconnect between policy and women's experiences in higher education, with some participants unaware of their university's gender equality policies. Women face challenges due to gendered domestic responsibilities, career barriers, and perceptions of incapability in management roles. Employers must alter their views to maintain more women in the workforce. Women's representation in leadership positions remains a challenge, and they should be seen as contributors, not tokens or checkboxes. To address these findings, the paper concludes with recommendations.

## 5. Recommendations

The goal of promoting gender equality in the higher education sector is an ongoing and complex process that requires a multi-faceted approach. In this study, the experiences of women working in the sector were examined to identify barriers to gender equity and to propose recommendations for improvement. The recommendations put forth are intended to serve as a starting point for meaningful change in the higher education sector, creating a more equitable and inclusive environment for all genders.

The following recommendations are suggested based on the findings of this study. Firstly, women should actively seek personal support mechanisms such as mentoring, coaching, or joining networks. Secondly, women employees must advocate for gender-related policies and familiarize themselves with existing policies. Thirdly, while access to higher education is improving for women, comprehensive support initiatives are necessary to ensure student retention, success, and continuous representation in higher education as employees. Fourthly, gender equality must be incorporated as a crosscutting problem throughout any organization, including the higher education sector. Fifthly, the Department of Higher Education and Training (DHET) must formulate national policies that address gender equality and provide clear definitions for key terms like "transformation." Finally, legislators must understand that gender inequality is maintained through institutional practices and that legislation alone is not enough to bring about transformative change; changes in behavior and attitudes are also necessary. Whereas legislative requirements for transformation tends to be quantitative in nature, attention must also be given to the real issues as experienced and raised by women who work in higher education.

By implementing these recommendations, higher education institutions can work towards promoting gender equality and addressing the challenges faced by women in the sector. This will not only benefit women, but will also lead to a more diverse, equitable, and inclusive higher education system.

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# BARRIERS TO REPORTING SEXUAL VIOLENCE IN HIGHER EDUCATION: POWER DYNAMICS AND ANTICIPATED COSTS

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## Abstract

Campus sexual victimization is associated with multiple physical and psychological consequences. It can affect the ability to pursue academic or professional activities at the university and foster feelings of institutional betrayal towards the university. The use of university services can sometimes help reduce negative consequences associated with sexual victimization. However, very few victims disclose sexual violence and use available resources in their institution. Studies that have explored reporting barriers have mostly been conducted on undergraduate students' samples. They also generally lack an intersectional perspective on violence and power relations, which acknowledges individuals' overlapping political and social identities. We conducted a mixed methods study in Quebec to explore the reasons behind the choice to not report sexual violence to university authorities or resources. First, we analyzed 88 testimonies of individuals who had experienced sexual violence and had not disclosed the situation to their institution. Second, we used a sample of 202 university community members who had been sexually victimized and had not reported it to conduct quantitative analyses. The results revealed a tendency to minimize the acts of violence, a negative perception of the institutional response and various fears of reprisals (e.g., social, professional, or academic repercussions). These findings allow us to reflect on the importance of fears for oneself and others, the assessment of anticipated costs and the potential benefits of disclosure, and the influence of power dynamics. Results can raise awareness among those likely to receive a report and, if necessary, to initiate appropriate institutional actions. The study confirms the need for awareness-raising messages that could improve victims' trust in academic institutions.

*Keywords: Higher education, campus sexual violence, sexual harassment, reporting, disclosure.*

## 1. Introduction

Gender-based and sexual violence in higher education institutions is a widespread social and public health concern. In North America as well as in Europe, several studies show that more than one third of university students had been sexually victimized (Burczycka, 2020; Federação Académica de Lisboa, 2019; Lebugle et al., 2021). Sexual violence on university campuses (SVUC) can have significant consequences on victims' functioning. SVUC victims are more likely to report negative consequences on their physical and mental health, including depression, suicide ideations, and post-traumatic stress symptoms (Basile et al., 2014; Burczycka, 2020; Campbell et al., 2009; Dworkin et al., 2017). SVUC can also lead to feelings of insecurity, hinder academic or professional pursuits, disrupt employment or educational pathways, reduce academic performance, and even result in a decision to leave the university (Bergeron et al., 2016; Burczycka, 2020; Jordan et al., 2014). The use of university resources can potentially mitigate the harmful outcomes associated with sexual victimization. However, rates of disclosure to university authorities or resources are very low. Only a small fraction of victims chooses to

disclose their experience of sexual violence and use services provided by their educational establishment (Burczycka, 2020; Federação Académica de Lisboa, 2019; Sabina & Ho, 2014; Stoner & Cramer, 2019).

Although several studies and surveys have explored the reasons why victims do not report the event to their university services (Sabina & Ho, 2014; Sable et al., 2006; Stoner & Cramer, 2019), the current state of knowledge is largely based on research conducted with a homogenous sample of white, heterosexual, cisgender, young, middle-class undergraduate students (Brubaker et al., 2017). Consequently, the experiences of other groups, such as graduate students, employees, and sexual and/or gender-minority individuals, remain largely unexplored (Brubaker et al., 2017). Previous studies also fail to adopt an intersectional perspective, which considers the multifaceted political and social identities of individuals, such as gender, age, ethnicity, sexual orientation, socioeconomic status and disability, and their relationship with power dynamics. The power dynamics associated with specific social positions can influence the decision to report SVUC event, making some individuals in the university community more likely to report than others who may have less power. Marginalized groups, such as racialized women, international students, or sexual and/or gender-minority individuals, may choose to remain silent due to the fear of negative stereotypes and experiences of revictimization (Brubaker et al., 2017; Palmer et al., 2022; Sable et al., 2006).

In this study, reporting is defined as communicating a situation of sexual violence to a university-affiliated service or resource, such as the safety office, the sexual violence prevention center, human resources, a student association, or a professor. It is important to note that reporting encompasses a broader range of actions beyond the formal filing of a complaint. Thus, the term reporting is distinguished from disclosure, which refers to the act of revealing the situation of sexual violence to someone within one's personal network, whether that person is a member of the university community or not. Also, sexual violence is conceived on a continuum that considers an inclusive range of different forms of sexual violence, as outlined by Kelly (2013). Furthermore, this violence is understood to be rooted in a paradigm that perpetuates its gendered and systemic dynamics (Hanmer, 1977).

## 2. Objectives & methods

We conducted a mixed methods study in Quebec to explore the reasons behind the choice to not report sexual violence to university authorities or resources. Documenting the reporting barriers allows for an improvement of institutional actions and measures and to achieve better outcomes.

### 2.1. Qualitative study

First, we analyzed testimonies of individuals who had experienced sexual violence and had not reported the situation to their institution. These testimonies are derived from the 2016 ESSIMU Study (Enquête Sexualité, Sécurité et Interactions en Milieu Universitaire; Bergeron et al., 2016). This study examined forms of SVUC by using a French adaptation of the Sexual Experiences Questionnaire elaborated by Fitzgerald et al. (1999). The questionnaire consists of 21 items to assess sexual harassment, unwanted sexual behaviors, and sexual coercion. When a participant reported having experienced at least one of incidence of sexual violence, an additional section invited them to respond to an open-ended question that asked them to describe an SVUC situation they had experienced: "This section allows you to testify about this event in greater detail. [...] Can you describe one of the situations in the university setting that you experienced (a one-time situation or a situation that occurred repeatedly over time)?"

Of the 9,284 individuals who participated in ESSIMU Study, 3,430 reported experiencing at least one SVUC situation and 1,801 responded to the open-ended question. Some individuals described multiple SVUC situations in their written response, and each situation was counted as a separate testimony, for a total of 2,057 testimonies, ranging from 5 to 950 words. Of these, 88 met the selection criteria for this study, namely: (1) having experienced some form of SVUC; and (2) having clearly mentioned non-reporting. Among respondents, 86% identified as cisgender female, 10% as cisgender male, and 4% as other gender. In terms of status within the university, 21% were undergraduate students, 29% were graduate students, 45% were professors or other employees of the university. Regarding sexual orientation, 78% identified as heterosexual and 18% as non-heterosexual. Finally, of the types of VSMU reported, 88% of the sample reported experiencing sexual harassment, 72% unwanted sexual behavior, and 23% sexual coercion.

### 2.2. Quantitative study

The second part of this study was based upon a quantitative research conducted from November 2021 to July 2022 at eight French-speaking universities in Quebec, Ontario, and New-Brunswick. Inclusion criteria were: (1) studying or working at university; (2) having experienced some form of SVUC; and (3) completing the entire questionnaire. The final sample consisted of 202 university

community members. The majority identified as cisgender women (77%), 15% as cisgender men, and 8% as other gender. Regarding sexual orientation, 64% identified as heterosexual and 36% as non-heterosexual. In terms of status, 33% were undergraduate students, 29% were graduate students, 38% were professors or other employees of the university.

As in the ESSIMU Study, participants were asked to complete the Sexual Experiences Questionnaire (Fitzgerald et al., 1999). If they had experienced a form of SVUC, they were directed to the question: "Following situations of sexual harassment or violence experienced in a university context, some people confide, and others are reluctant to do so. Have you disclosed one or more situations to a person, authority, or service at your university?" If participants indicated that they had not reported to any authorities or services, they were presented with a list of reasons that may have influenced their decision to disclose. They had to indicate with a Likert scale from *0 - Not at all influenced* to *5 - Definitely influenced* the extent to which each of the presented reasons influenced their decision. The list of reasons was specifically created for the study. A comprehensive review of the literature was conducted and identified the reasons primarily given by victims for not reporting a situation of sexual violence, particularly to academic institutions or services, but also to the judicial authorities (e.g., Amar, 2008; Krebs et al., 2010; Pinciotti et al., 2019; Proulx, 1997; Sabina & Ho, 2014; Stoner & Cramer, 2019; Walsh et al., 2010; Zinzow & Thompson, 2011). These studies have been conducted in Canada or the United States, with diverse populations. A total of 45 items were presented to the participants.

Prior to recruiting participants, all ethical approvals necessary for both data collections were obtained. The confidentiality of data collection and handling was ensured, and participants were given a list of support services and information.

## 3. Results

### 3.1. Qualitative analysis

The results of the content analysis highlighted four dimensions of motives and twenty reasons mentioned by the ESSIMU Study participants. The first dimension was the belief that the acts were not serious enough to be reported. It included 32 testimonies in which victims refer to characteristics related to the severity, triviality, and temporality of the SVUC situation to explain non-reporting (e.g., "It was not severe harassment.", "It was anecdotal, trivial, ordinary."). The second dimension was fears of negative repercussions. This dimension included 32 accounts that mentioned five fears expressed by the victims: fears of judgment and retaliation, fears of negative repercussions on their professional or academic career, fears of negative repercussions for the individual responsible for the acts of violence, fears of retaliation from the perpetrator or someone close to them. The third dimension was negative perceptions of the institutional response. It included 20 accounts that expressed a negative perception of the institutional process for handling reports of SVUC, particularly with respect to formal complaints (e.g., "The process is too long and complicated; it is also necessary to have the evidence to prove it happened.", "I've heard horror stories about how complaints are handled."). The fourth dimension was the use of self-defense and protection strategies. This last dimension included 17 testimonies in which reporting seemed unnecessary as victims have defensive strategies, such as confrontation or threatening to report the situation.

### 3.2. Quantitative analysis

The most common reporting barriers were the belief that the sexual violence was not serious enough to report, and that the psychological or physical consequences were not severe enough. These two items were reported by nearly 80% of participants. These results are consistent with findings of previous studies of the Research Chair on Sexist and Sexual Violence in Higher Education Settings (Bergeron et al., 2016). The normalization and trivialization of sexual violence can affect how victims perceive and interpret the situation, leading them to expect an institutional response that would also minimize the situation. The other most common reporting barriers were: "I felt able to handle the situation on my own.", "I wanted to put the situation behind me and stop thinking about it.", "I wanted to focus my time and energy on other important things (e.g., end of semester, exams, job).".

Principal axis factor analysis with promax oblique rotation was performed using R software. We performed the Next Eigenvalue Sufficiency Test (Achim, 2020). We determined that the optimal number of factors was seven, which accounted for nearly half of the total common variance. The seven components of barriers were:

1. Fear of negative repercussions in the university environment (e.g., "I feared negative impacts on my academic career, employment, or professional future.")

2. Fear of negative repercussions in the personal environment (e.g., "I was afraid of negative reactions from people around me (e.g., family, friends).")

3. Belief that the situation does not warrant reporting (e.g., "I did not consider the consequences of the situation to be serious enough to disclose it to my university's authorities or services.")

4. Use of avoidance and protective strategies (e.g., "I tried to avoid being in contact (or being near) the person who committed the acts rather than disclosing the situation to my university's authorities or services.")

5. Negative apprehension of institutional/university response when handling of reports (e.g., "I was concerned that the authorities or services at my university were not going to take the situation seriously.")

6. Limited awareness or knowledge of available services within the university) (e.g., "I didn't know who to contact at my university.")

7. Specific concerns related to minority groups (e.g., "I didn't know if the authorities or services at my university took an inclusive approach to diversity.")

## 4. Discussion

Using a mixed methods design, this study enlightens the variety of non-reporting experiences. It reveals the existence of multiple personal, social, and institutional factors. These findings can help university administrations better understand the support needs of victims and improve their services to promote recovery. The objective is neither to discourage individuals from reporting, nor to overemphasize the value of reporting at the expense of victims' health and safety. Rather, it is to illustrate the complexity of the decision-making process that does not always result in a satisfactory outcome for the victim.

The decision to (not) report the event to university services appears to be based on a cost-benefit analysis. For SVUC victims, the anticipated "costs", such as reputation damage, negative impacts on professional future, or safety concerns, may outweigh the potential "benefits" of reporting, causing some victims to opt for not reporting. Fear of reprisals for oneself and for others, as well as negative testimonies from other victims about how university authorities have handled cases in the past, contributed to victims' evaluation of the potential costs of reporting. It is crucial for university administrators and decision-makers to reflect on and challenge existing practices. Knowing that time and energy costs can be higher for victims from marginalized populations, universities' services and authorities should be aware of the power dynamics and privileges, and improve their cultural sensitivity (Brubaker et al., 2017). Institutions should also put in place institutional measures that can mitigate the perception of bias and feeling of helplessness, for instance, with external investigations. In addition, findings also show the need for mandatory training and the importance of providing information on resources, support, and institutional policies. It is important to consider developing new approaches that not only mitigate the costs associated with the reporting decision, but also increase confidence in the institutions' willingness to respond effectively and helpfully to reports and to sanction SVUC.

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# THE DECONSTRUCTION OF AMATEURISM IN AMERICAN SPORTS

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## Abstract

Despite all the good that amateur sports have brought to American society and its members over the past several decades, amateur sports have also served as a context for fostering some of life's nastier habits. The deconstruction of amateurism in America has happened, at least in part, because of a societal recognition of the need to re-construct amateurism so that it is more equitable, and to replace what was considered "fair" and "right" with something closer to actually level playing fields all across America. To gain a richly detailed understanding of the phenomena of the deconstruction of amateurism in American sports, a qualitative research approach was used for data collection and analysis. This analysis included a review of the three most prominent governing bodies in amateur sports in America, the Amateur Athletic Union (AAU) the National Collegiate Athletic Association (NCAA), and the Olympics, as well as the factors that brought America to that seminal moment at the 1968 Mexico City Olympics – the *Black Power Salute*. Despite the disparaging negativity that was used to characterize the *Black Power Salute* at the Mexico City Olympics in 1968, that act ushered into the collective American societal contemplation the *idea* that there were things that were wrong *in* amateur sports, and wrong *with* amateur sports in America – and effectively allowed for the possibility that amateurism itself had strayed from purity of intent (Andrews, 2018; Greene, 2012). Over the decades following, that awareness grew into moments of reality which collectively formed a full deconstruction of amateurism in American sports. The constellation of events and forces enacted following the *Black Power Salute* caused a steady breakdown of American amateur sports. Accordingly, this study details the factors that have cooperatively contributed to the full deconstruction of amateurism in American sports.

*Keywords:* American amateur sports, governance, deconstruction.

## 1. Introduction

Historically, amateur athletes participating in amateur sports in America have enjoyed social interest and cultural popularity for more than a century. Accordingly, amateur sports have emerged as a pivotal social construct in contemporary American society – solid and entrenched. For millions of American young people, amateur sports have provided a healthy context of opportunities for competition, creative expression, social interaction, and lifelong learning. Likewise, for millions, even billions of American adults, amateur sports have been much of the same, as well as a source of entertainment, a context for personal identity, and an extension of personal well-being.

However, for non-white Americans, amateur sports have been something less than all that. Yet, given the dominance in sport that Black athletes have established since being allowed to play on the same fields and courts as their counterparts – sometimes something more as well. This may perhaps be best characterized as being forced into a contradiction of sorrow and desire. Why? Because despite all the good that amateur sports have brought to American society and its members over the past several decades, amateur sports have also served as a context for fostering some of life's nastier habits, including but not limited to prejudice and discrimination, cruelty, and persecution, and also hatred and oppression.

This carefully constructed social mainstay of amateur sports has needed something akin to a major overhaul – a breaking down of the system or systems that have represented unfettered leverage against an overwhelming number of the athletes who have sacrificed so dutifully for the success of the social construct of amateur sports. Accordingly, this study is an examination of the deconstruction of amateur sports in America over the past several decades, and the factors that have contributed to the breaking down of this popular societal sanctuary.

## 2. Purpose

This examination has a fourfold purpose: 1) To identify the presence and impact of the deconstruction of amateurism in American sports, 2) To increase awareness of the effects of the deconstruction of amateurism in American sports, 3) To identify and explain the pros and cons of the deconstruction of amateurism in American sports, and 4) To identify and examine the effects of the deconstruction of amateurism in American sports on Black athletes in amateur sports in America.

## 3. Methodology

To gain a richly detailed understanding of the phenomena of the deconstruction of amateurism in American sports, a qualitative research approach was used for data collection and analysis. Accordingly, this study was phenomenological, where both primary and secondary sources were used in this study, yielding a blend of information containing depth and quality, triangulated among and between published case study results, public commentaries, newspaper publications, research papers, popular literature, web-based publications, textbooks, and empirically based journal articles. Accordingly, data from these sources were organized and interpreted such that patterns emerged from their intersections. These patterns and their associated impacts were identified, clarified, and highlighted, and are presented in the following paragraphs.

## 4. History of amateur sports in America

This section includes a review of the foundation and growth of amateur sports in America, as well as an examination of the three most prominent governing bodies in amateur sports in America, The Amateur Athletic Union (AAU), The National Collegiate Athletic Association (NCAA), and the Olympics. Operating alongside the American educational system, these para-educational governing bodies have established the operational framework for amateur sports in America.

Pruter (2013) reported that the earliest forms of amateur sports were casual games and sports events, usually using varied sorts of balls arranged and played by high school students in New England as early as the late 1700s. The games were chaotic and inchoate, so while schoolmasters of the day may have insisted on discouraging any ball playing near their windows, they generally looked favorably upon the boys' games as being good for health and physical exercise, and these first amateur sports games carried on well into the 1800s.

Yet, there were no Black athletes competing in these first amateur sports in America. The institution of slavery left little opportunity for most Black athletes to participate in any sort of leisure, recreation, or sports activities. To the extent that Black athletes were able to participate in sports at that time, their involvement reflected prevailing attitudes regarding race. Black athletes were confronted with enduring the frustration of racial discrimination, both in sports and in society. Unquestionably, the damaging effects of this era are still felt today in both sports and American society at large (Brown, 2008; Kieffer, 2023).

At primarily white institutions, early amateur sports became a vital part of the American social consciousness, even though these sports were still student initiated, driven, and directed. By the 1880s, educational reformers eventually stepped in and took over these sports programs claiming, "Athletics are educational." These same reformers brought student athletics under their regulatory control to make them part of the physical education curriculum (Pruter, 2013).

Black athletes were often kept out of interscholastic high school sports and their competitive presence in high school sports did not appear *en force* until the 1920s. The effects of Jim Crow laws and court rulings such as *Plessy v. Ferguson* (1896) served as justification for continued segregation and oppression of Black athletes in amateur sports (Davis, 2008; Pruter 2013, Sammons, 1994).

Conversely, white Americans benefitted from widespread growth across the amateur sports sector. Nationwide reform in amateur sports facilitated educator-sponsored leagues formed in both the cities and the rural areas. Governance of amateur sports began to be implemented, such that students in most areas acquiesced to educator control and passively accepted the new order of things. Educators began to realize that physical education was integral to human development. Adult-sponsored leagues and state associations became firmly established, although transition and implementation of governance was not seamless or smooth (Pruter, 2013).

## 5. Governance of amateur sports in America

When amateur sports in America were still messy, chaotic, and inchoate, there was a distinct need for organization and standardization (Pruter, 2013). Three primary para-educational institutions emerged for the governance of amateur sports in America. These three institutions were the Amateur Athletic Union (AAU), the National Collegiate Athletic Association (NCAA), and the Olympics. These governing institutions set about to bring organization to amateur sports.

The Amateur Athletic Union (AAU) was established in 1888 to create common standards for competition in amateur sports, as early leaders of the AAU brought uniformity to athletic competition. In addition, the AAU and its members worked closely with the Olympic movement to prepare athletes for the Olympic Games (AAU, 2023).

Throughout the 20th century, the AAU solidified its role in developing successful athletes and creating opportunities for success in amateur sports competitions. However, the second half of the 20th century brought controversy to the AAU. Resistance to how the AAU was handling certain competitive matters appeared. Soon thereafter, the AAU was deprived of a large measure of its authority and capacity for amateur sports governance (AAU, 2023; Amateur Sports Act, 1978).

In 1906, when the NCAA was established, its early primary function was to regulate the rules of college sports and to protect the players. The NCAA also established an enforcement department to go after schools and coaches breaking their rules. In addition, the auspicious term "student-athlete" was introduced to protect the NCAA from litigation. The power and reach of the NCAA gained momentum. Principles for financial aid, recruitment, and academic standards were implemented as well as competitive divisions, eligibility restrictions, and recruiting violations all aimed at promoting fairness (Harry, 2020; NCAA, 2023).

After the passing of the Amateur Sports Act of 1978, the NCAA laid claim to undisputed control over the charming perception that success in college amateur sports was the ticket to opportunities for participation in sports at the professional level. This has been particularly alluring to Black athletes, due largely to their competitive success. However, virtually all Black amateur athletes have had to contend with a variety of interruptions and challenges to their participation. In addition, successful Black athletes in NCAA sports have frequently found themselves caught between athletic codes of behavior, peer expectations, and all manner of turmoil. Although its leadership has attracted steady criticism over the course of its existence, the NCAA has worked to stay current with the societal issues impacting amateur sports and its athletes (NCAA, 2023; Smith, 2000).

In the late 19th century, Baron Pierre de Coubertin successfully revived the Olympic Games, and he was able to provide compelling leadership of the International Olympic Committee (IOC) dedicated to amateurism. He also gave amateurism a strong ideological tie to the Olympics and the popularity of the Olympics grew. The international bragging rights that came along with winning Olympic events brought unprecedented publicity. Because it was amateurs who were competing, the playing field seemed level in competition. The battlefield was ruled by the best militaries. The track was conquered by anyone who put their mind to it. Feelings of nationalism flourished as amateur athletes became national heroes (Andrews, 2018).

During the 20th century the Olympics enjoyed international popularity through the preservation of amateurism and the cultivation of the Olympic Spirit of good will to all. However, for all the good they brought, the modern Olympic Games were not immune to controversy. Threats to boycott the Olympics became a common political tactic to put pressure on rival nations, as a constellation of factors posed threats to the IOC and the sanctity of Olympic amateurism. These factors included allegations of the presence of cheating, the use of the Olympics for political statements, the increased popularity of the Games because of increased access to viewing the Games on television, and a shifting of the collective societal perspective on the importance of maintaining the purity of amateurism (Sammons, 1994).

## 6. Seminal moment

All three of the organizations providing governance over amateur athletics in American sports have played a major role in guiding American athletes in amateur competitions. It was at the Olympics, however, where the deconstruction of amateurism in American sports was initiated. At the 1968 Olympic Games in Mexico City, the world watched, on television and in color, as Tommie Smith and John Carlos, in solidarity and protest of the treatment of Black people, gave the world one of its most prolific moments in sports history.

Zirin (2012) reported that on the medal stand Smith and Carlos bowed their heads and raised their fists in what was described across the globe as a "*Black Power Salute.*" Further, they wore no shoes to protest Black poverty and oppression, as well as beads and scarves to protest lynching. This moment ushered into the collective American societal contemplation the *idea* that there were things that were wrong *in* amateur sports in America, and wrong *with* amateur sports in America – and effectively allowed for the possibility that amateurism itself had strayed from purely good intentions. The *Black Power Salute* served as the start of the deconstruction of amateurism in American sports because it definitively represented a substantial tear at the fabric that held amateurism together.

## 7. The deconstruction of amateurism in America following the *Black Power Salute*

At the 1968 Olympic Games, the Olympics were transformed, and amateurism no longer meant as much to the Olympics as it had previously. An indelible force within this transformation was the symbiotic relationship between the Olympic Games and television. The impact of television on the Olympics, and vice versa, has been profound. In addition, television and the media have also been instrumental in the development of commercial success for the NCAA and its member institutions. While the full breakdown of amateurism in America may fairly be characterized as having been a slow process, television has augmented and facilitated this dismantling all along the way (Andrews, 2018; Greene, 2012).

The effect of the Amateur Sports Act of 1978 was an ephemeral destabilization of governance power such that governance of amateur sports in America became lopsided. Instituting this imbalance of governance power served to leave amateurism vulnerable to the vices of humanity, and the vagaries of fate. A series of legal challenges directly impacted NCAA governance, and consequently also impacted collegiate amateur sports. Allegations criticized the NCAA for unfairness in its enforcement practices and its use of enforcement power. As mere accusations often do, the allegations of unfairness weakened the entire construct of amateur sports governance. Too much power was in too few hands, and as is widely understood, power corrupts. This dynamic was exacerbated by the flow of money brought by television, and the desire for more of these monies grew intense. Not surprisingly, major lawsuits appeared. Collectively, these legal challenges gave momentum to a growing consensus of lack of faith in the NCAA's ability to appropriately govern collegiate amateur sports (Smith, 2000). The way amateur sports in America had been constructed was beginning to waver and sway. The deconstruction of amateurism was becoming a crescendo, increasingly headed on its way to a point of no return.

By the end of the 1980s, the professionalization of the Olympics had gained full steam…which seemed to be just fine with the fans – the pros are there for a reason. At the 1992 Games in Barcelona, the performance and success of America's men's basketball team, The Dream Team, which was comprised of primarily professional players, was nothing short of sensational. They won every game they played convincingly, by an average of almost 44 points per game. They were so good that their coach did not call a single timeout during the entire Olympic tournament (Greene, 2012). Fundamentally, the Dream Team reinforced the deconstruction of amateurism at the Olympics. In a sense, their presence, performance, and success sealed the deal. Effectively, for America, the Dream Team brought closure to amateurism at the Olympics.

In collegiate amateur athletics, more legal challenges, a student-staged football boycott, and the pressures of media attention collectively served to continue to break down amateur sports governance power. Since the 1980s, athletic programs across the country have implemented changes to meet higher standards for the safety and protection of student-athletes, as power has shifted from the governors to the governed. Also being stirred were public sentiments for amateur athletes to receive compensation for their efforts, effectively pushing the deconstruction of amateurism to the brink of the point of no return (NPR News, 2013).

This point of no return subsequently arrived in collegiate amateur sports in the form of the Name, Image, and Likeness (NIL) Era. Not surprisingly, the NIL era was ushered into actuality by a sequence of legal actions. NIL essentially references the variety of proposals to allow contractual exchanges where individual student-athletes can profit from the sale of their name, image, or likeness without the threat of losing their amateur status as an athlete. Also present in this dilemma is the student-athletes' right to compensation for the use of their name, image, and likeness. In 2021, the NCAA lost a crucial NIL legal battle before the US Supreme Court. Just days later the NCAA released an Interim Policy allowing college athletes to financially benefit from their name, image, and likeness (Kessler & Greenspan, 2020). This policy thereby completed the full deconstruction of amateur sports in America.

## 8. Conclusion

These forces deconstructing amateurism in America together have created an elixir of change. This mix, in combination with all that has gone before it, has effectively stripped the concept of amateurism in American sports of most of its meaningfulness, leaving it a shell of what it used to be. Almost without exception, the language used by the defense, in the various legal proceedings promoting the effective deconstruction of amateurism in America, included the term or concept of the preservation of the *purity* of amateurism. As in, amateurism should be preserved for the *purity* of it. This occurred either as a point of distinction from professionalism, or as a suggestion that allowing individuals to be paid for their participation in amateur sports would contaminate amateurism, *and* the values that participants learn as a function of their participation in competition. This is understandable yet has also created something of a disconnect with Black athletes. What cannot be lost in any future research efforts is that *Black athletes are important to the success of amateur sports in America* (Andrews, 2018; Kessler & Greenspan, 2020; Smith, 2000).

Additional and different values need to be included and considered as critical to the reconstruction of amateurism in American sports. New pathways for equity need to be created and old mistakes need to be learned from, rather than repeated. Fortunately, the Post-NIL Era aftermath will include vast expanses of uncharted territory. Given that the NCAA's Interim Policy has left much of the NIL landscape unregulated, there is an undeniable sense of uncertainty, excitement, potential, and risk. Future research in areas associated with amateur sports in America should include a focus on how to use this potential to establish clear pathways for equity in the midst of the uncertainty.

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# THE FEDERAL INSTITUTES OF EDUCATION, SCIENCE AND TECHNOLOGY AND THE CONSTITUTION OF A NEW PROFESSIONALITY OF TEACHING IN BRAZIL

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## Abstract

This work discusses policies centered on the career and professionalization of teaching in Brazil, focusing on the Federal Institutes of Education, Science and Technology (IFs), and on the verticalization of teaching. Verticalization refers to teaching at two levels on the courses that encompasses technical professional teaching at secondary level and higher education, according to the demands of each region. Considering the character of this new structure, this research aimed at examining the working conditions of teachers, and the processes of professionalization, as well as different configurations of the teaching career and professionality that result from the reorganization of the federal institutions of professional education. A qualitative methodological approach was employed, involving extensive gathering of document data and empirical research with the application of questionnaires and interviews with teachers from two campuses, one in the state of Bahia, and one from São Paulo. The theoretical concepts were taken from classic and contemporary authors of the areas of sociology and education. The analyses of the verticalization of teaching promoted by the Federal Institutes allowed us to identify three simultaneous and dialectic movements. One of professionalization, which takes place through the structuring of the career and increase in professional recognition; one of deprofessionalization, characterized by the intensification of work and destabilizing of identitarian references; and other of reprofessionalization, issuing from the peculiarities of the career and from the creation of new structures of teaching work at the two levels of teaching. This context of changes has engendered dialectically a process of reprofessionalization, in the sense of developing a new professionality of teaching.

*Keywords: Federal Institutes of Education, Science and Technology (IFs), verticalization of teaching, reprofessionalization, teaching career.*

## 1. Introduction

The Federal Institutes of Education, Science and Technology (IFs, from the Portuguese *Institutos Federais*) were created in Brazil in 2008 from the integration of institutions of professional education already established at that time. Today, Brazil has 38 IFs spread across several campuses in the country. Among other features, the new institution was organized by the verticalization of teaching. Namely, through offering courses that cover from initial and continued education, and technical professional education at secondary school level, to higher education at undergraduate and graduate levels. To guarantee such diverse offer, the work configuration of teachers was changed, giving rise to the career of Teacher of Basic, Technical, and Technological Education (EBTT, from the Portuguese Magistério do Ensino Básico, Técnico e Tecnológico). After such changes, the working conditions of teachers also underwent significant alterations.

Prior to the creation of the IFs, the institutes of professional education hired teachers for separate careers, and with different professional roles, differentiating those that worked at secondary school level from those that taught only at higher education level. With the creation of the IFs, the two groups of professionals were integrated in the same career, as to be able to work in the different courses, levels, and modalities of teaching offered at the campuses in which they work.

Taking as the pivot of our analysis the teacher work under the verticalization of teaching, this work discusses the change in the meanings of teaching professionality at the IFs, which were previously based on the work of teachers at just one level of education. With the reconfiguration of the IFs and with teachers working at two levels of teaching, new meanings for the teaching activity emerge, indicating of a process of reprofessionalization in that context.

The investigation takes as its premise that educational structures are subject to the networks of functions, and social interdependence relationships, in a continuous and a dynamical process, as pointed out

by Elias (2010). This process also occurs in the constitution of the professions resulting from interdependent mediations between social needs and the demands of individuals that collectively create and impart meaning to these professions (Elias, 1950). To deal with more specific questions, the support of several authors was enlisted, such as the French ones Maubant, Roger and Lejeune (2013), Demailly and De La Broise (2009), Wittorski and Roquet (2013), among others, who have been investigating processes of professionalization, deprofessionalization, and reprofessionalization in several professional fields.

Maubant, Roger and Lejeune (2013) point out that the studies about professionalization often reveal its limits or obstacles to it, whilst evoking the negative effects and impacts that befall workers, the forms of suffering at work, job precariousness, and difficulties in the exercise of work activities. From that comes the strength of their argument that, in order to understand what deprofessionalization is, one has to be as close as possible to concrete professional situations. It is within such dynamics that one can better capture the contradictions and conflicts that characterize such processes, given that the State presents their policies as proposals of professionalization. However, when being carried out they bring about aspects that contradict such perspective.

Based in these authors, Bueno (2014) remarks that the idea of professionalization is related to the social recognition of the professional activities and to the efficacy of the contribution of the individuals to the activities of production; whereas the idea of deprofessionalization comprises the weakening or loss of professional identity references.

As a dialectical synthesis, reprofessionalization has been understood in this study as the process of reorganization of teaching professionality, whose identity is grounded in the contradiction between those elements. Namely, the specificities of the reorganization of the career, greater linking to institutional principles, and the exercise of teaching at two different levels of education.

## 2. Aim and objectives of the study

With those issues in mind, this work has as its objective to analyze the working conditions of teachers at the IFs, considering the teaching activities at two simultaneous levels: secondary school level technical professional basic education, and higher education. To such end, it seeks to examine:

- the meanings that the organization of work at the IFs acquires for the teachers with regard to professionalization and/or deprofessionalization; and
- how the teaching professionality is expressed considering the verticalization of teaching, and the working conditions of teachers at those institutes.

## 3. Research design and methodology

To fulfil those objectives, the investigation adopted various research procedures. Data are from two main sources: one of a legal nature comprised of official documents referring to the structure and functioning of the IFs and of the teaching career; and another of a qualitative order, consisting of questionnaires and interviews with 31 teachers belonging to two IFs, from Bahia and São Paulo states.

The document *corpus* includes legislation concerning the legal direction of the IFs, covering from their antecedents up to their creation in 2008. The analysis of this abundant material, added to the collection of studies that analyzed the history and the teaching career at the federal institutions of professional education, allowed us to see aspects of teaching ranging from the very first professional groups until the constitution of the EBTT career and of their current configurations. In this aspect, the theoretical support found in several works by Norbert Elias (1950 and 2010) was valuable, in order to analyze the interdependence between the professions, the individuals that constitute them, and the social needs that engender them.

These materials supplied the basis for an outline of how this professional group transitioned from a situation of being workers without a career, even working at schools of professional training, to a profile of professionals with a specific career within the federal public service, with complex and diversified labor attributions at two different levels of education.

Empirical data were collected during the doctorate studies carried out by Silva (2020) and Missaki (2020), involving the application of questionnaires to 51 teachers, and the conduction of interviews with 31 teachers, ensuring strict observance of standards of ethical research. The collection of testimonies was based on the concept of comprehensive interview discussed by Bourdieu (2008), who takes Kaufmann (2013) as his main reference.

Such procedure allowed a deeper theoretical dive into the problem under investigation, making use of categories that the interpretation of documents by itself would not warrant. For example, it allowed considering the perceptions of individuals that experience and weave in a complex manner the organization of teaching work at the IFs, without always agreeing with the direction adopted by Government policies. This direct contact with informants made it possible to observe the complexity of teaching at those institutions, and the network of interdependencies that configures teaching professionality within a process of reprofessionalization emerging between the dimensions of professionalization and deprofessionalization.

This double perspective of analysis afforded a wider view of the effects and repercussions of the reforms carried out at the IFs, by stimulating the dialogue between the macro policies of teacher education and the micro policies that permeate the school context involving the life and individuality of teachers. It thereby enabled the perception that a new teaching professionality is emerging in the context of the IFs.

## 4. Discussion and findings

The aspects considered in this section refer to elements that emerged from the examination of the working conditions of teachers at the IFs, namely: composition of working shift, professional attributions, management and control of the teaching activity, incentives to professional qualification, and remuneration. The aim in the present context is to show how those elements are interconnected, thereby avoiding interpretations based exclusively either on professionalization or deprofessionalization processes.

### 4.1. Composition of working shift

This issue can be observed under two perspectives. On the one hand, the relation between class hour and activity hour contributes to professionalization by exposing and attaching importance to the work outside the classroom, as well as to collective work and planning activities. On the other hand, the working shift is intertwined with processes of deprofessionalization by stimulating the intensification of work because of the complexity of attributions.

The organization of teaching activities within the working shift is regulated by each Institute, as long as the general parameters established are followed, which affect the following limits: from 10 to 20 weekly classes for full-time teachers; 8 to 12 weekly classes for part-time teachers. The remaining hours are dedicated to teaching support, research and innovation, extension, administration, and continued education.

Although at first sight this working shift may seem ideal, particularly when compared to those of other public education networks, there are disputes about it. Araújo and Mourão (2021), for example, consider this working shift an element of precarization of the teaching activity, for requiring greater mental effort from the teacher, adaptation to the diversity of classes, and more time for the preparation of classes due to the verticalized work.

In this sense, the deprofessionalization of the teaching career in EBTT does not necessarily mean the same as its precarization. The deprofessionalization encompasses identitarian transformations (Tardif & Lessard, 2014) by destabilizing the reference of teaching professionality previously based on a single level of teaching. The complexity of attributions can be understood as qualification of the character of teaching, expressing its professionality; but, by contrast, it is intertwined with processes that characterize deprofessionalization, since teachers are led to the intensification of work in order to respond to the increase in demands proceeding from principles of polyvalence and multitasking.

### 4.2. Professional attributions

Some of the teachers interviewed expressed the perception that the increase in the complexity of the tasks requires longer working hours. Although not officially instituted, it consumes more time, which often forces the teacher to work weekends. Without that, they cannot cope with teaching, research, and extension activities (offered for groups outside IFs). And, as some of them affirmed, without work in research and extension, classes suffer in quality. The logic of the work based on polyvalence was understood by teachers as having both positive and negative points, which signal to aspects of deprofessionalization through the intensification of work, as well as professionalization through the possibility of professional growth.

On the positive side, teachers mentioned the enhancement of experience. At the same time, the gain represented by polyvalence has stimulated the intensification of work. According to several statements, working at two levels of education is positive to enhance pupils' formation, but the teacher has to work much more. Based on Dal Rosso (2008) and Apple (1995) this can be interpreted as the increase in workload due to the need for greater commitment from the teacher, and greater efforts to carry out a work that, formerly, did not require extending the work shift. By embracing the verticalization of teaching, teachers feel overloaded with the need to develop multiple curricula, and to cater for the diversity of courses on offer. To cope with those requirements the teacher must be a flexible and versatile professional, regardless of their initial education or previous professional experience.

However, it is surprising that, despite the fact that the teaching staff of IFs is comprised of specialized professionals, having concluded a licentiateship course is not a requisite for entering the career. Therefore, professionals can be admitted who, without initial pedagogical training, need to face the specificities of teaching at the professionalizing basic education level. Subjected to considerable pressure of responsibilities in this context, their professional nature and role becomes still more complex, raising new questions about the traditional conceptions of teaching, particularly about the requirement to balance polyvalence and multitasking.

## 4.3. Management and control of teaching

In addition to work overload, the mechanisms of control of professional activities also contribute to deprofessionalization. The guidelines for the organization of the teaching at the IFs establish the obligation of controlling both teacher attendance and teacher productivity through activities in regular individual work plans and reports. The teaching activity is, therefore, measured both by the physical presence at the school, as is commonly required at basic education schools, and through the fulfilment of goals, productivity, and presentation of results, as required by teachers in higher education in Brazil. Such organization for the control and monitoring of work marks the complexity of this career, and exposes, through its simultaneity, the articulation between elements of professionalization and deprofessionalization.

Teachers interviewed demonstrated different perspectives on the need and pertinence of such control mechanisms, especially on the teacher attendance control. Favorable opinions pointed to the pertinence of the control to guarantee the fulfilment of professional activities; however, there were positions contrary to it associating the control via electronic timecards to a depersonalization of the teaching activity, considering that, due to the specific features of this activity, teachers also develop activities outside their campuses.

## 4.4. Incentive to professional qualification

The teaching career at the IFs shows the convergence of rights and duties prescribed in two different national laws. The Law of Guidelines and Bases of Education No. 9394 of December 20, 1996 establishes that the valuation of professionals of education must be promoted with the purpose of ensuring their continued professional improvement, including periodic paid leaves of absence to that end. The Law No. 8112 of December 11, 1990, which deals with the juridical labor regime of public servants, prescribes that civil servants can request paid leaves of absence to attend graduate programs in any region of the country. Thus, teachers at the IFs have the legal right to request leaves of absence to obtain qualification by graduate programs, whilst maintaining their wages for up to 4 years, and of having the academic titles thereby obtained considered for promotions within the teaching career, and as a component for academic title allowances. From the point of view of the teachers this is a major incentive to seek professional development.

## 4.5. Wages

This aspect also contributes to professionalization, since many teachers agree that is the most attractive feature of the career. A teacher said: "When you arrive from the state [school network], where progression is much smaller than at the IFs, you come here, and you find it satisfactory. The [salary] difference is huge!". Other studies, such as that of Jardim (2018), also found that the salary of teachers at IFs is considered as an element of professional satisfaction, particularly when compared to the average teacher paid in Brazil.

The Title Allowance (RT, from the Portuguese *Retribuição por Titulação*) is a distinguishing feature in the wage composition of EBTT teachers, and it can mean a significant increase in wages, depending on the teacher's formation and/or experience. If we take the wages of EBTT teachers and compare them with the average of the teacher's salary in the country, we find them rather higher. The wages of an EBTT teacher near the top of their career can be almost three times that of a teacher in a similar position in the São Paulo State School network, for example.

The aspects that interfere in the professionalization process can, therefore, be observed through the incentive to professional development, as well as through payment conditions. However, other aspects, such as control and management processes over the teaching activity, and the intensification of work, can be associated to processes of deprofessionalization, as indicated above.

## 5. Conclusions

Understanding by professionalization as processes that affirm teacher professionality, and by deprofessionalization as the processes that deny it, this study shows that the interdependence between the direction of the policies established for the IFs and the resistance of teachers to such guidance express dynamics of teacher professionalization, deprofessionalization, and reprofessionalization. It results from accepting claims for change in working conditions and professional development in the EBTT teaching career, whilst redefining the features of the teaching activity in courses at different levels and modalities of education.

As a synthesis between the movements of professionalization and deprofessionalization analyzed here, the organization of the teaching activity at the IFs also engenders processes of reprofessionalization that constitute a professionality characteristic of the EBTT teaching career. In this respect, the study points out: the specificities of the organization of this career, the links between teaching activity and the organizational principles of the IFs, particularly verticalization and interiorizing of basic and higher public education, apart from political and pedagogical perspectives of the work of teachers present within their respective student publics. It is important to note that this latter aspect has been little investigated, and deserves more attention in future studies, in Brazil and abroad.

The processes of implementation of policies that contribute to the EBTT teaching career in Brazil represent social progress in various aspects, but do not imply the guarantee and permanence of these

conditions, considering that in the history of the institutes of professional education the teaching career has been dependent on the directions taken by each mandate of federal government. These uncertainties clearly compromise the continuity of these policies, and the implementation of new actions focused on teacher professionality and professionalization.

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[i]The complete list of legal documents analyzed can be found in Missaki (2020) and Silva (2020) listed above.

# TEACHERS' ROLES IN REALISING HUMAN RIGHTS IN CHALLENGING CONTEXTS

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## Abstract

The promotion and protection of human rights is a critical issue, particularly in contexts such as South Africa's township classrooms where there are unique challenges that make it difficult for teachers to fulfil their responsibilities in this regard. Therefore, there is a need to equip teachers with the appropriate knowledge and training to enable them to carry out their roles effectively.

The purpose of this paper is to report on a study that explored the role of teachers in promoting and protecting human rights in township classrooms. The study drew on theoretical concepts in the domains of human rights literacy, human rights education, and legal literacy to conceptualize the roles that teachers play in the realization of human rights in the classroom.

The research was conducted using a qualitative research design in the form of narrative inquiry, with 29 purposively selected township teachers who work in challenging school contexts in a South African township. Participants were asked to provide written narratives of their positive and negative experiences, opportunities and barriers related to realizing human rights in their classrooms.

Six main themes emerged from the data, including support, safety, discipline, resources, and resilience. The findings revealed that teachers lack support from the Ministry of Education and parents, and they struggle with unacceptable student behaviour. This lack of support and the challenges they face in their classrooms drive teachers towards prohibited measures to control unruly students. Additionally, the study found that teachers feel unsafe in schools and that they rely on divine intervention to perform their roles effectively.

The paper concludes with practical guidelines that can assist teachers in effectively fulfilling their role in the realization of human rights. The guidelines focus on the need for adequate training and support for teachers, as well as the importance of creating a safe and supportive learning environment. The study highlights the importance of promoting human rights in township classrooms and the need for teachers to be equipped with the necessary skills and knowledge to fulfil their roles effectively.

*Keywords: Human rights, social justice, township school/classroom, teacher.*

## 1. Introduction and problem statement

Ensuring the promotion and safeguarding of human rights is a crucial concern, particularly in challenging settings such as post-conflict contexts, young democracies, and societies characterised by high levels of inequality and poverty. South African township schools are examples of settings where educators face unique challenges that impede their ability to fulfil their duties in regard to the rights of students. Township schools in South Africa are characterised by poverty, poor health, lack of infrastructure and technology, violence, and inferior education amongst other factors (Mdletshe, 2012). They are often dysfunctional and lack resources, leading to compromised teaching and learning environments (Carrim, 1999). Such challenges can negatively impact the realisation of human rights in schools, which are meant to promote principles of dignity, fairness and non-discrimination (UNESCO, 2012). Specific challenges must be acknowledged to address barriers to the realisation of human rights in these contexts. Teachers in such contexts may need particular training and support, which warrants a deeper understanding of how they experience their roles in this regard.

This paper reports on a narrative study that explored the role of teachers in promoting and protecting human rights in township classrooms and aim to make some recommendations that can assist teachers in effectively fulfilling their role in the realization of human rights.

## 2. Theoretical perspectives

Human rights are defined as rights that are owned by virtue of being human (United Nations, 1948). Smit and Oosthuizen (2013:51) are of the opinion that although human rights are accepted as universal across contexts, the application of the respective rights may vary in differing contexts. To ensure the realisation of human rights in different contexts, it is necessary to have an understanding of how human rights and contextual factors interact. Human rights education (HRE) plays a vital role in this regard.

### 2.1. Human rights education

HRE involves imparting knowledge and skills, instilling values, beliefs, and attitudes, and encouraging action to defend against violations of human rights (Tibbitts, 2014:130). Various models for the teaching and learning of human rights have been identified, including (a) value awareness models, which include information about what to teach, (b) awareness models, which focus on the legal perspective and politics, and (3) an activism transformation model, which focuses on the psychological and social perspective of human rights. (Freedman & Keevey, 2012; Simmonds & Du Preez, 2017; Tibbitts & Kirchschlaeger, 2010). HRE needs to focus on content, context, and processes of grappling with human rights and its application from a critical stance and the decolonization of rights (Keet, 2015; Mignolo, 2009:157, Zembylas, 2017:1).

However, learning about human rights can provide a deeper understanding of unjust treatment and help learners make sense of injustices. In challenging contexts, such as South Africa's township schools, it is important to grapple with the discrepancies between human rights instruments and law on the one hand and the material experiences of people who live in conditions that deprive them of human dignity. Human rights literacy considers the gaps between what is and what can be in terms of human rights realisation.

### 2.2. Human rights literacies

Human rights literacy is recognized as a crucial element for human rights education and the promotion of human rights by teachers. Human rights literacy is paramount for the facilitation of human rights since it can address the gap between what is written regarding human rights and what is lived or experienced as the material realities of dominance, exclusion, and marginalization. (Simmonds, 2013:70, Keet, 2017:11, Becker and Roux, 2019:1). Roux and Becker (2017:4) suggest that robust debates are necessary where in particular the voices of marginalised people should be heard. To quote Becker and Roux (2019:26): "new meanings, new understandings, new evolutionary processes and new language should be determined by the subjects of the rights as they grapple with both the written ideals and their own lived experiences of the (non)existence of human rights." According to De Wet and Simmonds (2018:187), transformative theory, post-conflict theory and anti-oppressive pedagogy can inform a bottom-up approach based on the lived experiences of the subjects of rights, where people are allowed to make meaning of human rights through their daily lives. In a school context, teachers should afford learners safe spaces where they can actively take part in disrupting, rejecting and defending human rights violations in their classrooms.

### 2.3. Legal literacy

De Wet (2018:15) poses that legal literacy is necessary as part of human rights education and the empowerment of teachers to protect human rights at school. Legal literacy involves knowledge of Education Law and the process of informing others of their rights and responsibilities in any setting (Jananeethi, 2014:94; Rapatsa, 2015:209). Legal literacy is a tool to bring about qualitative change, healing the wounds of the past and promoting change towards a better future (Langa, 2006:390). Improved legal literacy helps people work together effectively in diverse environments (Jananeethi, 2014:95) as it contributes to a better understanding of human rights of role players in the school environment, providing legal certainty with regards to the enforcement of own rights and the promotion and protection of the rights of others (De Wet, 2018:14). Legal knowledge and understanding also protect teachers and contribute to a human rights culture in schools (Jananeethi, 2014:1). Teachers understand their legal position and role regarding human rights promotion are better equipped to create an environment in the school within which the rights of learners are also respected, protected and promoted (Oosthuizen, 2015:6). The ability to interpret and implement relevant legal rules and competencies to make use of the processes and mechanisms associated with the enforcement of the law can enable teachers to advance the protection of human rights in their classrooms (De Wet, 2018:15).

## 3. Research methods

The exploratory empirical study was aimed at gaining a better understanding of the ongoing realization of human rights in township classrooms, using qualitative data to gain a better understanding of the topic, as outlined in the problem statement. Framed by an advocacy paradigm (Oosthuizen, 2020:367) a narrative study as the chosen research design allowed for a better understanding of teachers' experiences through based on their rich, insightful, and meaningful stories (Garvis, 2017:2-4).

In this study, the population referred to all teachers in township schools in the Lejweleputswa District in the Free State Province in South Africa (N=4516), and the preferred sample size was 20 teachers. Using non-probability and purposive sampling (Nieuwenhuis, 2010:79) a total of 29 teachers from two selected schools participated, one primary and one secondary school situated in a township and representing low-income contexts.

For the purpose of this study, the narratives were obtained in writing. Participants were provided with the following prompt: "*Please write your story in which you share your experiences about teachers' roles in realising human rights in township classrooms. The experiences you write about can either be positive or negative. In the story that you write, you could also refer to opportunities and barriers that teachers at township schools experience in playing their roles towards realising human rights in their classrooms. The length of your story should be 3-5 pages.*"

Care was taken to adhere to ethical requirements as per the policy of the hosting university, giving attention to no-harm principles, privacy, confidentiality, and informed consent. Thematic analysis was used to uncover prominent themes and create categories beyond what was initially anticipated. Narrative analysis complemented the thematic analysis by identifying shared themes across narratives. Researchers act as instruments in data generation, so measures such as member checking, reflexivity, and an audit trail were taken to ensure trustworthiness (Nieuwenhuis, 2010:80).

## 4. Findings

Six main themes resulted from the analysis: parental support, safety, discipline, resources, resilience, and culture.

The findings of the study suggest that parental support is crucial for the education and development of children. Participants of the study emphasized that parents (n=14/29) should not shift their responsibilities to teachers and instead offer moral support. The study also revealed that parents often misunderstand their role in supporting the education and development of their children and verbally assault teachers in front of their classes on matters involving their children's conduct.

Support from state departments was found to be a key factor for realizing human rights in township classrooms. However, the study highlighted that the support provided by the Department of Basic Education (n=10/29) is insufficient, and the department focuses only on protecting the rights of learners, neglecting those of teachers. Participants felt that the department should strike a balance in protecting these rights. Despite acknowledging the department's efforts in supporting schools by allocating bursaries for teacher development and budgets for the school's needs, the participants believed that more needs to be done to realize human rights. They expressed the need for workshops for professional development and training of teachers to handle the pressure and stress brought about by the difficult circumstances they face while practicing.

The study highlighted that creating an environment free from violence, such as bullying, and resting upon the principle of safety and security, is essential to realize human rights in township classrooms. Participants echoed that township schools are not safe (n=4/29), as motivated by accounts that visitors have entered the school premises without proper access control, and of dangerous objects and drugs frequently carried by learners (n=3/29).

A lack of discipline (n=13/29) was described as a prevailing sentiment shared among the participants and attending school in townships was found to have a negative impact on both teachers and learners. The findings revealed that township classrooms are associated with gangsters (n=7/29), drug addicts (n=3/29), and bunkers (n=10/29), which are likely to demotivate teachers and result in disciplinary measures that are contrary to the law. Participants believed corporal punishment, although illegal, would regulate learner behaviour (n=6/29), which they justified on the basis of having been brought up the same way. A need for training on lawful disciplinary measures were expressed.

As a fifth theme it was suggested that the training that teachers received at tertiary institutions was not sufficient to equip teachers to play their role effectively in realizing human rights in township classrooms (n=13/29). Teachers feel they are placed at the mercy of unruly learners and feel powerless to implement any form of effective disciplinary measures. Participants indicated that there is a gap between policy maker's intentions and teachers' understanding of human rights values in that realization of human

rights is left solely in the hands of teachers (Participant 5). It is, therefore, essential that teachers receive sufficient training that will impart knowledge of human rights necessary for successful teaching and learning of human rights as well as implementation and application of rights (Participant 23).

Finally. the study highlighted lack of resources (n=3/29) and infrastructure (n=4/29) as a specific challenge that township classrooms face in the effective implementation of human rights. Despite some upgrades to school facilities (Participant 4), these are not sufficient, amidst increasing numbers of learners, many of whom face learning barriers (Participant 9). Participants expressed that the misallocation of funds, unhealthy environments, and poor working conditions that are associated with a lack of resources and infrastructure in township classrooms continue to weigh on the teachers, thereby affecting the right to basic education and safety of learners (Participants 9 and 24).

## 5. Recommendations

The recommendations presented in this paper emanated from literature as well as empirical research and address the following:

The first recommendation is to present human rights as a subject in its own right, allowing learners sufficient time and attention to internalize the concepts of human rights. By integrating human rights education into the school curriculum, students can gain a deeper understanding of human rights concepts and be better prepared to become responsible citizens who respect and promote human rights.

Secondly, it is recommended that the Department of Education should establish a specific directorate responsible for ensuring adequate in-service training, monitoring, and evaluation of the effectiveness of such a venture. Workshops, seminars, and training conducted by the Department and all other stakeholders of education should be offered for further professional development through which teachers can enhance their knowledge and skills related to human rights and become better equipped to implement human rights education in their classrooms.

Teachers should take their responsibility to keep themselves informed on new developments regarding human rights seriously, attending workshops, subscribing to online content and staying informed on NGOs dealing with human rights (Pretorius, 2016:3).

The fourth recommendation is for teachers to further their studies at higher educational institutions to advance their human rights literacy and legal literacy. Teachers can share the knowledge they have gained from their studies with their peers and start communities of practice through which teachers come together to enhance their human rights knowledge and skills. This will promote a culture of continuous learning and professional growth among teachers.

Parental participation is also crucial, and parental involvement workshops should be conducted in the language that most parents understand in that school, encouraging parents to take an active role in their child's development and education. Where parents lack the means or time to become involved in face-to-face events or meetings, teachers and schools should be creative and innovative in designing platforms that would make parental participation feasible and motivating (Modisaotsile, 2012:3).

The sixth recommendation is the establishment of a wellness program for teachers to counsel and support them, address staffing issues, and to learn from and support one another in a district. This could alleviate teachers' stress levels, which is a right step in the direction of the effective realization of human rights. Secondly, a school-based support team should function effectively to deal with an array of problems that learners may encounter, from health issues to psychosocial issues and human rights violations.

## 6. Conclusion

In conclusion, this study proposes an integrated model for realizing human rights in township classrooms. The recommendations presented in this study focus on promoting human rights education, providing professional development opportunities for teachers, encouraging parental involvement, and supporting the well-being of teachers. By implementing these recommendations, it is hoped that township classrooms will become more inclusive and promote respect for human rights among learners. This study serves as a starting point for further research and dialogue on how best to realize human rights in education.

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# THE RELATIONSHIP BETWEEN ENTREPRENEURIAL LEADERSHIP AND TEACHER JOB SATISFACTION: THE MEDIATION EFFECT OF INTRAORGANIZATIONAL FACTORS

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## Abstract

Entrepreneurial leadership has emerged following new privatization and autonomy policies in Israel. As a result of these policies, principals are pressured to assume the role of entrepreneurial leaders to find outside resources for the funding of innovative projects and programs in school. Entrepreneurial leadership has been defined in terms of leader traits and behavior. We define entrepreneurial leadership as principals' proactiveness and school innovativeness. Proactiveness means the principals adopting an active search for new opportunities to shape the school environment; innovation is defined as the actual implementation of these opportunities in school.

Entrepreneurial leaders need to take into consideration intra-organizational factors. Principals as entrepreneurs should ensure teachers' willing participation in implementation and overcome their natural resistance, because those changes require more time and create a heavier workload. Teachers' readiness to make the extra effort depends on their job satisfaction. The literature indicates that job satisfaction is related to teachers' professional development, teacher-student positive interaction teamwork, and teacher/student ratio. Therefore, we hypothesize that proactiveness and innovation will have a positive effect on teachers' job satisfaction; mediated by professional development, teacher-student interaction, teacher/student ratio in school, and teamwork.

Our study is based on the responses of 410 Israeli teachers from all levels, teaching in Jewish and Arab State public schools, who filled out a questionnaire. Conducting a univariate GLM model, the results indicate the following: All levels (low, medium, high) of school innovativeness and principals' proactiveness have a positive effect on teachers' job satisfaction. In addition, when the mediating variables of professional development, teacher-student interaction, teamwork, and T/S ratio are introduced, they have a significant effect on job satisfaction. Furthermore, the appearance of the mediating variables weakens the effect of proactiveness and innovativeness on job satisfaction.

Our study contributes to the knowledge on the impact of entrepreneurial leadership on teachers' outcomes. This has implications on programs of principal training.

*Keywords: Entrepreneurial leadership, professional development, teamwork, teacher-student interaction, T/S ratio.*

## 1. Introduction

This study focuses on the relationship between entrepreneurial leadership and teacher factors. Teacher job satisfaction and its predictors have been extensively studied in the past. However, new developments in the educational system in Israel and elsewhere call for new studies.

In Israel since the Eighties there has been a continuous development of decentralization and privatization (Yemini, Ramot, and Sagie, 2016). This required principals to adopt entrepreneurial leadership in order to recruit outside resources that will enable them to bring about new pedagogical activities in school. However, principals also need teachers' consent to cooperate willingly in these frequent and sometimes large-scale changes, which require their time and energy and getting over their resistance to change.

The objective of the study is to examine the impact of entrepreneurial leadership on teachers' outcome through the mediation of professional development' teacher-student interaction, teacher/student ratio, and teamwork. These variables were found to affect job satisfaction and to be related to certain leadership styles (Bogler, 2001).

## 2. The Model

### 2.1. Job satisfaction
Job satisfaction can be viewed as both a cognitive (Herzberg et al., 1959) and affective construct (Weiss, 2002), including enjoyment from work or part of it (Skaalvik & Skaalvik, 2020). We chose the enjoyment component in the present study.

### 2.2. Entrepreneurial leadership
Entrepreneurial leadership includes traits (such as risk-taking, creativity), and behaviors (such as proactivity, creating innovations). We defined entrepreneurial leadership as principal proactiveness, that is, an active search for opportunities and communicating it to the staff; and as school innovativeness, that is, the actual innovations implemented. These were measured in terms of frequency and scale (Eyal & Inbar, 2003).

### 2.3. Mediating variables

**2.3.1. Professional development.** Professional development was found to be related to job satisfaction and increasing teacher support of technological innovations. Early preparation and knowledge reduce teachers' resistance (Masry-Herzalah & Dor-Haim, 2021).

**2.3.2. Teacher-student interaction.** Teacher-student interaction is one of the most significant factors of job satisfaction. When teachers are willing to go the extra mile, and show concern for their students, discipline problems decrease. This motivates students to learn which, in turn, increases teachers' satisfaction (Havik & Westergård, 2020).

**2.3.3. Teacher/student ratio.** Teacher/student ratio. Schools and classrooms that have high T/S ratio were found to increase teacher job satisfaction. Harfitt and Tsui (2015) studied the short- and long-term effects of class size in Hong Kong and found that students were more motivated to learn in small classes, which had characteristics of a community of study. Blatchford et al. (2007) noted that small classes enable teachers to focus on children individually and have more interaction with them which, in turn increases teachers' satisfaction.

**2.3.4. Teamwork.** Working in a team increases teachers' joy, learning and thus their satisfaction (Skaalvik & Skaalvik, 2015), it is also effective in diffusing change (Benoliel and Schechter, 2018).

## 3. Methodology

A 33-item questionnaire was distributed to 410 teachers in Israel. A univariate General Linear Model test was conducted to test our hypotheses of the effect of entrepreneurial leadership on job satisfaction through the mediation of teacher professional development' teacher-student relations and teamwork.
Proactiveness and innovativeness were grouped into low, medium, and high groups.

## 4. Findings

- **Descriptive statistics** indicated that proactiveness and innovativeness at each level affect job satisfaction. This effect exists proactiveness and innovativeness are separated, and also when in interaction with each other.
- A **Univariate GLM analysis** indicates that the first model, without mediation, is significant in all three levels, for proactiveness and for innovativeness. The second model indicates that when introducing the mediating variables, the effect of innovativeness is not significant. It also indicated that the higher the proactiveness, the lower the effect of innovativeness, in fact, it is not significant.

*Table 1. Univariate GLM (General Linear Model).*

| Model | Source | F | Sig. |
|---|---|---|---|
| without mediation | Main Effect | 31.77 | 0.00 |
| | Proactiveness | 18.96 | 0.00 |
| | Innovativeness | 4.93 | 0.01 |
| | Interaction | 3.32 | 0.01 |
| with mediation | Main Effect | 55.39 | 0.00 |
| | P.D | 57.66 | 0.00 |
| | Teamwork | 5.95 | 0.01 |
| | T/R ratio | 43.90 | 0.00 |
| | TSI | 8.94 | 0.00 |
| | Proactiveness | 3.03 | 0.05 |
| | Innovativeness | 0.85 | 0.43 |
| | Interaction | 1.30 | 0.27 |

## 5. Conclusions

Our hypotheses regarding the relationship between the independent variable of entrepreneurial leadership, mediating variables of professional development, teacher-student interaction and teacher/student ratio, teamwork and teacher job satisfaction have been partially supported. There is a different effect of each of the two components of entrepreneurial leadership: Innovativeness is directly related to teacher job satisfaction, whereas proactiveness affects it through the mediation of the four variables.

It seems that teachers respond positively to innovations, despite studies on their resistance due to the high cost of time and energy and uncertainty on them. But when the principal institutionalizes some mechanisms to ensure that his/her initiatives are supported by outside sources, s/he would also be supported by teachers in the sense that the latter become part of the entrepreneurial process through activities that matter to them.

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# POSTERS

# ONLINE VS ONSITE: LESS SATISFACTION, BUT SIMILAR EFFECTIVENESS AND ACADEMIC INTEGRITY

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## Abstract

The debate about the effectiveness of online and onsite education is one of the most significant topics in recent years. The current report presents data from an obligatory Bachelor's degree course for full-time, first-year, psychology students. The course consisted of 30 didactic hours of an online lecture and 24 didactic hours of the workshop. All the workshop groups were taught by the same lecturer, but importantly, half of the workshop groups were run online (n=71) and half onsite (n=64). Due to various personal reasons, each person from this group of international psychology students decided whether to study online or onsite for the duration of the entire semester. Three groups of variables were monitored during the course: a) Study Effectiveness: 12 literature quizzes; 12 written assignments; midsemester exam; cumulative final exam; b) Academic Integrity: written assignments were submitted using Google Classroom with originality reports turned on. The algorithm compared students' work with web pages and books, flagging uncited text; c) Student Satisfaction: anonymous course evaluation (8 items, Likert-type scale). Results show that the online vs onsite students did not differ with respect to Academic Integrity, as well as mid-semester or final exams. Online students however studied less systematically, obtaining significantly lower scores on literature quizzes. Online students evaluated their workshops as less "interesting" than onsite students, but there was no difference in other aspects of evaluation (e.g. There was much to learn; the lecturer was prepared). Implications of those results are discussed.

***Keywords:*** *Online learning, student satisfaction, academic integrity, learning effectiveness.*

## 1. Introduction

Well-designed learning experiences should find a balance between being: effective, efficient, and enjoyable (Neelen & Kirschner, 2020). In recent years online education clearly became much more efficient: easier to use, cheaper, and with more universal access. It offers an option to engage in teacher-student contact hours, or collaborative teamwork, despite physical distance. The important question is: what about the effectiveness and enjoyability of such learning experiences? The current study compares these two parameters in a Bachelor-level course offered in two modalities: online vs onsite.

## 2. Method

The academic year 2021/22 marked the end of COVID-19 restrictions in Poland, but globally many travel and procedural difficulties remained. Students from the international Psychology in English program at SWPS University were offered an option to study online or onsite for the duration of the spring semester. Students made their choices before the semester started and were grouped accordingly for the small class workshops (about 20 people per group), with all the lectures being held online. This enabled a comparison of the effectiveness and enjoyability of the same course, led by the same lecturer, but in partially different modalities. The design of this comparison is correlational, as it cannot be ruled out that the choices made by the students, with regards to the course modality, were non-random and related to their previous effectiveness or enjoyability of education at SWPS. It should be emphasized however that the specific context of the pandemic enhances the probability that the choice of modality, in most cases, was forced by random life-circumstance-related events, such as the requirement to travel back to one home country, problems in obtaining a Visa or other difficulties in travel or housing conditions.

## 2.1. Course and participants

Data comes from an obligatory Bachelor's degree course in Developmental Psychology (full-time, 1st year, 6 ECTS) at the Faculty of Psychology, SWPS University (Warsaw, Poland). Students in this study were of international origin, with ~40% coming from various European Union countries (incl. Poland), 20% coming from Turkey, 20% from post-Soviet non-EU countries, and 20% from the rest of the world. Most data were obtained from n = 64 (onsite) and n = 71 (online) students. Course evaluation data was anonymous, not obligatory, and the sample size for this set of results is lower, with n = 36 (online) and n = 38 (onsite).

The course consisted of 15 meetings / 30 didactic hours of lecture and 12 meetings / 24 didactic hours of workshops. Scheduling was almost identical for the workshops done online and onsite (all organized within the same week). Lecture preceded the workshop on a particular topic.

## 2.2. Learning effectiveness and academic integrity

Learning effectiveness was measured in four ways: 1) 12 literature quizzes, one at the beginning of each workshop; 2) 12 essay assignments, prepared outside of classroom time and delivered before each workshop; 3) Midsemester multiple choice exam; 4) cumulative final multiple choice exam. Both multiple choice exams were delivered online and were in an open-book format with questions checking for comprehension and application of concepts, not verbatim memorization.

Essay assignments were submitted using Google Classroom with originality reports turned on. The algorithm compared students' work with web pages and books, flagging uncited text. This enabled students to manually check their work for authenticity, and unintentional plagiarism before they turn it in their work. The teacher was unable to see this initial report. After students turn in their work another plagiarism check was automatically run and provided to the teacher.

## 2.3. Learning enjoyability

Learning enjoyability was measured by student course evaluation, administered online during one of the last workshops/lectures, without the presence of the teacher. It was anonymous and not obligatory. Students answered the following questions on a 5-point scale (from "definitely no" to "definitely yes"): 1) The classes were conducted in an interesting way. 2) One could learn a lot during the classes. 3) The tutor was well-prepared for the classes. 4) Classes were conducted in accordance with the syllabus. 5) Lecturer treated the participants with respect. 6) Lecturer checked whether the content was understandable for the participants. 7) There was an opportunity to ask questions or discuss issues during the classes. The last question: "How do you assess the level of requirements during the classes?" was answered on a 5-point scale with labels from "too easy", through "adequate" at the midpoint, to "too difficult".

## 3. Results

Online and onsite students did not differ with respect to plagiarism and most measures of learning effectiveness, apart from systematic literature quizzes, where online students performed more poorly. Online and onsite students did not differ with respect to most aspects of course evaluation apart from "interest", as online students enjoyed the course less. Results are described in Table 1.

## 4. Discussion

The current study compared the effectiveness and enjoyability of learning experiences in two modalities: online and onsite, during a Bachelor-level psychology course. Results clearly show that student performance in the most comprehensive, summative measures of learning effectiveness: final and midterm exams, was unaffected by their chosen modality of studies. This suggests that online and onsite collaborative work in small classes can be equally effective when it comes to achieving overall study goals in the context of individual knowledge.

Performance in individual essay assignments, as well as academic integrity in those tasks, was also not compromised in the online modality. This suggests that students working online do not necessarily feel less obligation to behave ethically while doing independent work. Student actions are not anonymous in either case and physical classroom presence seems not to give any additional benefit for ethical norm following. It should be noted however that the procedure applied in the current study was not based on unannounced plagiarism checks, but rather each student received feedback on their possible norm violation and had the option to correct this error before the information was passed on to the lecturer. Despite this, ~30% of students submitted an essay with substantial nonoriginal content at least

once and 5% tried this on 5 or more occasions (out of 12). Crucially, this did not happen more frequently in the online modality.

Finally, the only significant differences between onsite and online modalities show up in two, possibly interconnected, variables. Online students did not read the assigned textbook chapters as systematically as onsite students did, and they also judged the small group classes to be conducted in a less interesting way. A likely explanation of those results is that the current technology of online collaborative work, especially interactive, multi-participant discussions is the weakest aspect of this modality. Lively discussions are less frequent and the enjoyment of social conversation is fading. From the student perspective, this means that the main rationale for systematic reading of literature - the ability to participate in synchronous class discussions in an informed way – is less apparent. Online education is certainly more flexible, it offers each student the possibility of engaging in more tasks at their chosen time or place, but the unintended negative outcome seems to be the loss of the additional value of the small group discussion. This loss is not visible in the overall, individual assessment of general course knowledge, possibly because the standard multiple-choice final exams do not test for information gained from the idiosyncratic knowledge-building events, which emerge from well-managed group conversations.

## 5. Conclusions

Main conclusions from this study: a) onsite and online modalities can be generally as effective when it comes to individual core course knowledge and online modality can be considered for use when it offers more learning efficiency; b) online modality needs better tools for high pace multi-participant group discussions in order to maintain learning enjoyment; c) in absence of better conversation tools lecturers should come up with additional reasons for students to keep up with systematic literature reads.

*Table 1. Comparison of learning effectiveness, integrity, and enjoyability in onsite vs online modalities.*

| Variable | Onsite | | Online | | Sig. |
| --- | --- | --- | --- | --- | --- |
| | M | SD | M | SD | |
| Workshop Literature Quizzes (total pts) | 17,7 | 3,5 | 15,7 | 4,9 | p < 0.01 |
| Workshop Essay (total pts) | 16,1 | 4,9 | 15,4 | 6,1 | n.s. |
| Midterm exam (pts) | 17,0 | 3,1 | 16,5 | 3,8 | n.s. |
| Final exam (pts) | 17,2 | 3,2 | 16,5 | 3,8 | n.s. |
| Plagiarism (occurrences) | 1,1 | 2,2 | 1,2 | 2,5 | n.s. |
| The classes were conducted in an interesting way | 4,8 | 0,5 | 4,4 | 0,8 | p < 0.01 |
| One could learn a lot during the classes | 4,8 | 0,5 | 4,7 | 0,5 | n.s. |
| The tutor was well-prepared for the classes | 4,9 | 0,2 | 4,9 | 0,2 | n.s. |
| Classes were conducted in accordance with the syllabus | 4,8 | 0,4 | 4,8 | 0,5 | n.s. |
| Lecturer treated the participants with respect. | 4,8 | 0,4 | 5,0 | 0,2 | n.s. |
| Lecturer checked whether the content was understandable for the participants | 4,7 | 0,7 | 4,6 | 0,7 | n.s. |
| There was an opportunity to ask questions or discuss issues during the classes | 4,9 | 0,3 | 4,9 | 0,3 | n.s. |
| How do you assess the level of requirements during the classes? | 3,3 | 0,6 | 3,6 | 0,7 | n.s. |

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# PUPILS WITH HEARING IMPAIRMENT AND THEIR POSITION IN THE INCLUSIVE SCHOOL

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## Abstract

Pupils with hearing impairments can choose between special schools and mainstream schools for their education. The Czech Republic has 13 special schools for pupils with hearing impairments, but more students are opting for inclusive education. They are therefore educated with hearing peers, with the use of support measures and often in the presence of another person - either a teaching assistant (who checks the pupil's understanding and can also help in case of mishearing) or a Czech sign language interpreter. Unfortunately, this type of education can also bring barriers - communication and social. They can arise from the nature of the disability - pupils have difficulty with hearing, have to ask repeatedly about the same thing, or use a completely different communication system. They may be overlooked by their peers after repeated failures in communication and have the role of class outsiders. This 'exclusion phenomenon' is also a common reason why pupils leave for special schools.
The author of this paper has already dealt with the issue of inclusive education in her previous studies and now she is building on her research in her dissertation. The findings provide the perspective of parents and teachers on the education of this group of pupils, and the author herself focused on the interaction between classmates and teachers by observing the classroom. The results obtained from the research will be used to create material for teachers of pupils with hearing impairment - containing recommendations on how to work with this group of pupils.

*Keywords: Barriers, hearing impairment, inclusive education, mainstream school, social roles.*

## 1. Pupils with hearing impairment

The hearing impaired group includes people with different types and degrees of hearing loss, varied degrees of compensation, diverse skills and communication systems. In the school year 2017/2018, the total number of pupils with hearing impairment in primary schools was 1 173 (we should point out that there will be pupils with mild hearing impairment in schools or more socially able pupils who have not yet been diagnosed with the impairment and are therefore not included in this statistic) – 60.4% (i.e. 708 pupils) are placed and educated in mainstream schools, the remaining 39.6% (i.e. 465 pupils) are educated in schools for the hearing impaired. The current situation is probably very similar, pupils are more likely to opt inclusion and it is therefore possible that the current percentage in mainstream schools could be even higher (Inkluze v praxi, 2018).

These two educational pathways have some positives and negatives and therefore suit various groups of people with hearing impairment. There are 13 schools for children, pupils, and students with hearing impairment in the Czech Republic. These institutions employ people with proper education and knowledge in the field of special education of children, pupils, and students with hearing impairment. There are also many experts - whether they are special educators, speech therapists or (Czech) sign language interpreters. In many of these schools we also encounter i.e., bilingual education - deaf and hearing teachers work together in the classrooms, bringing both languages to the pupils as native speakers/users. Specific to this education is also the use of textbooks adapted for the group of pupils with special educational needs, aids and one extra year of compulsory education - the Czech Republic has 9 years of compulsory primary education, so in special schools the length of education is 10 years. The extra year is either used to divide the first grade into two years, or the school use this year as a last year to repeat and consolidate the material that has been covered (Hádková, 2016).

Inclusive education is usually recommended for those pupils whose abilities, skills and maturity allow them to enter mainstream school. These are mainly pupils who communicate in the language of the majority society (spoken Czech), and in rare cases also users of Czech sign language. Inclusive education for pupils with special educational needs is based on their level of support. There are five of them - level 1 is the lowest level of support up to level 5, which is usually for severe forms of hearing impairment combined with other disabilities. The support measures are based on the type of hearing impairment, abilities, communication skills of the pupil and based on that an individual education plan is created in which the pupil is educated. The catalogue of these support measures clearly specifies what pupils are entitled to at each level; from level 3 onwards, a teaching assistant may be assigned to the pupil, and from level 4 onwards, the pupil might need a Czech sign language interpreter (or another expert on communication system used by the pupil). In general, if we were to mention some support measures suitable for pupils with hearing impairment, these include, for example, adapting the classroom (carpet, curtains - suitable for soundproofing the classroom) or providing a correct place for the pupil (preferably in the second row of desks). In addition, it would also be advisable to know the principles of communication with a person with a hearing impairment - i.e., to keep a maximum distance of 4 metres, not to speak while you are turn back and not facing the classroom (this is extremely important for lip-reading), and to provide suitable lighting for communication. In addition, teachers should be informed on how to work with a compensatory aid, for example, to be able to change the battery (Barvíková and all., 2015).

## 1.1. School climate

The climate of the classroom collective is understood as the social relations between the individuals who are participants in the educational process. It is the (self-)evaluation of the emotions, experiences, and interactions of all participants, within the classroom environment and their activities. The climate of the classroom collective can thus be influenced by the pupils, teachers, and parents of the participating pupils (Dewitt, 2018).

In the case of the placement of a pupil with a hearing impairment, we may encounter a certain lack of understanding from peers (sometimes, unfortunately, from the teaching staff as well) and intolerance of their individual needs. For this reason, a social and communication barrier then also arises. Pupils with hearing impairment would therefore be perceived as outsiders within the hierarchy, standing on the periphery of the collective with minimal interaction with their classmates. In such cases, we speak of the so-called exclusion phenomenon. The presence of these barriers, and other pathological phenomena (bullying), can be a reason to change schools, even to return to a special school.

Therefore, it is important to work with the class, to develop peer interaction and positive relationships between classmates. It is important to explain to classmates what accommodations pupils will have in the classroom, why they are important to them, and how their hearing impairment affects their language sensitivity, auditory perception and listening comprehension - because the presence of accommodations is often the reason that pupils complain about their classmates, feel unfairness, and pupils with special educational needs then become targets for the rest of the class (Čáp and Mareš, 2007).

## 2. Author's research

The author has already dealt with this issue in her master's thesis. There she also focused on inclusive education of pupils with hearing impairment and their communication and social skills. It was the results of this research that pointed to the social isolation of pupils with hearing impairment, primarily those pupils who were later diagnosed with hearing impairment and its compensation (Tureckiová, 2019).

This research is currently being followed up with a focus on the position of pupils with hearing impairment and the classroom climate of a collective in which they are present. This research will involve the use of several research methods - a questionnaire survey aimed at teachers working with pupils with hearing impairment, interviews with teachers and parents of these pupils, and observations of the normal school day in the classroom. Due to the specificity of the focus, the research will also use methods related to the climate of the classroom (school) team. Primarily, the SO-RA-D (Sociometric Rating Method) will be used, which focuses on the likes and dislikes in the classroom collective and examines how individual students are perceived in terms of their influence. The advantage of this research method is that pupils rate themselves as well. This reflection on their part is important for us to understand the different groups and the hierarchy of relationships in the classroom. This method will be complemented by other methods focusing on the climate of the classroom collective, so that the most comprehensive view of the issue is obtained.

## 2.1. Expected results and contribution of the work

The aim of the author's research is to map the inclusive education of pupils with hearing impairment throughout the Czech Republic, to focus on possible changes in the classroom climate in the presence of pupils with special educational needs and to point out the most common problematic areas associated with the placement of these pupils in mainstream schools.

The findings obtained from the parents and teachers of this specific group of pupils, together with the results of the used methods, will be crucial for the development of the material. The latter will shed light on the education of pupils with hearing impairment, its problematic areas and the factors that can lead to impaired work with the class collective and the emergence of pathological phenomena in the classroom. Working with pupils with hearing impairment is often a new experience for many teachers, and this will also be the focus of the newly developed material. So that inclusive education can be understood by all and thus increase pupil´s chances of success in their educational journey.

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# WHAT IS IMPORTANT FOR ME? ANALYSIS OF UNIVERSITY STUDENTS' ANSWERS AS TOOL OF WELL-BEING RESEARCH

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## Abstract

The analysis of subjective perception of well-being is very important part of current inclusive education. For this reason, the main aim of presented content is the analysis of surveyed university students answers. Answers of university students were acquired by own empirical research. Empirical research of mentioned issue was realized by the content analysis of the methodical concept one page profile. The methodical concept one page profile has three question and the answer of one question (What is important for me) is one of the important ways of subjective well-being perception in the inclusive education. In the empirical research there were 194 surveyed university students. Surveyed university students were studying at the Slovakian university. 98 surveyed university students were full time students and 96 university students were students of external form of study. Presented context submits created categories by results of research. These categories are defined by subjective answers of surveyed university students. Subjective answers of surveyed university students' emphasis what is important in respondent life and it is the way of better understanding of university students' well-being. The main aim of the presented results is the comparison of created categories of both forms of university study. Presented conclusions will improve well-being of university students. Presented study is a part of scientific project solving KEGA 004-UCM-4/2022 with the name "Promoting Health and Well Being through inclusive education in Higher Education" and project BIN SGS02_2021_002 with the name "University enhancing active smart aging".

*Keywords: Inclusive education, one page profile, university students, well-being.*

## 1. Introduction

Inclusive education is a consequential area of contemporary pedagogy. It has become a key topic in educational theory mainly in recent years. The constant development of society results in continuing progress also in the field of education. In this context, we can note that current pedagogical theories and concepts defining the educational process focus mainly on highlighting the emergent specifics that characterise education in contemporary society. If we concentrate on emphasising the specifics, it is necessary to focus on a more detailed examination of the specificity and uniqueness of the participants of the educational process, among whom we must, without doubt, include the persons being educated at different levels of the existing educational system in different countries of the world.

The presented study deals with the application of the inclusive approach in the field of higher education pedagogy. The theoretical part defines the key concepts associated with the field of inclusive education. In this context, the detailed analysis focuses on defining and emphasising the promotion of a subjective sense of well-being and satisfaction in higher education. The empirical part of the study analyses the methodological concept - One Page Profile as a tool for investigating the aforementioned well-being among the interviewed university students studying at the University of St. Cyril and Methodius. Drawing conclusions from our investigation is possible based on a content analysis of the recorded responses. The empirical part of the study aims to answer the following question - What is important in the life of a university student.? Having answered the above question, we then analyse the possibilities of creating a subjective sense of well-being through university education.

## 2. Inclusive education

In relation to the focus of our investigation, the theoretical part aims to define inclusive education. "Inclusive education is not essentially concerned only with some specific groups of pupils, but with all pupils who are part of the process of education. Thus, we are talking about the school

environment as such, because every pupil is an individuality, every pupil is unique in some way." (Bagalová, Bizíková, & Fatulová, 2015) The essence of inclusive education is to focus on a pupil as a unique personality. Every pupil who is part of the educational process implemented in the school environment should be perceived as a unique and at the same time, a specific personality. In addition, the inclusive approach should be applied to all levels of the existing education system. Not only a pupil in primary or secondary school but also a student participating in the higher education process is a unique and specific human personality. If we want to apply the inclusive approach to university students, it is necessary to define mental health in more detail.

## 3. Research design

Based on the focus of our research on promoting the inclusive approach in higher education, we used the One Page Profile tool to survey the attitudes and opinions of the interviewed university students. Through the One Page Profile, the approached university students answered three questions profiling their individual preferences and needs ("What is important to me?", "What do people like about me?", "How can others support me (in what I want to achieve)")

Compact answers to the three questions above form a prerequisite for understanding a person's individual needs. The recommended length of answers in the One Page Profile is, expectedly, one page. Recording the answers to the above questions in the stated scope is based on the assumption that listening to and understanding an individual is essential for his/her better and more effective participation in tasks and activities (onepageprofiles.wordpress.com).

A more detailed exploration of subjective perceptions of well-being was carried out based on a qualitative research design implemented through content analysis of recorded responses to the question - What is important to me? We started from the assumption that if we identify what university students consider important, we can subsequently analyse the subjective sense of well-being in that population group. In the content analysis of the recorded responses, we adopted an inductive approach, which means that during the analysis of students´ responses (in the form of text), we created codes and subsequently, analytical categories, allowing us to establish the conclusions of the investigation and to answer the stated question - What is currently important for the addressed first-year university students studying at the University of St. Cyril and Methodius in Trnava (Hendl, 2016).

### 3.1. Data analysis and interpretation

Based on the content analysis of students´ responses to one of the questions that formed the One Page Profile, we can state the following findings arising from our investigation. The recorded responses of full-time undergraduate students helped us to identify three analytical units. The first analytical unit that indicates the area of importance for the addressed undergraduate students is university study. We created the same analytical category for the recorded responses of part-time students. Therefore, we can conclude that studying at a university is ranked as important by the addressed university students of both full-time and part-time forms of study. Therefore, by applying the approach of inclusive pedagogy to the higher education process, the participation of university students in the process of education must not lag behind the expectations of students. The persistence of university students' perception of the importance of studying at university indicates their interest in education at the university level. By completing their chosen study programme, university students want to apply themselves in practice, develop their attitudes and opinions, and acquire the necessary knowledge, skills and experience.

Another analytical category we identified for full-time students is leisure time. Full-time undergraduate students perceive leisure time as an important part of their lives. As they are generally young people who are not yet employed and have no family responsibilities, they are able to pursue their interests and hobbies to a greater extent in their leisure time than students in part-time study programmes, for whom the space for pursuing leisure activities is largely reduced. On the contrary, for students studying part-time, we recorded statements indicating the importance of forming interpersonal relationships. For this reason, we believe that university teachers need to treat students fairly and equitably. We assume that university teachers´ pattern of behaviour is to some extent transferred into students´ conduct and thus, it influences the formation of students´ attitudes and opinions in the context of interpersonal relationships.

Last but not least, based on the responses of both full-time and part-time students, we have created another analytical category - family. The sense of satisfaction and well-being resulting from a happy family life is also considered important by the interviewed university students. Orderly life and functioning family relationships participate in the formation of well-being and satisfaction among the respondents.

## 4. Conclusion

In the presented study of theoretical-empirical nature, we have focused on analysing the possibilities of promoting well-being among university students. Promoting well-being among the addressed population is part of the inclusive approach to education in current pedagogical theories and concepts. The inclusive approach in the educational process means the consideration of the individual and specific needs of the persons being educated. University students also reflect on their needs, which cannot go unnoticed in the application of the inclusive approach. In addition, we need to stress the fact that if we apply the inclusive approach to educating university students, it is necessary to find out what promotes a subjective sense of well-being. We used the methodological concept of the One Page Profile to investigate well-being and its promotion among university students. Through the One Page Profile, the approached university students answered three simple questions profiling the subjective perception of current priorities in their lives. We focused on a content analysis of students´ responses to the question: What is important to me? We compared the analysed answers of two groups of interviewed university students studying at the University of St. Cyril and Methodius in Trnava.

By recording what university students consider important, it is possible to influence, at least to some extent, the direction of the higher education process. If the university study itself is important to the addressed university students, then university teachers must conduct lectures, seminars, exercises as well as other organisational forms of university education in a professional way. The level of professionalism in a university education will determine not only students' increased interest in studying but also their subjective awareness of the need to be a university-educated person. In addition, leisure time or time spent with family is also important for students studying at university. Therefore, it is necessary to create conditions in which university students are not overburdened. In many cases, however, this is not a problem on the part of university teachers but students themselves as they often leave their duties to the last minute. As a result, it may seem, at a first glance, that there is too much work. The minor differences observed between full-time and part-time undergraduate students can be explained by the personal characteristics of undergraduate students. For students in the part-time form of university education, we assume a higher age and more work responsibilities, which influences the identification of what is important for a given university student.

As we consider analysing the promotion of well-being among university students to be a topical issue in the area of an inclusive approach to education, we also propose further research in the stated area. The promotion of the individual approach to university students could be strengthened mainly based on a comprehensive analysis of all responses recorded through the One Page Profile. For this reason, we plan to work out a comprehensive interpretation of the One Page Profile for the addressed students studying at the University of St. Cyril and Methodius in Trnava. We can assume that the recorded findings will contribute to the promotion of the inclusive approach in more universities not only in Slovakia but also in neighbouring countries.

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# SOCIAL GROWTH FOR CHILDREN AND OLDER ADULTS THROUGH INTERGENERATIONAL ACTIVITY

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## Abstract

A unique research project emerged between a nursing home adjacent to a preschool, the preschool children, their teacher and two preservice teachers. Two-three pre-schoolers were grouped with one elderly person and they met on a regular basis, something that contributed to a feeling of intimacy, warmth and formed meaningful bonds between them.
A case study was done using a qualitative analyses, it's tools being interviews and observation (Denzin, 2008). Data was collected from 12 transcripts by two preservice teacher's conversing with two preschoolers, ages 4-5. Thematic data analysis led to the identification of two main themes that are related to the types of participation: Affective Participation and Collaborative Participation.
Implication: Intergenerational activity can teach children new perspectives and empower them to teach others while being beneficial for the elderly as well, reducing medical and emotional distress. This study suggests that opportunities should be sought to involve young children within early childhood education in the lives of the elderly.

*Keywords: Intergenerational activity, authentic dialogue, verbal & nonverbal interactions.*

## 1. Introduction

Research indicates that investing in a well-planned intergenerational relationship, where the elderly and young children choose to engage, is key to significant learning for both groups. Furthermore, informal settings provide a relaxed atmosphere and are essential for engagement and reciprocal open conversations, leading to valuable learning experiences.

## 2. Intergenerational practice

Intergenerational practice refers to 'cooperation and interaction between people of different generations' (Heyman, Gutheil, White-Ryan, 2011, p.436). Literature suggests that involving older people in the education of young children has many benefits (Gallagher, & Fitzpatrick, 2018). The impact of children growing up in a society where they only relate to their own age group has led to a loss of wider community inclusion and has limited opportunities for them to learn from more knowledgeable others (Vygotsky, 1978).
Rosebrook (2002) explained that their are social and emotional benefits to intergenerational activity for three- to four-year-old children. However, there tends to be a 'generational disconnectedness' (p.31) meaning that reduced interactions between people of different generations which could have a potential negative effect on children's development.
Femia, Zarit, Blair, Jarrott & Bruno (2008) evaluated the potential impact of intergenerational programs on children's socio-emotional development, behaviour, school performance, attitudes and behaviour towards older adults. They showed that children ages 6–8 years old had higher levels of social acceptance and positive attitudes towards and displayed higher levels of empathy towards older people.

## 3. Purpose of the study

There were two main goals for the research; to strengthen the bond between pre-schoolers and the elderly and to examine the way they apply values taught in preschool while interacting with the elderly.

## 4. Research methods

The research design employed a qualitative case study methodology and interviewing and observation tools (Denzin, 2008) in which a phenomenon within a particular context is researched through various data sources. An in-depth examination of individuals or groups reveal multiple facets of the case at hand. We were interested in the meaning of real-time experiences to the subjects themselves, rather than in generalizing results to other groups of people.

### 4.1. Participants

The participants are two preservice Israeli teachers in their third and final year of training and two pre-schoolers, ages 4 and 5.

### 4.2. Research tools and data processing

Each of the two preservice teachers conducted three conversations with the same preschooler who visited the nursing home. Back in the preschool, they cconducted a 10 minute personal dialogue with them about their visit. The conversations with the children revolved around the photos and videos taken during the nursing home visits. This was done in order to create an opportunity for dialogue that would interest both parties involved.

During the dialogue, preservice teachers videotaped and took notes. They then produced a transcript combining the information from the oral videotapes and written notes that were analyzed using a qualitative content method (Denzin, 2008). Videotaping is a tool that is used to document authentic situations and to help teachers learn to critically reflect on their classroom interactions (Borko, Jacobs, Eiteljorg, & Pittman, 2008).

## 5. Findings

The analysis led to the identification of two main themes related to types of participation: **Affective Participation**: empathy compassion, concern for emotional needs and **Collaborative Participation:** concern for physical needs and comparison to the private family.

### 5.1. Dialogue conducted between Yael (preservice teacher) and Yahav (child)

1. Yael: I have a very special picture I took at the nursing home.
2. Yahav: This is the grandmother who was with me (answers happily) .
3. Yael: Correct
4. Yahav: I drew a picture with the elderly woman. The picture fell and a boy picked it up for her because she is old and can't walk. We need to help her.
7. Yael:  You're right.
8. Yahav: I t fell again, then I picked it up. She couldn't get it.
9: Yael: I'll show you another picture.
10: Yahav: That's me, the old woman is hugging me.
11: Yael: How did you feel?
12: Yahav: I like it. She wanted us to take a picture because she misses her children.

The dialogue expresses the manner in which the girl, Yahav, understands the older woman's feelings and limitations and is there to help her. The empathy stems from the recognition of the physical limitations of the elderly woman and the desire of the girl to help her. She also understands the emotional state of the elderly woman when she said: "she misses her children ". We can perceive that a positive attitude has developed and contains the physical and emotional state of the elderly, while trying to help her.

## 6. Conclusions

Intergenerational activity can teach children new perspectives and empower them to teach others. It is beneficial for the elderly to interact with young children, informally, in early childhood educational centers as well as in nursing homes.

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# INTERACTIVE TEACHING OF PHYSICS BY VIDEO ANALYSIS METHODS

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## Abstract

Teaching physics during the pandemic did not allow full-time teaching and became challenging for both students and teachers. The inability to perform real experiments was complicated by the building of new students' knowledge and the development of their abstract thinking.

Video analysis is a possible substitute for experiments - analysis of real physical events recorded in the form of videos using the program Tracker. In the lectures, we applied an interactive form of teaching - video analysis - analysis of real physics experiments recorded in the form of video in the experimental group. Lectures and presentations using videos of real demonstrations combined with video analysis using the interactive program Tracker and active discussion of students were carried out using the Peer Instruction method.

The following article describes the teaching of physics using the video analysis method and finally offers an assessment of the students applying the Peer Instruction method.

*Keywords: Interactive teaching, video analysis, e-learning, STEM education, PI method.*

## 1. Introduction

As mentioned in previous works, elementary school students' basic skills in physics (but also in mathematics) have decreased dramatically in recent decades (Pinxten et al., 2017). Physics is often considered a difficult subject because the fundamental laws are expressed in the language of mathematics. Teachers are constantly trying to make pupils better understand and comprehend various phenomena and basic laws. One of the creative methods of teaching physics that makes science more interesting for students is video analysis (VAS method) using the program Tracker (Hockicko et al., 2014, 2015). Group projects based on digital video analysis are a motivational, educational, and cost- and time-effective alternative to traditional activities associated with a basic physics course (Laws et al., 1998).

Traditional lectures have been shown to help acquire only basic knowledge without deeper understanding and problem-solving skills. The traditional teaching of Newtonian mechanics in the first years of undergraduate studies only slightly eliminates the misconceptions students acquired during their high school studies. Students do not demonstrate the conceptual understanding of the subject matter that should result from sufficient quantitative problem solving and logical lectures (Redish, 2002).

Many video-based tasks are suitable for demonstrating simple mathematical analysis, and the use of integrals and derivations in physics. The use of video-analysis-based problems in physics can significantly impact the knowledge gap compared to students solving traditional problems from a printed textbook (Hockicko et al., 2015).

## 2. Video analysis of motions by program tracker

The Tracker is a free, open-source program (https://physlets.org/tracker/), that can be installed on a USB stick and runs directly from the USB stick. Working with this program is intuitive, the program includes help in several languages. Students can work with the program by inserting a video into the program, performing a subsequent calibration, and capturing the position of the moving object (either automatically after marking the moving object or manually).

The student's task is to describe the event from a physical point of view - to perform a mathematical analysis of the dependencies obtained (the program offers 24 predefined time dependencies, other dependencies can be defined and not only time dependencies can be investigated, as the program also allows to change a predefined physical quantity). The subsequent analysis should describe the motion in the *x,* and *y*-axis direction, and determine the initial velocity in the *x,* and *y*-axis. From the analysis of the velocity in the given directions, we can determine the instantaneous and average acceleration (examples from kinematics).

Figure 1 shows the analysis of the movement of the throwing ball in the program Tracker. The student's task is to analyze the force(s) acting on the ball.

*Figure 1. Video analysis of motion – the movement of throwing the ball.*
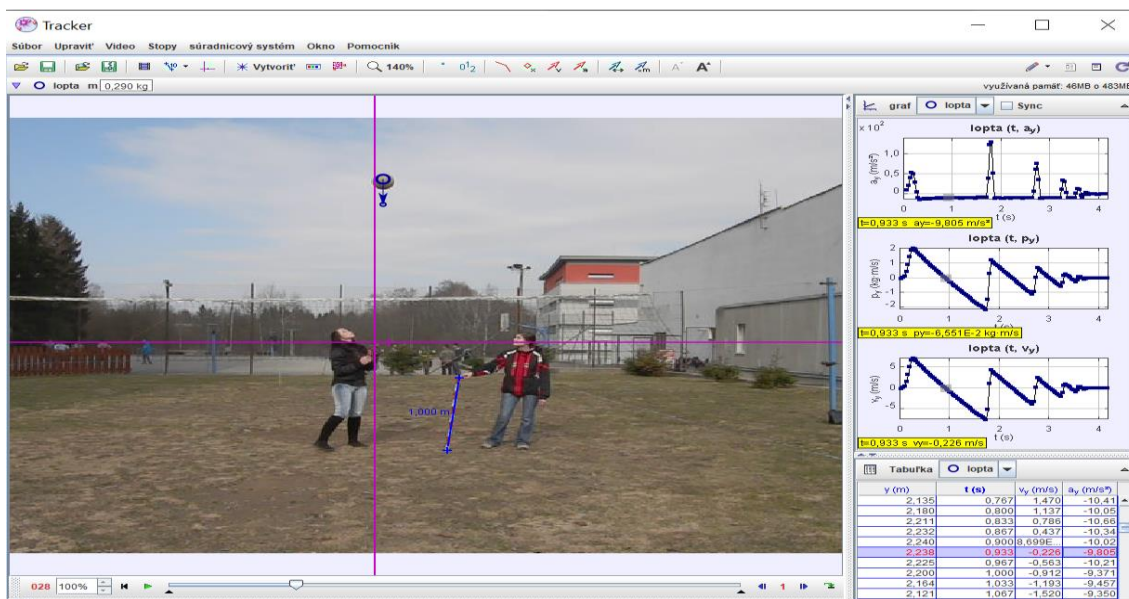


## 3. Video analysis versus traditional teaching

The use of video-analysis-based problems in physics significantly improves the understanding of basic laws and knowledge acquisition compared to students who solved traditional problems from a printed textbook. Video analysis and simulation (VAS method) of problem problems using the interactive Tracker program is one of the methods that significantly helps to form conceptual thinking while eliminating misconceptions, developing students' manual skills and intellectual abilities, and increasing students' knowledge (Hockicko et al., 2020). These results have been found and confirmed by using pre- and post-FCI (Force Concept Inventory) tests (Hestenes et al., 1992).

## 4. Using the PI method and discussion with students

The Peer Instruction (PI) method was used to motivate the students (Crouch et al., 2007): Each conceptual question during lectures has the following format (under PI):
1. A question is posed
2. Students are given time to think
3. Students record individual answers (1st voting)
4. Students discuss their answers
5. Students record revised answers (2nd voting)
6. Feedback to teacher: Tally of answers
7. Explanation of correct and incorrect answers using methods of video analysis (3rd voting)

*Figure 2. Development and evaluation of students' answers to question 13 of the FCI test.*
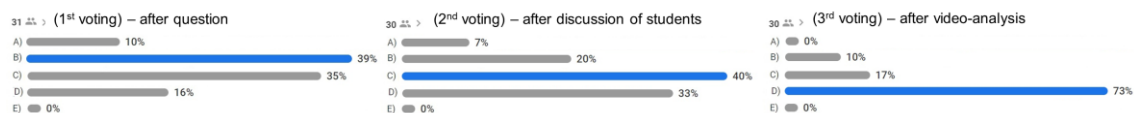


The student vote was organized using the Slido platform: https://www.sli.do/. It should be pointed out that the teacher never told the students which answer was correct. The students had to find the correct answer themselves. During the lectures, only 2/3 of the students present actively participated in the voting.

## 4.1. Evaluation of the students themselves

After the exam, students had the opportunity to comment on the course of the semester, from their answers we selected some of them:

- I liked the lectures, a lot of things were from everyday life, I got a different perspective, it was experiential,
- I understood a lot of things thanks to the analyses in Tracker, it was more vivid, I liked the applied physics,
- the demonstrations helped me, I understood a lot, it was good because I didn't have much physics in high school,
- it was more interesting than theory, an interactive form of explanation, I liked the physics, it was the connection between theory and practice,
- I had a difficult beginning in physics, but this form helped me - not only the explanation but also the video, it was clearer,
- interesting way of learning, it made online learning come alive, it was lively and interactive, and many people engaged in discussions and were forced to think, I liked the link with practice - I learn when I see something,
- finally, it was proper physics from practical life,
- I slept through some of the online lectures, but not yours, I didn't.

## 5. Conclusions

Watching real physics videos, active student discussion with the application of the PI method, and subsequent video analysis of physics problems had a positive impact on the growth of knowledge and improvement of the concept of Newtonian mechanics at the end of the semester. This fact has also been declared in our previous studies as well as in studies by other authors (Tarjanyiova et al., 2022).

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# THE IMPACT OF THE COVID-19 PANDEMIC ON EDUCATION: A CASE STUDY OF THE TRANSFER TO THE ONLINE SPACE

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## Abstract

The contribution is a partial output of KEGA research task no. 011STU-4/2022 conducted at the Institute of Management of the STU in Bratislava. One of the areas significantly affected by the COVID-19 pandemic is education. Exclusion of students from face-to-face teaching required a quick reaction to these new conditions, both on the part of teachers and schools. Teaching at universities did not stop, but has moved to the online space, which has its own specifics. The article presents the results of the transfer of education to the online space at a technically oriented university. The article describes two basic tools used at the Slovak University of Technology in Bratislava, which have the task of neatly storing study materials, organizing students' work, and providing tools for their assessment and testing. The first investigated tool is MOODLE and the second is the Academic Information System - AIS. In addition to the mentioned areas, AIS also serves as an electronic student book, a communication channel, and a system for study management and administration. It offers much more functionality than was primarily used before COVID-19. In the last period, the e-learning functionality comes to the fore, which allows, among other things, the automatic entry of evaluation. On the other hand, MOODLE has a greater advantage in creating questions focused on calculations, which are created with a greater range of options and with the option of automatically filling in random values from a preset data set.

*Keywords: COVID-19, information system, online education.*

## 1. Introduction

The COVID-19 pandemic significantly affected teaching already at the beginning of the summer semester 2020. Universities had to gradually move to the online space, both in the form of video calls and meetings with students, but also in the form of creating online courses and using online tools for teaching. At that time, public universities in Slovakia already had active Microsoft Office 365 licenses, which significantly helped universities in the initial phase. The Office 365 Teams application began to be used massively for communication with students. In addition to MS Teams, communication through the Google Suit platform, namely Google Meet, is actively used. In addition to these, the most frequently used, we can also mention others that some universities and teachers used to use, such as Zoom or Webex (Paksiova & Brauner, 2022). The aim of this post is to present the most used online teaching tools at the Slovak Technical University (STU), the Academic Information System and Moodle. These tools are often called Learning Management Systems (LMS). LMS is a software application or web-based technology that supports students in communication, serves to plan, implement, and evaluate specific teaching. The LMS gives the teacher the ability to create and deliver content, monitor student participation in education, and evaluate student outcomes.

LMS systems support web editors, which allow teachers to add study materials. The flow of information in LMS systems is not only one-way (from teacher to student) but two-way. The teacher can create assignments, tests, and activities that require student activity. LMS systems were used at STU even before the COVID-19 pandemic. Due to the impact of the pandemic, their use has increased many times. Even after the end of the pandemic and the start of face-to-face teaching, many teachers continued to use these systems.

## 2. Moodle

The Moodle system is a software package for the creation of educational systems and electronic courses on the Internet. It is a project that is constantly evolving, designed on the basis of a social-constructivist approach to education (Fikar, 2018). The moodle application is operated at two STU faculties, the Faculty of Chemical and Food Technology (FCHPT - https://elearn.uiam.sk/) and at the Faculty of Electrical Engineering and Informatics (FEI - https://elearn.elf.stuba.sk/moodle/). Both systems are similar based on the same source code but have a little difference that do not influence the

usability. In our work we will present the system administered at the FCHPT, that are used also on other faculties and workplaces (Institute of Management, Faculty of Civil Engineering, Faculty of Mechanical Engineering). At the time of writing, the moodle at FCHPT had 5 905 users and 260 courses (e-learning na FCHPT STU, 2022).

The user can access moodle through the web browser or through the mobile applications that are available for iOS or Android. Student and teachers can access moodle through their official university login details that are available to them. The moodle administrator creates a course and assigns a certain person as the course administrator. The course administrator can then add other people to different roles, modify their rights. The course administrator determines the enrollment methods. He has the choice between adding a student manually, self enrolment (free or password-based), or guest access. He has many options on how to modify the course. He can set up course format, visibility, timing, appearance, groups, and many others.

The best way to use the moodle is to add activity or resources for the students. Teachers can add in general two categories of modules. Sources with which they provide students with study materials. They are not interactive and serve only to provide information. Activities are interactive, where there are one-way or two-way interactions between teachers and students. Standard activities are survey, database, forum, quiz, and assignment.

*Figure 1. Resources and activities in moodle.*
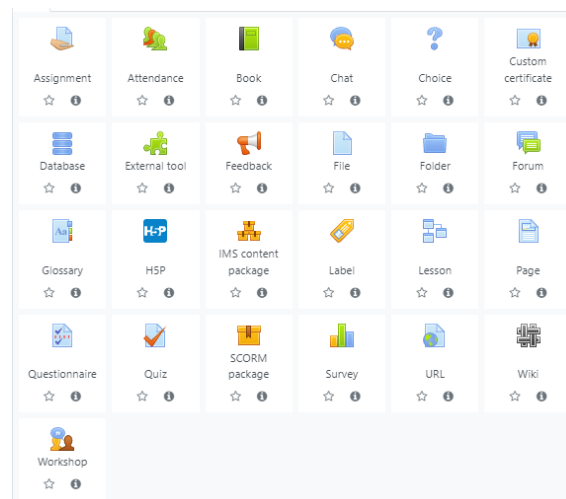


A big advantage of the activities is clarity and the possibility of communication with the student. The student sees the assignment or description of the activity and the submission deadline. The teacher can see when the student submitted the assignment or completed the activity, can comment and evaluate. The evaluation and comments are displayed directly to the student, who can thus track his progress in the subject. In this way, information about the assessment is always available to the student in the grade section. In this way, the GDPR issue associated with mass notification of marks is eliminated. The big plus of Moodle is the question bank, which can be set up for each course. Here, the teacher can set many types of questions (multiple choice, true/false, matching, short answer, numerical, essay, calculated, etc.). Questions can be categorized into created categories and then used in the activities in the course.

The teacher can enter various goals that the student must achieve in order to move forward in the subject, e.g. achieve a certain number of points on a test or assignment, submit a homework, or so on. In the grade section, the teacher has an overview of all participants in the subject, and automatic evaluation will help him record the final grades. The user environment of moodle and its individual modules is very intuitive and can be used even by a less technically proficient person.

After the end of the course, the course administrator can backup the course and restore or reset it for the new semester, while he can save the backup and keep the data and files he considers necessary to the next semester.

## 3. Academic information system - AIS

The Academic Information System of Slovak University of Technology in Bratislava allows the academic community, university staff, and public to access a wide range of information (Academic Information System, 2022). The home page contains information and options for personal administration (log in, first log ins, system integrators), admission procedure (e-application form to study at STU, pre-enrollment, accommodation), information about STU (persons at STU, validity verification of

identification cards, graduates), study information (academic year schedule, study plans, course catalogue, final theses at STU), science and research information (library, projects, publications) and information about the information system (FAQ, statistics). Figure 2 shows the annual number of active users of the information system. The number of users is closely related to the number of STU students and teachers, and this trend because the use of AIS is mandatory at STU.

*Figure 2. The annual number of active users of the AIS at STU.*
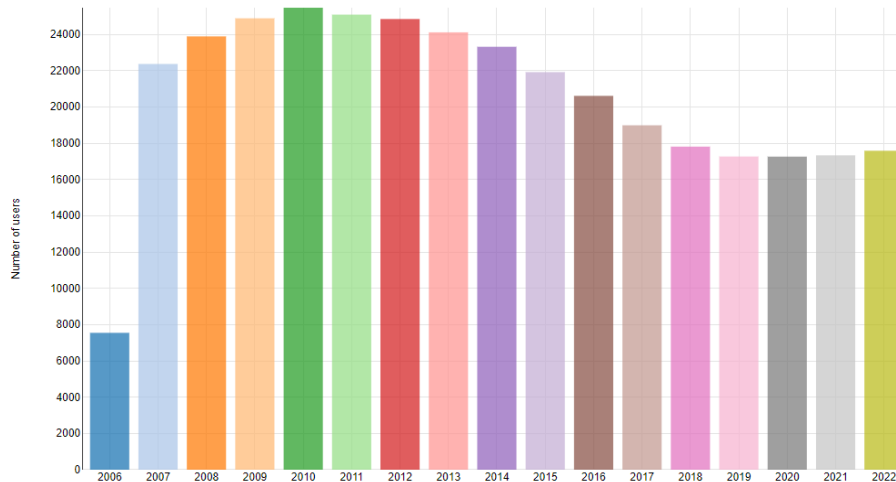


After login in to AIS users can see the personal administration page that contains information about their study/teaching and other useful tools and documents. The AIS has many more functions than moodle, because it is mainly study administration and, communication tool and as an addition, it supports LMS. In this paper, we will focus on AIS LMS module. The main module for LMS is eLearning. It contains eLearnings projects, electronic study materials, tests and examinations. The first step to use LMS module eLearning is to set up an eLearning project. An e-Learning project is a standalone object that will combine all materials related to one e-learning project and is independent of the taught subject. Subsequently, it can be linked to the currently taught subjects and thus made available to students.

In addition to providing information and study materials, eLearning is also suitable for online testing of students. The teacher can create a Test base with questions that can be categorized into created folders. The types of questions that teacher can add are: 1 from N, dichotomic, selective M from N, forced selection, verbal, matching, open, ordering, filling in, connecting, and so on. The biggest advantage compared to moodle is automatic assessment. The results of the test can be automatically transferred to the evaluation page, and the teacher can automatically write subject grades for the student. It is a great help especially in subjects with a large number of students. In this way, the possibility of errors is eliminated in the manual recording of grades.

## 4. Conclusions

A detailed description of the LMS systems used at STU would require much more space. This article briefly describes the main modules and functionalities that are used at STU in Bratislava and that significantly helped move teaching to the online space during the COVID 19 pandemic. The moodle system has its advantages, especially in the area of testing calculation tasks, where automatic calculations are possible based on programmed entries with the import of a large number of variations. The LMS modules offered by the AIS system stand out mainly due to their integration into the main administrative and communication system of the STU, which is mandatory.

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# FLIPPED LEARNING – INNOVATIVE, PEDAGOGIC APPROACH IN EDUCATION OF MECHANICAL ENGINEERING STUDENTS

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## Abstract

In times of transformation to Industry 4.0 the requirements to develop competencies 4.0 and the needed skills are becoming more and more demanding. Academia faces a number of challenges to tune programs and curriculums in order to satisfy the needs of the companies. New and innovative pedagogic approaches are needed not so much in the introduction and first level subject courses, where basic technical knowledge is delivered. However, in the third year, for the advanced subject and project courses they are critical for achieving the objectives of the courses and developing the competencies required by the industry of tomorrow.

The authors of this paper are teachers of a course – Product design and development - and they are members respectively to Mechanical Engineering department and Design department. In the paper, an overview of innovative pedagogical methods and approaches applied in educating mechanical engineering students is presented. In addition, an example with shifting the classroom teaching to flipped learning applied in the course Product design and development is given. The outcome of this shift will be represented by the result in the course and the analysis of a survey, where data was gathered from the students in the course.

*Keywords: Industry 4.0, competences 4.0, innovative pedagogic approaches, flipped learning.*

## 1. Introduction

In a dynamic world that is forever undergoing economical, societal, environmental and political changes, the higher education sector in general and the engineering discipline in particular remain under constant pressure to meet the continuous demands of the industry that is in need of highly intellectual graduates with the relevant cognitive and experiential skills. Such dynamics and demands, paired with the fast growing and rapid advancements of technology at the dawn of the twenty-first century, have been a great catalyst for change in higher education. In times of transformation to Industry 4.0 the requirements to develop competencies 4.0 and the needed skills are becoming more and more demanding. Academia faces a number of challenges to tune programs and curriculums in order to satisfy the needs of the companies. New and innovative pedagogic approaches are needed not so much in the introduction and first level subject courses, where basic technical knowledge is delivered. However, in the third year, for the advanced subject and project courses they are critical for achieving the objectives of the courses and developing the competencies required by the industry of tomorrow. Pedagogical innovations that are experimented by many universities are alternatives to lecture, exploring the possibilities of active learning including project-based learning, inquiry-based learning, competency-based learning, scenario-based learning, adopt collaborative learning and share collective responsibility with the learners, and more. Technology supported innovations in higher education are described as the incorporation of technology into learning environments that can enhance knowledge, skills and attitudes. They are not merely the adoption of software and applications to manage the learning environment effectively, but they are enhancing the student's acquisition by introducing technological devices

## 2. Method

Flipped learning is an academic methodology wherein direct guidance moves from the gathering learning space to the individual learning space, and therefore the subsequent active gathering session is modified into a dynamic, intelligent learning condition where the teacher guides students, gives prompt feedback, discusses ideas. (see Figure 1)

*Figure 1. Flipped learning compared to traditional face-to-face learning [Larmand A., 2021].*
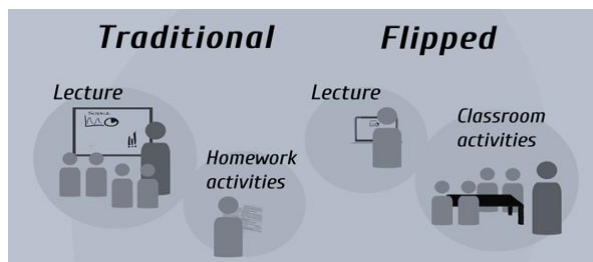


Flipped learning a purposeful approach to teaching and learning. It usually involves students reading text or watching videos outside of class and then taking part in a discussion, answering questions, writing essays, or completing projects once they return as a group. There is an important acronym when it comes to flipped learning. Often referred to as the four pillars of FLIP - keep a flexible environment, focus on the learning culture, deliver intentional content, and remain professional. Starting with flexibility - flipped learning allows teachers to try many different instructional modes and they often rearrange their teaching spaces to allow for different things. As for learning culture, educators need to flip from a teacher-centred model to a student-centred one. In addition, the fourth pillar - being a professional educator is more than it seems and involves greater demands in flipped learning. Teachers need to be constantly observing all students and providing relevant feedback. They also need to be reflective by assessing both student work and their own practice. No matter that is not teacher centred model, teachers are the essential factor in successful flipped learning. [Larmand A., 2021]

## 3. Example from Product design and development course for mechanical engineering students at LNU

In the figure below (see Figure 2), the knowledge and the competencies in the fields of mechanical engineering are presented in relation to the Bloom´s taxonomy and the chronological development of that knowledge following the industrial revolutions until nowadays and further.

*Figure 2. Knowledge and competences in the field of mechanical engineering in relation to Bloom´s taxonomy and following the chronology of industrial revolutions.*
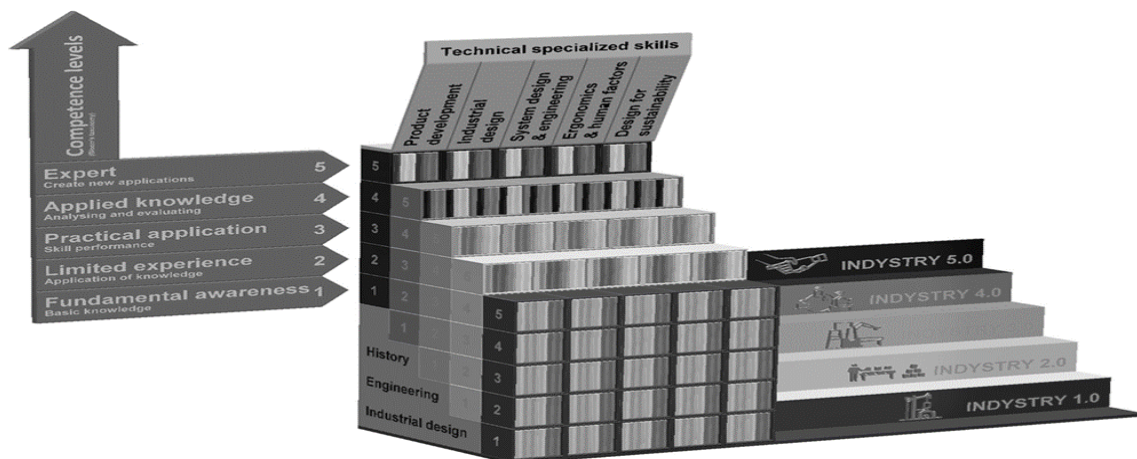


One key subject in the field is Product development. Example with a course Product design and development will be presented further. It is one example of a subject that contributes to development of soft competences from the list of 2020 as follows: Complex problem solving, Critical thinking, Creativity, People Management (working in project groups), Coordinating with others, Judgment and decision-making, Cognitive flexibility. From other hand, the course is mobilising the specialized, technical and engineering skills acquired in the previous courses.

Product design and development course is a course from the last third year of the Mechanical engineering bachelor study and it is one of the last courses before the final project. The course is dedicated to not only give the students some knowledge and experience about Product design and development but it gives also a methodical base for successful degree projects. The course is project-based, with project task given by industrial companies. Working on the project students have the

feeling that they are solving problems from the reality. The examination is done through the report, written for the project, and the seminar sessions where students are presenting their work. A number of lectures are presenting to the students the theory needed to be applied in the project. From other hand, the course is mobilising the specialized, technical and engineering skills acquired in the previous courses.

During the pandemic time, when a shift from traditional teaching to online teaching was forced. After first two lectures, feedback from the students showed that lectures based on the active delivery from the teacher are not suitable to give via Zoom. Student are getting more passive when the life interaction is missing. The teacher who was giving the course had experience from previous redesign of the course with converting the course to active learning and student-centred learning with shifting some responsibilities for delivering knowledge content to students. Based on that experience and in discussion with the students it was decided that the approach to the online course Product design and development will be flipped learning. The presentations of the lectures, all the materials and the references to the textbooks were available for the student on the course page. They should get familiar with the lecture material in their own pace but before the corresponding steps in the project will be implemented. Then active sessions were planned for guiding, discussions and questions on the studied topic. For those sessions new type of lectures were prepared with guiding how to apply the theoretical step in the project. The students better appreciated such applicable approach. Those active sessions were done via Zoom in synchronous mode. Additionally, group project meetings were planned to be done with each project group separately in face-to face meetings. The result with applying Flipped learning during distance teaching was satisfactory, so it was decided to proceed with it in the face-to-face teaching.

In the sense of the first pillar "flexible environment", the students were given the opportunity to work in different environments. Theoretical material they have received for studding it in asynchronous mode, in their own pace. The guiding sessions were executed at the classroom as an active discussion to give the students confidentiality to apply the theory to the project. In the tutoring sessions, the teachers were meeting the project groups separately and often to give them feedback and as much as possible insights on what they have done in the project steps. The three seminars gave the students possibility to present their achievements and receive feedback from opposing group. Following the concept of the second pillar, students were transferred knowledge in a professional way of theoretical notes, guiding lectures and supporting materials to deliver the intentional content. Being intentional allows the learning to remain student-centred and active. When talking about the third pillar – "learning culture" the active class time was used for exploring topics in-depth and encouraging students to participate in and evaluate their learning. In this way, flipped learning can help students understand key concepts and procedures for solving problems. In addition, about the application of the fourth pillar – "to professional educator" – it could be stated that flipped learning sets higher demands on the educators to follow very close students learning and project work, to give continuous, relevant feedback and reflect not only the students work but also their own. Part of this reflection in the light of the demands for competences 4.0 is this paper.

## 4. Conclusion

The flipped learning method gave very good results in the course Product design and development. It provides students with an environment where they can learn and reflect according to their own needs and comfort. Flipped learning allows a student-centric learning approach rather than making a teacher, the primary and only source of information. With providing to every student relevant and accessible content, with available constant accesses and expert feedback the flipped learning approach really worked for the Product design and development course. It was decided to adopt the same approach in the post-pandemic period having the face-to-face mode of active sessions and group project tutoring done on campus.

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# ANALYSIS OF UNIVERSITY STUDENTS' NEEDS FOR INCLUSIVE EDUCATION

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## Abstract

Inclusive education is a current phenomenon in Slovakia that is associated with improving the quality of higher education. Quality education must create adequate conditions for all groups of both regular students and students with specific educational needs. It is therefore necessary to create conditions for increasing the well-being of university students in the educational process. If we want to increase the well-being of higher education students, we must first of all find out what the students' needs are. Within the project KEGA 004UCM-4/2022 "Promoting Health and Well Being through Inclusive Education in Higher Education" and project BIN SGS02_2021_002 with the name "University enhancing active smart aging" the research team carried out a qualitative analysis of students' needs through the one-page profile methodology. This methodology has been used in Slovak higher education institutions since 2018 to identify students' needs in the area of education and personal growth. The paper presents the results of the analysis in the third category of the one-page profile "how to support me". The analysis presents a comparison of needs prepared on the basis of subjective statements of Slovak university students. The research sample consisted of 96 part-time students and 98 full-time students. As a result of the analysis, the basic categories of needs of university students in student and personal life are identified.

*Keywords:* Wellbeing, needed, university student, inclusive education, one-page profile.

## 1. Educational inclusion

Inclusion in the conditions of Slovak universities is understood as an innovative approach in the field of education, which primarily emphasizes the right of every student to quality education.

Inclusion in general is a never-ending process in which people with disadvantages can, to the greatest extent possible, participate in all activities in society like the majority. It is therefore the natural inclusion of all people into society, taking into account the individual characteristics of each person (Kováčová, 2019). Inclusion assumes that all people are different and everyone can co-create and co-determine. The individual groups in society must not only adjust to one another.

Educational inclusion emphasizes the right of every student to quality education. It is a flexible process with the aim of creating an educational environment in which the diverse educational needs of each individual can be met without exception. The full participation of students with specific needs in the educational process is likely to increase their success and prevent them from distancing themselves from education, for example. Educational inclusion includes all students regardless of their physical, intellectual, emotional, social, linguistic or other conditions, regardless of race, religion, disability, impairment, social background, aptitude or gender.

In order to ensure the creation of appropriate study conditions for all students and students with specific needs, the University of St. Cyril and Methodius in Trnava (Slovakia) has developed a guideline to ensure a generally accessible academic environment for students with specific needs. On one hand, this directive regulates the principles of a generally accessible academic environment for students with specific needs, the concept, characteristics, rights and responsibilities of students with specific needs. On the other hand, it regulates the rights and responsibilities of the University in providing a generally accessible academic environment for students with specific needs. The Directive establishes the status, mission and responsibilities of the Support Centre for Students with Specific Needs, the rights and responsibilities of university staff and organizational units in providing a generally accessible academic environment for students with specific needs.

Students with specific needs at the University include students with disabilities and learning disabilities. A student with a disability is a student:

- Who has a disability (visual, hearing, physical, communication impairment, autism or other pervasive developmental disabilities or multiple disabilities) that prevents said student from

participating equally in the educational process and achieving the desired outcomes as compared to a student without a disability;

- With a chronic illness, mental illness and impairment of a short-term, long-term or permanent nature for which the student needs reasonable accommodation and educational support.

Students with learning disabilities are students who have difficulty acquiring or presenting knowledge. Students with specific needs are defined as students who require targeted support services and reasonable adjustments to their learning to overcome their disadvantage without reducing the demands on their learning outcomes.

## 2. Research design and method

In inclusive higher education, the main goal is to create adequate learning conditions for all students. Therefore, it is necessary, among other things, to ascertain their educational and personal growth needs. With this aim in mind, in the project KEGA 004UCM-4/2022 "Promoting Health and Well Being through Inclusive Education in Higher Education" and project BIN SGS02_2021_002 with the name "University enhancing active smart aging".

We have chosen a qualitative analysis of students' needs through the one-page profile methodology. Through the one-page profile, university students/respondents answered three questions profiling individual preferences and needs ("What is important to me?", "What do people like about me?", "How can others support me (in what I want to achieve)?"). The above questions were answered briefly by respondents within the stipulated one-page limit. Thus, respondents had to capture the essence without introducing unnecessary ballast. Even simple answers create a prerequisite for understanding a person's individual needs (onepageprofiles.wordpress.com).

In the qualitative analysis of one-page profiles we chose the method of content analysis of text documents. Content analysis as a research method is a procedure for objectively, systematically and quantitatively describing the apparent content of communication (Hendl, 2016). By aggregating and otherwise quantifying content units within their qualitative categories (concepts, ideas, themes), content analysis organically incorporates the qualitative aspect of the text. The most frequently applied of the quantification procedures is the detection of the frequency of occurrence of the analytical category in text. We found this quantification procedure to be the most appropriate for processing students' written accounts. In the first stage, we determined the analytic categories of the content, which formed a system of fixed indicators that we used to classify the recording units. The units of record in the analysis of the one-page profile utterances were the most frequently occurring ideas in the form of superordinate parts of the whole. These supra-sentential parts of the whole were not written with the same words, but their narrative value and meaning were the same. These were then assigned to the analytic categories we had established in our preliminary reading of the texts. The number of recording units then indicated a match in preference for students' needs in learning and personal development.

## 3. Analysis of research findings and their interpretation

Given the scope of the paper, we will present the results of the analysis in the third category of the one-page profile "how to support me". The research sample consisted of one-page profiles submitted by 96 part-time students and 98 full-time students. In the preparatory reading, we established 6 analytical categories in the external form of study. For each category we provide examples of recording units. The frequencies in percentage terms are shown in Table 1.

*Table 1. Occurrence of record units in the external form of study.*

| Analytical category | Number of recording units v % | Example unit of record from one-page respondent profile |
|---|---|---|
| 1. Support from family and friends | 68% | *"I am supported by my family and friends who share every success and failure with me".* |
| 2. Support from colleagues in the workplace | 30% | *"When difficulties are caused by unexpected events, have the support and cooperation of colleagues in the workplace".* |
| 3. Clearly defined objectives, task assignments, activities and timetable | 19% | *"I prefer clear and concise assignments. Defining goals means for me an outcome that I will try to work towards".* |
| 4. Teacher support, Faculty support | 28% | *"When a professor is human and willing to help and praise, that's enough to motivate me and move me forward in life."* |
| 5. Open and direct Communication | 26% | *"Transparent communication is important to me in carrying out any activity".* |
| 6. Feedback | 24% | *"I find constructive feedback that offers positive alternatives most beneficial."* |

In the same way we performed the analysis of one-page profiles of full-time students. We established 6 analytical categories. The frequencies in percentage terms are shown in Table 2.

*Table 2. Occurrence of record units in full-time study.*

| Analytical category | Number of recording units v % | Example unit of record from one-page respondent profile |
|---|---|---|
| 1. Support from family and friends | 61% | *"I am very supported in my life by my family and friends. I know I can turn to them and trust them at any time".* |
| 2. Support and empathetic approach from neighborhood | 48% | *"My surroundings can support me by understanding me and not judging me for my emotions and decisions".* |
| 3. Clearly defined objectives, task assignments, activities and timetable | 13% | *"They will give me as much accurate information as possible about what is expected of me, so that I have a better idea of the issue at hand and can deal with it in the best possible way."* |
| 4. Teacher support, Faculty support | 2% | *"It helps me a lot in my studies on campus when teachers are patient with me because my beginnings are always slow".* |
| 5. Open and direct Communication | 23% | *"The best support for me is open and honest communication".* |
| 6. Feedback | 23% | *"Feedback is as important to me as knowing that I am heard and understood".* |

## 3. Conclusion

The analytic categories in both forms of study are the same in numbers. The only difference is in category 2 where external students need the support of their colleagues in the workplace and full-time students need the overall support of people around them. The comparison of the above analyses in the form of tables shows that students in both external and full-time forms of study equally consider the support of family and friends to be the most important in their education and personal development. Support and empathetic attitude from the environment and support from colleagues in the workplace ranked second in preference. The difference in preferences is particularly evident in category 3. Support from teachers is needed more by external students than by full-time students, which seems to result from the extent of personal contact full-time and external students have directly with their teachers. Both groups of students equally need open communication, feedback and clearly defined goals and activities for their studies and personal development. The above analysis shows the need for the development of communication competences and didactic competences of university teachers.

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# INTERCULTURAL COMPETENCE IN 21ST CENTURY MUSEUMS: MUSEUM EDUCATORS' PERSPECTIVES

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## Abstract

Many museums around the world are providing engaging and participatory educational programs and exhibits, and reshaping their missions, structures, and staff to become more inclusive and to create and promote intercultural dialogue in their spaces. This qualitative study aims to understand the perceptions of museum educators regarding inclusive museums, intercultural dialogue practices in museums and explore necessary intercultural competence skills for museum educators. Several key findings emerged from the analysis of the data: In inclusive museums visitors feel welcome and belonged and their multiple needs are considered; museums should reflect the diversity of their community in their staff and their programs; museums should critically and continuously examine themselves and their educational programs; crucial intercultural competence skills for museum educators are flexibility, adaptivity, dynamism and openness; and financial restrictions should not discourage museum educators for creating professional trainings.

*Keywords: Intercultural competence, intercultural dialogue, museum education, inclusive museums.*

## 1. Introduction

In the 21st century, museums have been transformed from being strict and elitist institutions to being active, innovative, and participatory institutions (Simon, 2010). Therefore, current discussions in the museum world have focused on creating more diverse and inclusive museum practices; becoming more socially responsive; and meeting the needs and expectations of a diverse population of visitors (Falk, 2016; Mason, 2004; Schultz, 2011). The literature on inclusive museums suggest that museums should establish a new trust with the communities they serve; redefine their roles, missions, and commitments; become more visitor oriented and integrate diversity and inclusion as institutional values and as initiatives into their main work (Cole, 2014; Falk, 2016; Weil, 2012).

Most of the empirical research on inclusive museums are conducted in the field of visitor studies. Many visitor studies indicate that there are different types of visitors with divergent needs and interests; museum visitors gain learning and therapeutic benefits from participation; museums have social values and responsibilities; and museums are highly valued public forums for encountering and negotiating social issues (Everett & Barrett, 2011). The empirical research on inclusion also focuses on the importance of accessibility. The studies in this area mostly explore the importance of accessible curatorial and educational design practices in museums (Dodd, 2015, Rappolt-Schlichtmann & Daley, 2013).

The number of studies focusing intercultural dialogue and intercultural competence in museums and intercultural trainings for museum professionals is very limited. Most of the studies on intercultural thought and intercultural competence in museums are conducted in Europe and they mostly focus on the perspectives and experiences of immigrant communities. These studies show that intercultural practices in museums can positively affect social inclusion and creating intercultural dialogue in museums is a process of change that requires time and effort (Egholk, & Jensen, 2016; Giusti, 2013; Vermeulen, Vermeylen, Maas, de Vet, & van Engel, M., 2019).

While those studies mainly focus on the perspectives of museum visitors, little academic work has focused on the perspectives of museum educators. This study research aims to fill this gap by focusing on museum educators' perspectives on inclusive museums and record their efforts on intercultural dialogue and suggestions for intercultural competence trainings. This exploration is guided by the following research questions: RQ1: What does inclusive museum mean for museum educators? RQ2: How can 21st century museums enhance professional and institutional intercultural competencies?

## 2. Methods

The primary data collection method for this study is semi-structured interviews. Semi-structured interviews can elicit a depth of data that is difficult to gather by other means and reveal insights that go beyond the data collected in everyday conversation (Fontana & Frey, 2003). The interview protocol was

developed with questions that are designed to initiate thoughts about three major domains: inclusive museums; intercultural dialogue in museums; and intercultural competence trainings for museum professionals. The semi-structured, open-ended, in-depth interviews allowed this study to explore participants' personal perceptions more deeply, and, in this way, rich and descriptive data was collected. For this study, ~1-hour interviews were conducted with three museum educators. The participants were selected from three different museums in the United States. All the participants have been working in the museum education field at least for five years.

## 3. Results

The data analysis yielded to several important findings on the issues of inclusive museums and intercultural competence. All the participants mentioned that in inclusive museums visitors feel welcome and belonged. When I asked about what the idea of inclusive museum means to them, all the participants mentioned the importance of the feeling welcomed and being belonged to the museum space. All three participants gave a lot of specific examples on how to make a museum more inclusive, such as designing the museum space for different physical needs, creating multi language signs for exhibits and being more inviting to non-traditional museum visitors.

The importance of participation was another key element when participants defined inclusive museums and shared their efforts in creating cultural dialogue in their programs. It is vital that museums increase public access to their activities and services and integrate visitors to their identity and programs. However, the participants mentioned that the lack of cultural representation and the cost of admission are the two main obstacles that prevent diverse museum participation. With having different types of visitors with divergent needs and interests; museums need to provide accessible curatorial, educational, and technological and universal design practices. Additionally, museums should continuously critically examine themselves and self-reflect on their roles and works. As one of the participants said when creating intercultural programs, they should think "who they are actually serving, and who they are not serving".

Staff diversity is another theme that reflected in the interviews. All the participants agreed that being an inclusive museum and creating cultural dialogue is not only about the visitors and museums should reflect the diversity of their community in their staff. According to a report published in 2015, the positions of museum curators, educators, conservators, and especially the museum leadership are not reflecting the diversity of US population (Schonfeld, Westermann& Sweeney, 2015). However, according to the participants of this study, the museum world is widely aware of that, and a lot of museum professionals are working slowly but eagerly on changing that.

The data analysis also provides important findings for the importance of intercultural competence in museum education. Participants mentioned that flexibility, adaptivity, dynamism and openness are crucial intercultural competence skills that are needed for museum educators and those skills need to be emphasized in professional trainings. Another important finding on intercultural competence is that to achieve institutional intercultural competence, museums need interculturally competent individuals working at their institutes.

The study participants highlighted the importance of personal efforts of museum educators to create an institutional change in their workplaces. All three participants mentioned the variety of opportunities that are available for museum professionals to learn more on the issues of equity, inclusion, and diversity and to face their own unconscious biases. They think that this personal effort can easily reflect in museum professionals' own work and benefit the overall institutional intercultural competence.

As non-profit institutions, financial restriction is usually a problem for museums, especially when it comes to professional development opportunities for their staff. However, all the participants think that money is not a must for intercultural trainings in museums. Having the right mindset is more important than having sufficient budgets for staff trainings. All three participants shared their creative and cost-effective ways of self and institutional development opportunities such as reading and discussing about museum case studies and attending local museum and education conferences.

## 4. Discussion and conclusions

The findings of this study show that museums must be more open to the needs and ideas of their community. Therefore, 21st century museums should demystify themselves and should be more open and welcoming for everyone. Museums must move beyond simply setting goals and developing outreach programs to reach a deeper level of engagement. Visitors must be integrated into the museums' vision and identity, permeating all levels of the organizations. In other words, the visitor must be the core focus.

Additionally, museums should integrate inclusion initiatives into their main work. Most museums (both in staff and visitors) still do not reflect the demographics of the communities they serve. A good starting point would be developing better hiring processes. In addition to providing

equitable hiring process that can lead to diverse participation, like other sites, museums should "state a vision and set goals related to equity and intercultural development for its staff" (Dejaehere & Cho, 2009, p. 446) and act immediately to account for differing intercultural competencies among staff members. Every museum professional must do personal work to face unconscious bias and they need to do self-reflection work since institutional intercultural competence starts from the individual. Museums do not need to wait for acquiring large grants or budget approvals. To provide these trainings, museums can start with small steps such as organizing weekly article discussions, encouraging their staff to attend local professional organizations and conferences.

In intercultural research and training, it is important that both researchers and practitioners should work together to synthesize theory and practice (Landis & Bhawuk, 2004). When intercultural trainings for museum professionals are designed, their specific needs (such as flexibility, adaptivity, openness and dynamism) should be considered.

All these suggestions can be considered for new topics of future research. This study can also be replicated and extended by expanding the sample size, interviewing with museums professionals from variety of locations, types of museums and departments. In addition to in depth interviews, surveys can be conducted with larger sample size. Working with museum professionals and intercultural communication scholars, specific intercultural and inclusive museum trainings can be designed for museum educators and this process can be documented as a new research study.

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# ELEMENTARY AND SECONDARY SCHOOL GEOSCIENCES HANDS ON LEARNING AT RIA FORMOSA (SOUTH PORTUGAL)

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## Abstract

Elementary and secondary school hands on learning on geosciences is promoted by the project EDUCOAST (EEAGrants) at the field station of the Portuguese Institute of Sea and Atmosphere (IPMA, I.P.) in the area of Geosciences. This facility, located at Ria Formosa (Algarve, southern Portugal), is located in a unique coastal environmental setting, that includes dunes, saltmarshes, lagoon, sand barriers and beaches. The activities set is plentiful and is usually constituted by a field trip for sampling or data collection followed by a lab component and it falls under the priority theme of preserving and protecting the environment and, in particular, the importance and sustainability of coastal systems. In a one-year, the project has already engaged *circa* 438 students from different regional schools, with a very positive reception of this experimental learning.

*Keywords: Hands on, Geosciences, Ria Formosa, visits on demand.*

## 1. Introduction

Learning outside the classroom leads to motivation, creativity and critical thinking, which contributes to a better understanding of the natural world. With this in mind, the EDUCOAST project (funded by the EEAGRANTS – Blue Growth Programme - PT-INNOVATION-0067) promotes "hands on" learning for every grade level, in the area of Geosciences, using the Ria Formosa – a unique coastal environmental setting, that includes dunes, saltmarshes, lagoon, sand barriers and beaches - as an experimental classroom. The project is based at the facilities of the Portuguese Institute of Sea and Atmosphere (IPMA, I.P.) field Station in Tavira, located in southern Portugal. Besides its location, close to the Ria Formosa lagoon, the station has well equipped labs (funded by the EMSO-PT project). The schools' visits are on demand and targets primary and high schools, as well as local associations and it usually correspond to half-day activities. They have fully begun after the lifting of major restrictions due to COVID-19 pandemic, i.e., after March 2022.

## 2. Objectives

The educational offer focuses on learning experiences outside the classroom, promoting forms of experimental learning that cannot be achieved elsewhere. The aim of this work is that students become familiar with the different types of coastal environments, learn about their importance and how to preserve them. With the experimental learning, students have the opportunity to experience first-hand, the process of data collection and analysis, in the field and on lab setting, and learn how to interpret the data. Also, they become more aware of the importance of preserving and protecting the environment, in particular these fragile coastal systems.

## 3. Activities

To achieve these goals, the students usually study in-loco the coastal processes, make observations and perform analysis to characterize sediments, water parameters, beach profiles, etc., by employing different technologies (GPS, sediment sampling, water probes, among others).

These activities usually begin with an initial introduction, followed by practical sessions, in the field (land and/or sea) and/or at the laboratory. The "schools' visits on demand" schedule is usually made by the Tavira Ciência Viva Science Centre, one of the project partners and with the collaboration of Tavira City Council that supports the student's transportation.

The project offers several activities, adapted to the student's grades. In every "school visit" the activity to perform is previously agreed with the teacher, based on the EDUCOAST "Pedagogical offer". The offer is wide and the main activities include themes such as:

- "What are the differences between beaches and saltmarsh sediments?"- This activity is focused on the sedimentological characterization of these different environments. The students collect sediment samples of each area and then characterize them at the lab, regarding the colour and grain size. In this analysis, they use the sieving method and weight each size fraction to compute the respective percentages (Figure 1).

-"What is the sand made of?" In this activity, students analyse the mineralogical composition of various sands from different beaches around the world. The sediment source of each is discussed. Each sand sample is observed using a binocular microscope, photographed and sent to each student mobile phone by Bluetooth using an application (Figure 2).

*Figure 1. "What are the differences between beaches and saltmarsh sediments?". 2th May 7th year.*



*Figure 2. "What is the sand made of?" activity. 13th October 2022, secondary - 11th year.*



- "Let's get to know the saltmarsh" - In this activity students collect sediment samples and plants/algae in order to better define the saltmarsh zones (low, medium, and high marsh). At the lab, they perform the grain size analysis as well as identify the sediment colour with the aid of a standard chart. They identify the plants as well by making an herbarium (Figure 3).

*Figure 3. "Let's get to know the saltmarsh" activity- 12th December 2022. 5th year.*

## 4. Conclusions

This hands-on learning experience with the basic and secondary grades has received a positive answer from the students and professors according to the survey's results, registered at the end of each activity. In a universe of around 438 students, 55% and 46% found the activities very fun and fun, respectively; 55% enjoyed very much and 42% liked to participate; 46% learned a lot of new things and 93% were interested by environmental issues. (Figure 4). These are rewarding results that motivate us to continue this effort among the school population and in the end of the project (April 2024) we will present all the results and the final evaluation.

*Figure 4. Activities student survey's results.*
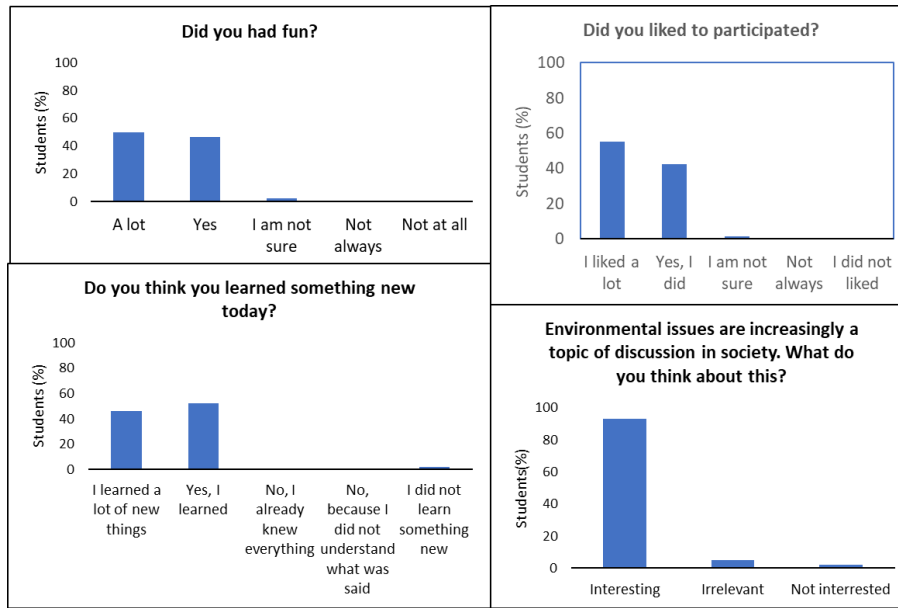


*Acknowledgments*

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# MOBILE TECHNOLOGIES – A KEY ELEMENT IN CONTEMPORARY APPROACHES TO LEARNING

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## Abstract

Mobile technologies catalyse radical transformations in contemporary society's perceptions and needs. In terms of information and education services modern users require major changes in the approaches of provision of access to knowledge.

This paper presents the results of a survey concerning mobile digital libraries and mobile learning conducted in June – July 2021 among information users, namely students at the University of Library Studies and Information Technologies – BULGARIA. The study was realised in accordance with the research project "Information portal for mobile learning and mobile access to library services and resources".

The main aim is to analyse to what extent information users benefit from mobile devices for reading, learning and access to information resources, what their opinion on the inclusion of mobile digital services and learning in library services is and whether they support international policies on mobile learning and mobile access to library services and resources.

For the achievement of this goal a questionnaire with three main sections has been devised: Part 1. Mobile devices, applications and mobile digital libraries; Part 2. Mobile learning and lifelong learning; Part 3. Policies for mobile information provision and mobile learning.

The study has been conducted via an online questionnaire form and the application Google Forms. The empirical data has been inserted and treated with the statistics software IBM SPSS Statistics 21.

The results of the survey prove that the inclusion of mobile technologies in the contemporary university environment is widely welcomed by students and effectively satisfies the individual needs of every learner.

*Keywords: Mobile digital libraries, mobile learning, mobile technologies, research project, higher education.*

## 1. Introduction

Mobile technologies are an essential element of almost all human activities today. The development of information and communication technologies has changed both the economy and social life, the cultural and educational environment. In the new information environment, intellectual activities and searches, educational and cultural needs have radically been transformed, but new opportunities have also appeared. The inclusion of modern mobile technologies in the educational process, the discovery of more efficient and responsive ways of accessing knowledge and information, the high level of information literacy of both teachers and students today are key elements of modern effective educational approaches.

## 2. Scientific research project for mobile learning and mobile digital libraries

The use of modern mobile technologies in education and in library and information services, respectively mobile learning and mobile digital libraries are the focus of attention of a team of researchers from the University of Library Studies and Information Technologies - Sofia, Bulgaria, who have worked on a project entitled: "Information Portal for Mobile Learning and Mobile Access to Library Services and Resources". The project is under contract №КП-06-М35/2 of 18.12.2019, as part of a competition for funding fundamental scientific research by junior scientists and post-doctoral students – 2019, funded by the Bulgarian Science Fund of the Ministry of Education and Science.

**The main project objective** на проекта is through a systematic study of the issues related to mobile learning and mobile access to library services and resources, both in Bulgaria and in other European countries, to reach new scientific knowledge and products, united and presented in a common information internet portal, through which to reveal and summarize the positive changes information technologies bring to modern society in terms of new opportunities to access learning and information through the active role of mobile digital libraries.

**The specific project aims are** ca conducting scientific research that will lead to obtaining new theoretical knowledge, scientific-applied results and new educational content; stimulating the scientific potential and development of postdoctoral students, PhD students and students; the popularization of mobile forms of training and information among the library community and in educational environments; promotion of mobile access to digital collections of cultural institutions as a modern approach to the socialization of literary cultural heritage, to stimulate scientific research in the field and to preserve the cultural identity of the society.

## 3. Research on the attitude of information users and learners towards mobile digital libraries and mobile learning

As part of the activities of the "Information Portal for Mobile Learning and Mobile Access to Library Services and Resources" project, a study was conducted on the attitude of information users and learners towards mobile digital libraries and mobile learning. For this purpose, in the period June - July 2021, a survey on the topic "Mobile Digital Libraries and Mobile Learning" was conducted. The object of the research are students as active learners and users of information resources and digital services. The survey was sent to 1,943 respondents, covering the students of the two faculties of the University - Faculty of Library Studies and Cultural Heritage (FLSCH) - n=71, 52.2% and Faculty of Information Sciences (FIS) - n=65, 47.8%.

**In this survey, we have focused our efforts** on researching and analyzing the current needs and demands of users of information and knowledge in relation to library and educational services; to what extent information users use mobile devices for reading, learning and accessing information resources; what is their attitude towards the inclusion of mobile digital services and learning in the library service; and how informed and supportive they are of international policies for mobile access to learning and library services and resources.

In order to realize the set objective and fulfill the identified research tasks, a questionnaire with three main panels was developed specifically for the needs of the specific empirical study:
- PART 1. Mobile devices, applications, and mobile digital libraries;
- PART 2. Mobile education and lifelong learning;
- PART 3. Policies for mobile information services and mobile education.

**The questionnaire** included closed, half-open (using the 5-degree Likert scale) and open-end questions.

**The research methodology** was implemented through an online form of a structured questionnaire and through the Google Forms application, through which 136 students from the University of Library Studies and Information Technologies, Sofia with different professional and socio-demographic profiles were surveyed in the period June - July 2021:
- gender - men (n=52, 38.2%) and women (n=84, 61.8%);
- age - 18 – 25. (n=58, 42.6%), 26 – 29. (n=11, 8.1%), 30 – 39. (n=36, 26.5%), 40 – 50. (n=29, 21.3%) and over 50. (n=2, 1.5%);
- education - secondary (n=53, 39%), secondary-vocational (n=42, 30,9%) and higher education (n=41, 30.1%);
- place of living - Sofia (n=107, 78.7%), a district center (n=15, 11%), another town (n=9, 6.6%) and village (n=5, 3.7%);
- educational and qualification degree- BA students (n=120, 88.2%), MA students (n=8, 5.9%) PhD students (n=8, 5.9%).

**The empirical data** were entered and processed with the statistical software IBM SPSS Statistics 21. Univariate frequency distributions and qualitative content analysis of the answers to the open questions were used in the processing of the empirical data.

**The results of the research,** summaries and analyses are described in detail in the monograph "Highly Sophisticated Mobile Technologies in Library and Education" by Elisaveta Tsvetkova, as well as in a number of publications presented at international scientific forums (Garvanova, 2021, p. 2024-2029). (Garvanova, 2021, p. 1848-1853), (Tsvetkova, 2022), (Tsvetkova, 2022, p. 5811-5818).

**The main conclusions** of the realized scientific research, made after a thorough analysis of the obtained data, can be formulated through the following conclusions:

- The use of mobile technologies by modern information users is extremely active and widespread;
- The provision of mobile information, educational and library services is the necessary and adequate response to current readers' searches and needs;
- Modern users need an information environment that meets European and global trends, including digital and mobile information provision;
- Although they appreciate the opportunities and good prospects of mobile and digital forms of providing information and knowledge and support their implementation and development, information users are insufficiently informed on these issues and insufficiently familiar with global trends in this direction;
- A need for a single informational Internet portal was identified, which would unite information on these problems and promote them among all interested parties.

## 4. Conclusions

Summarizing the analysis of the results of the conducted survey, the thesis is proven that modern information users very actively use mobile devices – especially mobile phones – for reading, learning and searching for information. However, the possibility of mobile library service and mobile learning is still poorly represented, awareness of these issues is not sufficient, and higher information literacy is needed. At the same time, the responses of the respondents show a very positive attitude towards the introduction of mobile information services and the construction of digital and mobile digital libraries.

The results of the research also prove that the introduction of mobile information technologies in the modern education system is very well-received among the user community and can satisfy the needs of learners in today's global educational and information space, oriented to the individual needs of each learner.

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# BENEFITS AND CHALLENGES IN USING AI-POWERED EDUCATIONAL TOOLS

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## Abstract

The introduction of large language model tools, such as Open AI's ChatGPT in November 2022, has sparked considerable discussion on the impact of artificial intelligence (AI) in education. Educators in both K-12 and post-secondary settings began to integrate AI in their classrooms during ongoing discussions about ethical technology use, maintaining academic integrity, safeguarding personal information, and other potential concerns. This poster discusses the current state of AI in education, exploring the various applications of AI in the classroom, the benefits and challenges that come with it, and the potential impact on students and educators. It highlights the role of AI in supporting personalized learning experiences, providing adaptive assessments, automating administrative tasks, and enhancing teaching and learning outcomes. Additionally, this poster examines the need to create effective university policies for AI to promote the ethical and responsible use of AI, reduce legal risks, and ensure a safe and inclusive learning environment for all students.

*Keywords: Large language model tools, post-secondary education, artificial intelligence policies.*

## 1. AI use in education

As technology continues to evolve, AI is increasingly being incorporated into various tools and applications. Some of the existing technologies that integrate elements of generative AI are captioning, transcription, proofreading, and word prediction tools, while emerging generative AI tools have the ability to grade, provide feedback, produce natural language, create images and art based on natural language descriptions, and real-time sign language translation.

Since ChatGPT was officially launched on November 30, 2023, it is unrealistic to expect to find any published peer-reviewed research that presents a comprehensive review on the use of generative AI in education. According to a rapid review by Lo (2023) of 50 academic articles published between January 2022 to February 2023 and discussing ChatGPT in the field of education, ChatGPT's performance varies across subject domains. The findings of the review also suggest that ChatGPT could assist instructors with teaching preparation (i.e., generating course materials, providing suggestions, and translation) and assessment (i.e., generating assessment materials and evaluating student performance). ChatGPT has also the potential to assist students with learning (i.e., answering questions, summarising information) and assessment (i.e., proving feedback, exam preparation).

Wu & Yu (2023) conducted a meta-analysis of 24 studies examining the effects of AI chatbots on students' learning outcomes and the moderating effects of educational levels and intervention duration. Study results revealed a statistically significant large effect of AI chatbots on overall learning outcomes, e.g., learning motivation, learning self-efficacy, and learning interest. In addition, higher education students experienced a statistically significant large effect of AI chatbots when compared to K-12 students. Further, short interventions with a duration of less than ten weeks employing AI chatbots tended to have a large and statistically significant effect on students' learning outcomes than long interventions with a duration of ten weeks or longer.

Tlili and colleagues (2023) investigated concerns about the use of chatbots for educational purposes. The researchers employed social network analysis of tweets, content analysis of interviews, and investigation of user experiences. While the study findings show that there is a general openness and enthusiasm regarding the use of ChatGPT among early adopters, educators need more guidelines on how to cautiously and safely incorporate chatbots. Given the increasing popularity of chatbots in education, it is essential to consider new pedagogical approaches that can effectively accommodate this modern educational tool. Additionally, upskilling competencies have emerged as a crucial aspect of this shift,

highlighting the need to develop curricula that can enhance both teachers' and students' competencies in dealing with the current and future advancements of chatbots.

Educators are utilizing repositories such as Social Science Research Network (SSRN) and arXiv to disseminate information on how instructors could use the capabilities of AI to improve students' learning, e.g. writing of prompts and assignments (Mollick & Mollick, 2022). Social media, such as LinkedIn, Twitter, and personal blogs offer many practical guides on using chatbots in education.

The integration of generative AI in education is an exciting area of research that has the potential to revolutionize the way we teach and learn. While studies have shown the positive effects of AI chatbots on students' learning outcomes, it is important to consider the concerns and challenges associated with their use. Educators must develop pedagogical approaches and upskill competencies to maximize the benefits of chatbots in education while ensuring their safe and ethical use. With continued research and innovation, generative AI tools, such as ChatGPT, have the potential to transform the future of education.

## 2. Ethical and responsible use of AI in education

The use of ChatGPT and other AI technologies in education has brought about concerns regarding accuracy, reliability, and plagiarism prevention (Cotton, Cotton, & Shipway, 2023; Lo, 2023). These issues may be exacerbated by the potential biases that can be present in AI systems. Bias is a subjective and often unconscious preference or prejudice that is reflected in the way information is processed and presented. There are different interpretations of what constitutes bias, how it is created, and how it can be removed from AI systems, making it an important topic of discussion in the science community.

The algorithms and data used to create AI can modify the way we represent and interact with ideas, which is important for learning. If we don't ensure the technology is fair and unbiased, it can continue perpetuating existing problems and inequalities (Johri, 2022). In response, post-secondary educational institutions must go beyond simply providing AI access and strive for a solution that works equally well for everyone. In McDermott's presentation during the Artificial Intelligence Webinar Week in March 2023, organized by Quality and Qualifications Ireland in association with the National Academic Integrity Network (NAIN), McDermott discussed the ethical use of AI through a social justice lens. Creating fair generative AI, including minority experiences, and challenging "standard" English are seen as some of the major social justice concerns with the current state of generative AI.

There is a significant need to involve people with disabilities in the development phase of AI software and technology that is intended to serve people with disabilities. According to the Alan Turing Institute (2019) a roadmap that considers ethical issues around AI and studies the gaps in digital accessibility is yet to be developed.

The European Network for Academic Integrity (ENAI) Recommendations on the Ethical Use of Artificial Intelligence were recently published in the International Journal for Educational Integrity (Foltynek et al., 2023). These recommendations aim to assist the academic community in shaping educational policies, pedagogy and practice regarding the skills and knowledge needed for the ethical use of AI tools. Addressing the ethical issues surrounding the use of AI in education is essential to ensure that it is used in a fair and equitable manner.

## 3. Academic integrity and AI

AI has the potential to transform academic practices, however it is also seen as a threat to academic integrity. Students could use AI-powered tools to write academic papers and assignments that appear to be genuine but in fact, are generated by AI. Students could also employ AI-powered tools that automate parts of the research process, i.e., locating peer-review sources and summarizing their key findings. AI-powered tools are seen as having the capability to pose a risk to the authenticity of online exams. Susnjak (2022) investigated the capability of ChatGPT to generate text and perform higher-order thinking tasks. ChatGPT was tasked with (1) generating critical thinking questions, based on a scenario, that is suitable for undergraduate students across different academic fields; (2) asking to answer the generated questions; and (3) asking to critically evaluate the answer. The following assessment criteria were applied to the responses provided by ChatGPT: relevance, clarity, accuracy, precision, breadth, depth, logic, persuasiveness, and originality. Response analysis showed that ChatGPT can demonstrate critical thinking abilities and produce remarkably realistic text with minimal guidance, posing a possible risk to the authenticity of online exams. In recent months Turnitin and Cadmus, Internet-based plagiarism detection services, added AI writing indicators to detect text that has a high likelihood to be AI-generated to safeguard academic integrity.

Considering that AI is here to stay the question becomes how we can best teach our students. The successful use of AI is dependent on the post-secondary institutions developing policies and procedures, training, and support around the humane and responsible use of AI.

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# DO GENDER DIFFERENCES AFFECT IN ADMISSION AND FINAL GRADES CORRELATION?

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## Abstract

Unequal gender roles and social norms impact us before the moment we are born, causing serious lifetime consequences. It is widely recognised that the academic and professional development of women is directly affected by gender bias. Because of that, women result to be still seriously underrepresented in the Science, Technology, Engineering, and Math (STEM) academic environment, which may affect their performance. Our main goal was to analyse and identify differences regarding gender before and during college education. To this end, university admission cut-off marks together with final course qualification from around 7099 students from STEM subjects were divided by terciles and analysed by gender. The 5 studied subjects were chosen from the following 5 STEM degrees: Biomedical Engineering; Technical Architecture; Aerospace Engineering; Electronic Engineering and Industrial Automation; and Mechanical Engineering. All subjects were undertaken at the *Universitat Politècnica de València*, and the compiled data covered the last 11 academic years (2011-2022). The results showed that admission cut-off marks rise from 1 to around 2 points more from 2011 to 2021. Nevertheless, the final course qualification remains constant, or slightly decreases, over time. Students from the tercile with higher cut-off marks continue to be outstanding during college evaluations. There is no difference between the lower tercile students' distributions regarding their final course qualifications. Regarding gender approaches, data show that women used to have greater cut-off marks than male students. On the other hand, when analysing the final course grades, male students show slightly higher results than women.

*Keywords: STEM disciplines, gender gap, gender differences, physics, cut-off marks.*

## 1. Introduction

The university student and graduate profile in Spain is mostly female (56% and 60%, respectively). But, as in other nations, women are underrepresented in STEM (science, technology, engineering, and mathematics) (Verdugo-Castro et al., 2022). British data show that even in professions where women are overrepresented, like medical degrees, the percentage of women opting to specialise in sectors that need a solid foundation in mathematics and the natural sciences, like surgery, drops considerably (Hill & Vaughan, 2013). Sax et al. (Sax et al., 2016) analysed the percentage of female engineering majors from 1971 to 2011. They discovered that having a STEM father or good school grades boosted the probability of studying engineering, regardless of gender. The survey also revealed that activist-minded women (those who want to help others or change society) are more interested in engineering. However, women's mathematical confidence was a lesser predictor. Men with lower salaries are more likely to major in engineering, and extrinsic motives like a better job have become a significant predictor of why they do so. Gender matters when choosing role models, which help students build paradigmatic success pathways (Swafford & Anderson, 2020). Hill and Vaughan's (Hill & Vaughan, 2013) studied university medical school student's experiences and found that paradigmatic trajectories deter female students from becoming surgeons. Female STEM role models debunk misconceptions, improve girls' interest in STEM, and boost their mathematical confidence (González-Pérez et al., 2020). When female role models are present, success expectations in STEM careers are magnified, and girls are more inclined to enter STEM areas. Olsson and Martiny's (Olsson & Martiny, 2018) review of counterstereotypical gender models and their impact on observers' vocational goals and academic decisions highlights the need for interventions with boys. They found that girls would not pursue high-status or challenging occupations until boys' perceptions regarding home duties change. Governments should adopt equality measures to reduce the STEM gender gap in universities.

In this paper, the university admission cut-off marks and final course qualifications from around 7000 students from five STEM subjects of five engineering degrees at the Universitat Politècnica de València (UPV) were analysed. Students were divided by terciles, based on cut-off marks, and analysed by gender. Our study was based on two research questions:

RQ1) Are women and men evenly distributed in the three terciles?

RQ2) Are women and men evenly distributed in the final course marks?

To achieve this, we compare the qualifications for women and men entering university degrees with their qualifications in specific courses during the first four semesters.

## 2. Method

We studied the data of university entrance cut-off marks and final course grades collected between 2011 and 2022 (11 academic years) from the standpoint of gender equality. The sample consisted of 7099 students who were enrolled at the UPV in one of five different degrees (Table 1).

*Table 1. Number of students enrolled in each course and degree.*

| Course | Degree | Number of students |
|---|---|---|
| Biophysics | Biomedical Engineering (BE) | 714 |
| Physics | Technical Architecture (TA) | 1494 |
| Physics | Mechanical Engineering (ME) | 1784 |
| Physics | Aerospace Engineering (AE) | 1304 |
| Physics | Electronic Engineering and Industrial Automation (EEIA) | 1803 |

In Spain, the minimum score required to enter university is determined by a calculation that takes into account both the final grade received in secondary school and the score obtained on the examination required to enter university. The maximum number of points that can be awarded for these cut-off marks is 14. On the other hand, a score of ten was the highest possible for the final grade in the course.

To go deeper into our sample study, we analysed the university cut-off marks grouping the students in three terciles, 1T, 2T and 3T, ordered from lower to higher grades, in each of the degrees. We also studied gender distribution in each of the terciles.

## 3. Results

The access qualifications of 7099 students starting from 2011-2012 to 2021-2022 academic years who were taking courses from the five grades have been analysed. Of these, 25% are women and 75% men, although with large differences between degrees ranging from 12% women in the ME degree to 60% in BE degree. We grouped the students in three terciles (1T, 2T and 3T) according to their cut-off marks (from lowest to highest) in each of the degrees analysed. We studied the distribution of women and men among each of the terciles. It can be observed how women increase their proportion in each growing tercile, from 30% in 1T to 36% in 3T, and men decrease, from 35% to 32%. This behaviour is similar in all grades except AE, in which the participation in each tercile of women and men is similar and close to 33%. It is worth noting the EEIA degree, in which women went from being 25% in 1T to 45% in 3T.

In all grades and terciles, the cut-off marks of women are higher than that of men, reaching a difference of 6% in some cases. Grouping the grades of all the students, the differences disappear, equalizing the global averages by gender of the five grades in all terciles.

We have calculated the average of the final grades in each grade and by gender. In figure 1 we have compared the values obtained by men and women. In most cases, the qualifications of men are higher than those of women, except in the EEIA degree.

*Figure 1. Final qualification by cut-off mark terciles in each grade, comparing men and women.*
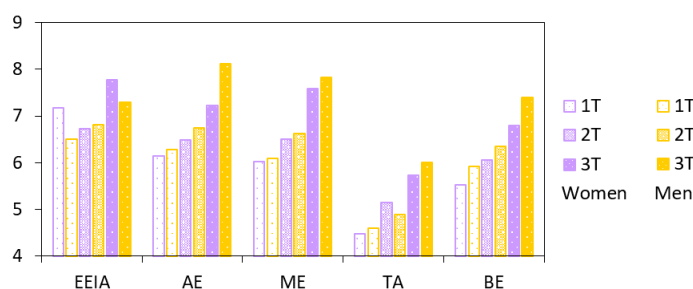
When calculating the joint average of all grades and courses, from the values normalized to the course average, we can observe a significant difference in the third tercile score in favour of men.

In order to check whether these differences are significant, a two-way ANOVA analysis on final grade considering gender and tercile was performed. It is found that, globally, final grades depend significantly on the tercile ($F(3,6220)=160.42$, $p=0.001$), but not on gender ($F(1,6220)=1.92$, $p=0.17$), with no gender-tercile interaction. Analysing by degrees, we find the same behaviour except in the EEIA degree, in which there are also significant differences in gender ($F(1,1636)=5.32$, $p=0.02$).

## 3. Conclusions

The results presented in this study show how cut-off marks and final course qualifications seem to be independent assessment tools with no direct correlation. Although women's cut-off marks are higher than men's, in most cases, men's final grades are higher than women. This difference is more noticeable in the case of students with a higher cut-off grade (tercile 3). In addition, a gender gap has been demonstrated, mainly in the number of women in engineering degrees. Further analysis will be needed to identify the key parameters that are responsible for the existence of gender differences. Once these needs have been identified, teaching may be improved by adjusting the classroom environment and the student's evaluation towards a more gender-equal system.

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# RECONSTRUCTING TEACHERS' DISCOURSE TO BUILD INCLUSIVE INTERACTIONS USING POSITIVE DISCOURSE ANALYSIS AND FORMATIVE INTERVENTION

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## Abstract

Teachers' discourse constitutes the main bases for language instruction and learning. Humans use their discourse as a tool for building peace, and promoting inclusive interactions, democracy, and social justice in the classroom (Van Dijk, 2000). But it also may be used as a pathway for promoting exclusion. Discourse represents powerful means to transform societies. However, inappropriate uses of discourse might end in marginalization. For example, violence and discrimination are sometimes enacted in teachers' discourse by taking almost exclusive control of it in the classroom, or by unconsciously discriminating against students (McKay & Devlin, 2014). Research has explored discrimination and symbolic violence in the classroom. Others have focused on raising awareness of the power of teachers' discourse (Beaulieu, 2016; Buzzelli, 1996; Calle-Díaz, 2019; Gillies & Boyle, 2008; Ritchie & Tobin, 2001). Nevertheless, little is known about teachers' transformation of their discourse to promote inclusive interactions to students with special needs. This study explored how formative interventions and positive discourse analysis helped to reconstruct a teacher's discourse to promote more inclusive interactions with diverse learners. The study enrolled an experienced teacher in inclusive education and English teaching and 38 students. Lessons were taught at a public urban school in Monteria Cordoba, Colombia. Results showed transformation in the teacher's discourse in three main elements, subject, object, and discursive mediation tools. The teacher used more positive and inclusive discourses with students providing room to voice students' ideas.

*Keywords:* Teachers' discourse, positive discourse analysis, inclusion.

## 1. Introduction

Formative intervention programs have been used to unveil contradictions and promote transformation in teachers´ agency. Very few studies have used formative interventions for promoting changes in the discourse of teachers to build inclusive interactions with students. Thus, this study explores how teachers' reflections on their discourse might help reconstruct their classroom practices into more inclusive interactions with diverse students in mainstream contexts when enrolling in a formative intervention program based on positive discourse analysis (PDA) (Martin, 2004; Sannino, 2015; Sannino et al., 2016). To this end, this study answered the following question: how might a formative intervention program help an EFL teacher reconstruct her discourse into more inclusive interactions with diverse students in a mainstream Colombian context? .

Formative interventions are used for expansive learning processes. We understood formative intervention programs within cultural historical activity theory. They helped to generate solutions that can lead to transformation of our activity system (Sannino, 2015; Sannino et al., 2016).

## 2. Methods

This qualitative study aimed at exploring a problem concerning a teacher's discourse and its possibilities for transformations. To this end, this study was framed under the theoretical principles of cultural historical activity theory (Engeström & Sannino, 2010) based on the idea that "…activity is primary, that doing precedes thinking, that goals, images, cognitive models, intentions, and abstract notions like "definition" and "determinant" grow out of people doing things" (Morf & Weber, 2000, p. 81). Activity theory uses elements such as subject, object, mediation tools, community, rules, and division of labour as unit of analysis. Subject refers to the person being studied, while the object is the intended activity. The mediation tools are the main artefacts teachers use for teaching students any subject

or topic. Rules are the conditions that help people act in certain situations. The element division of labour consists of roles, distributions of actions among workers, teachers, students among others. Whereas, the community refers to the people, groups, and team of workers as active members of the system. (Hasan, 1998; Hashim & Jones, 2007; McAvinia, 2016).

The participant of this study was a teacher from the Caribbean coast of Colombia, to whom we refer in this study as Maria. She has taught English for about 23 years in both public and private institutions. She has experience teaching to students with special educational needs, particularly to deaf and Asperger students.

To answer the question of this research, we used in-depth interviews, observations, and stimulated recalls. Interviews served to collect information about teachers' thoughts and perceptions toward the effects of common language choices we make to mean and interact with students. Furthermore, five non-participant observations lasting around two hours each were conducted to characterize the teacher´s activity system in terms of her discourse (Cypress, 2018). Additionally, two stimulated recalls were used; one occurred after the in-depth interview while the second took place at the end of the FI project. María was shown scenes of some parts of her lesson to reflect on situations, particularly about her discourse and its impact in students' inclusion (Swain, 2006).

The information obtained from the interviews, observations and stimulated recalls was transcribed and analysed using qualitative coding applied in Nvivo software. The Activity theory elements were used as units of analysis to understand how the teacher used her discourse before and after the FI program (Engeström, 1999).

Additionally, we used iterative viewing and group discussions for the validation of the data. We discussed initial and final codes with a research group and the participant of this research in order to verify the codes and generate insights concerning their appropriateness for answering the question. Iterative viewing consisted of first, identifying patterns from the data organised and second, and communicating the patterns to an audience (Morgan & Nica, 2020).

## 3. Results

The findings of this research are divided into two parts. The analysis we did of Maria´s initial discourse and the changes analysed in the teacher's activity system elements after the formative intervention program.

### 3.1. Teacher's initial activity system

One objective identified in Maria´s initial activity system was to build a funny environment for students to feel comfortable and relax during classes. To this end, the professor employed humour and sarcasm in her discourses. Interviews revealed that Maria does not have discouraging intentions towards students when she used humour; instead, she aims at making them feel comfortable in the lessons. However, we believe this might cause marked confusions in students' learning process as sarcasm and humour in teacher's explanations might not be well received in all the students, particularly when talking about unknown topics.

The teacher used narratives about diverse topics. The aim of these narratives was to introduce students to social injustices, polities, and social values. For example, She talked about the discovery of America by using negative adjectives to describe colonizers '*when the disgusting, nasty, filthy Spanish men came to discover (makes a gesture of quotation and uses a sarcastic tone) ha ha ha (loud horror laugh)'*. With the narrative, students were encouraged to learn about historical issues that affected our country. However, it generated violence and feelings of hate. The teacher was committed to raising students' awareness about culture, history, and the importance of our roots. However, her discourse and sarcasm turned out to be more discriminatory toward foreigners.

There were other elements in the activity system of the teacher that interfered with her decisions as an inclusive practitioner. For instance, rules from the institution limited Maria's knowledge and praxis concerning inclusive education. During interviews, the teacher disagreed with the inclusive project the school had. This showed the first contradiction in Maria's activity system since she felt frustrated when dealing with the rules proposed in the inclusive education project. The other tension is clearly seen in the community element. Her community is full of diverse students. She had to teach students who had been discriminated against their disabilities. Maria wanted to offer opportunities to students with some disabilities, but lack of special training to teach blind children.

### 3.2. Reconstructions in teacher's discourse

Once we began with the formative intervention program, teacher Maria started realizing needs regarding her discourse which turned into opportunities for transforming three elements of her activity system: subject, object, and mediation tools. For instance, concerning the subject Maria kept being humorous and interested in inclusive practices but this time using positive discourses; she became more thoughtful regarding the use of humour particularly during the stages of questioning and analyzing.

Initially, we showed Maria transcripts of her interactions with students. She said that reading those extracts and the proposed articles made her reflect on the impact of her words in the class. This interaction helped Maria realized her discourse was not well-received by some students who felt discriminated and found her humour negative. This conversation helped Maria become more careful with her discourse and monitor her language anytime she wanted to use negative humour. During FI, we observed changes in her discourse of humour. For example, she kindly provided feedback to students, especially when responding to mistakes.

## 4. Disscussion and conclusions

The results of this study unveiled how the teacher's reflections on her discourse during FI contribute to reconstruct Maria's classroom discourse into more inclusive interactions with diverse students. The research reports Maria's discursive practices within a CHAT framework, synthesizing elements from the participant's activity system revealing needs regarding her discourse. Therefore, initial analysis of Maria's praxis revealed discriminatory discourses that did not help to promote inclusion. Results of the study coined with the premise that discursive choices might contribute to social change and inclusive education (Ainscow & Miles, 2009; Fairclough, 2013). The results of this study unveiled the need researchers and teaching programs have to transform pre-service discourse of inclusion (Engeström, 2011; Engeström et al., 2014; Postholm, 2020).

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# PLANTING SEEDS AND BEARING FRUIT: SWEDISH AND JAPANESE EDUCATOR PARTICIPATION IN A SYMPOSIUM OF PEDAGOGY DISCUSSIONS REGARDING SDG-INSPIRED CURRICULUM

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## Abstract

In the autumn of 2022, with a research grant from the Japanese Ministry of Education, we organized a symposium in Nagoya, Japan with Swedish and Japanese early education specialists. This collaboration was based on previous work that investigated ESD, aesthetic, and multicultural curriculum in Sweden and Japan (Morrone, Matsuyama, 2019 et al). This 2022 seminar week was created to provide an opportunity to have Swedish educators experience Japanese school curriculum, see the issues facing Japanese education today, and express their opinions and queries. The Swedish reactions to what they experienced in Japanese school observations tell much about what values Swedish society and culture aims to instill in the developing child. Similarly, the Japanese opinions of Swedish education observed shines a light on what are considered important goals for Japanese education. Additionally, our symposium invitees were given cultural tours prior to their school visits in order to gain some visceral insight into the historical and cultural environment that influences what school is in a particular society. In this way, the symposium provides a place and time to see the sort of educational realities both countries face, get a sense of how each society prepares the next generation of teachers, and motivates educators to imagine what challenges must be met. At the end of the week, both Japanese and Swedish educators saw similarities regarding changing demographics; all felt the need to create a platform for continued professional education for teachers, experts, and potentially, pre-service teachers. The following is a discussion of points of change and aspects of curricular development highlighted by the symposium.

*Keywords*: *Convention on the Rights of the Child, democracy, inclusion, multicultural education, SDGs, early childhood education, Japan, Sweden.*

## 1. Swedish SDG Curriculum, the social environment, and notions of "Democracy" - some background

Education for Sustainable Development (ESD) Sustainable Development Goals (SDGs), in particular, social SDGs such as inclusiveness and multiculturalism, has long been present in the Swedish curriculum. Due to its relatively low population and great open spaces, a commitment to the preservation of the environment has long been a priority that the Swedish Ministry of Education promotes in schools and in turn, society. As for diversity issues, Sweden is not new to the idea of accepting newcomers. In the 1970's and 80's, political refugees from countries like Syria and Chile saw Sweden as a country very welcoming to newcomers. Simultaneously, European programs such as Erasthmus that encourage the exchange of students among the European Union, founded greater cross-immigration within the European Union. All these factors have altered the look of the previous, more homogenous Scandinavian culture. However, the more recent intensification of the peak immigration of 2015, has brought more social tension with questions arising regarding assimilation. Of particular concern regards the notion of Swedish democracy and its ability to function for all citizens with equity. When questionning Swedish educators about what they felt was the most important goal of education, "teaching democratic values" is often cited

as the most valued. (Morrone & Matsuyama, 2013, 2022).  Democracy, it seems, has different expectations depending on each society it inhabits.

Such values have inspired the Swedish Education Ministry to respond to demographic changes with directives that encouraged further educational research towards the creation of new programs. Swedish language classes for better acculturation, reassessment for student testing and placement, and the creation of mother-tongue programs* were initiated. At the base lies the idea that for newcomers to participate in a democracy, they should be true participants in society. In order to to this, they should be comfortable in Swedish, and understand the values of the country's politics so that they can work for them, too.  Also important is to ensure by some means that the newcomers are respected by the indigenous Swedes for the cultural heritage, customs, and religion that they bring to Sweden. As one principal explained to me, "It makes the country so much more interesting having all these new cultures!" (Morrone, Interview, 2011, 2022). However, even among a citizenry who tend to view immigration positively, the most recent immigration wave has created some questions within schools and communities that there was too little too late.  Much of the responsibility for democratic values lies with the schools, rather than the newly arrived parents.  How can schools ensure that democratic values are understood well when language and housing problems are not adequately addressed in the first place? The experience of Sweden and its history of recent immigration provides an example from which Japanese educators may benefit with their increasingly diverse social environment. For Swedish visitors to Japan, experiencing the Japanese perspective on immigration, diversity, and multiculturalism may provide a new perspective on how a non-European culture might address the present challenges.

## 2. Democracy in the Japanese society and school

After World War II, a consensus among the members of the Allied Forces Occupation worried that the pre-war education system had been largely responsible for the growth of militarism under the Emperor's name. The allied occupation, lead by the United States, decided that elements of democracy could be put into place systemically via land, economic, and education reforms.  Regarding education, some of the main characteristics introduced were an American 6-3-3 public system, co-educational public schools to encourage better gender equality, a bano on religious studies in public schools to enforce separation of church and state, and grassroots organizations like the PTA (parent-teacher associations) were introduced to couner the local neighbourhood groups that had exerted influence during the war-time period.  Since these occupation reforms, there has been little if any change in such democratic systems, which are still alive and well in the schools.

However successful democratic values like equity and individuality have been encouraged, election time never fails to surprise the world with the low voter turnout, which hovers near or above 50 percent (Japan Times, 2022).  It should be noted that skepticism regarding democracy is in a purely political sense.  Socially, ideals of fair and equal treatment under the law is certainly alive and well in society, and equity issues are clearly supported by the Japanese Ministry of Education.  That being said, there is some question as to whether all the more modern aspects of democracy are at work in a child's development at the individual school level.  Even though the The Ministry of Education encourage schools to have curriculum that focuses on "critical thinking skills." (Ministry of Education, 2022, Vickers, 2019.) the emphasis on democracy continues to focus on the development of human capital to contribute to society rather than social equity issues or developing self expression. This is clearly witnessed in the lack of focus on such issues in teacher education programs. One main reason for this harken back to a general distrust in society of passionate ideals; in particular those relating to religion and politics.  Similarly, individual choice may be viewed as a potential danger to harmony, making it difficult to introduce activities in schools that overemphasize such personal freedoms.  Japan, like anywhere, is a nation of individuals with desires and passions.  That one is reluctant to express them easily suggests a compromise between individual expression and the ideal of the smooth-running society for which Japan prides itself.

## 3. Conclusion. Reassessment of cultural ideals regarding democracy in Japan

Discussions from our 2022 symposium highlight how in Sweden, democratic attitudes and values are considered characteristics so essential for healthy societal function that they are integrated from a child's first entry into society, at preschool. This notion reiterated by each of the Swedish experts above, suggests that the notion of democracy is at its core, valued in both social and individual ways. Individual rights, thoughts, and opinions create the platform from which a child comes to understand and express his or her passions and ambitions. School is also the place where relations with other children, teachers, and members of the community expand the child's egoistic world and where decisions are made together with others towards common goals. The child, guided by and with others, comes to understand the importance of

participation in all things social, and political, securing the goal of the Ministry of Education to democratize the child in the true sense of the word---as a full-fledged member of a multicultural, inclusive society deserving of full rights.

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# EDUCATIONAL PROJECTS AN ADEQUATE RESOURCE FOR CONSIDERING ORAL AND WRITTEN EXPRESSION SKILLS

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## Abstract

The educational project can be a useful tool in strengthening the skills of oral and written expression when the target group is made up of foreign students attending the courses of the Preparatory Year of the Romanian language as a foreign language. This method of learning and consolidating knowledge can be applied both at the beginning of studies, when the learner is initiated into the secrets of a language, and at the end of them, when oral and written communication skills will already be formed. The present study aims to highlight the importance of the educational project both in the initiation of students into the secrets of the Romanian language, at which point the 60 students grouped in 6 teams will have to draw up lists of the most common words they need both in the academic environment and in the socio-cultural one. The lists will be exchanged between the teams, and at the end of the two months of the project, they will create a dictionary of the foreign student in Romania. In the second semester, the same teams will create, based on the dictionary created as an educational project in the first semester, a guide for adapting to a foreign country for students everywhere. Thus, the study aims to highlight the formative side of educational projects in learning and consolidating knowledge of the Romanian language in the case of foreign students from the Preparatory Year.

*Keywords: Dictionary, foreign, knowledge, language, teams.*

## 1. Introduction

Romanian as a foreign language is an increasingly attractive field for research, insufficiently explored, because the target groups that assimilate this idiom are diverse and heterogeneous. The Romanian language does not have the status of an international language, it is spoken only in our country, in the Republic of Moldova, in the former historical provinces belonging today to other countries from a geo-political point of view, as well as in the smaller or larger communities of the Diaspora. Not having the advantage of an international language, the teaching activity is thus much more specific, the didactic approach having to be constantly adapted in order to reach a criterion of efficiency and attractiveness. The foreign student who arrived in Romania to continue his studies is, from the beginning, very motivated to learn this language, but faces, in addition to the inherent culture shock, natural obstacles that sometimes relate to the specifics of an alphabet that is completely different from the one of the country of birth and of the mother tongue. The Preparatory Year of the Romanian language annually brings together students from different continents, with different alphabets, in some cases, with different religions and cultures. Equally, the age and individual characteristics are extremely varied, as well as the learning levels: some want to pursue bachelor's studies, others continue their master's and even doctoral studies, the few of them are undecided, learn Romanian first and then they decide what they will do about their professional, implicitly personal, development.

In order to form the groups, two preliminary questionnaires were administered, namely, the first provided different items regarding the origin (country of origin, continent, religion, specific culture, type of alphabet used, and the second addressed the areas of interest, the important spheres for every student – from a linguistic point of view.

Thus, the six groups made up of 10 students in order to ensure group cohesion are the following: 1. Ukrainian group; 2. Group of Turks 3. Group of Arabs 4. Group of Iranians 5. Group of Albanians 6. Group of Bulgarians. It can be mentioned that there were enough students and different in what they represented to constitute the 6 groups. These could also be formed according to the data provided by the administrative services, but the questionnaires also provided useful, additional information, namely: if they lived only in the country of origin and know only their mother tongue or a foreign language, in most cases English, if they emigrated and lived for a while in another country or even on another continent than their

native one, thus knowing English or the language of that country. Most of the people from the Arab countries lived for a time in Germany or the Nordic countries. The same is the case with Turks or other nationalities, who have the advantage of familiarizing themselves in one way or another, more or less consistently with the Latin alphabet, with a major Romance language or with the Anglo-Saxon ones.

Among the linguistic needs identified through the second questionnaire, the following stood out: those related to everyday life - at shops, at the pharmacy, in the supermarket, at the bus station, those related to administration and authorities - at the immigration office, at bank, police and those related to the academic community - studies - secretariat - international relations office.

In addition, the usefulness of the project as a method of teaching-learning a foreign language should be mentioned, especially through the lens of developing oral and written communication skills and the formation of key skills for the subsequent assimilation of information, for creative text production, for daily interaction with different social categories encountered in Romania. There are some real benefits of such methods especially in terms of learning: efficiency, collaborative learning, critical thinking, distance learning, permanent motivation, easier overcoming of obstacles. Within the groups formed by ethnically, religiously, culturally similar people, it aims, initially, for a limited but optimal social interaction for this moment of learning when the student needs to feel comfortable. Thus, students play various social roles and become capable of implementing them in solving complex tasks in real interaction contexts. Often, the task of the project that falls to each group, but also to each student within the group, confronts the process of acquiring a foreign language with the assimilation of different knowledge and the ability to use this information practically. Initiating a project as an individual educational resource makes the process of assimilating everyone's knowledge unique, specific to the student, intrinsically motivated.

## 2. Methodology

Once the 6 groups were built and welded, they were assigned tasks, namely, each group had to draw up daily lists, word organizers or even mind maps for each area of interest: daily life, administration/ public authorities and academic life. At the end of each week, the groups exchanged lists/organizers, each filling in the terms they hadn't come across – group 1 will exchange with group 2, group 3 with group 4, group 5 with 6. At the end of the first month each group had to have at least 200 words on their list, without repeating themselves, and at the end of the second month there had to be another 200 terms. Lists/organizers could be letter or word format, using technology where resources exist. Equally, it should be mentioned that in the Romanian language course a padlet was created for each group in which the leader of each group or a volunteer inventory the terms weekly and thus, to be easier to use and not to lose time.

The contexts that the students, the 60, encounter during the first months of accommodation in another country, with another language, are varied, they include both internal factors, brought with them from the country of origin, and external factors, of language acts used daily. Among my frequently encountered words, considered essential in the sphere of everyday life, are those regarding food, clothing, means of transport, names of streets and bus, trolley or tram stops. Regarding the administration/bank/immigration, the most frequent words concern the documents: residence permit, visa, medical certificate, application, declaration, passport, bulletin, personal numerical code, as well as the equivalent of existing structures in Romania and inoperable for foreign citizens. Also, as far as the university environment is concerned, the first and most used terms are: secretariat, cashier, office, student card, certificate, application, lecture hall - blackboard, video projector, markers, sheets, cards, laptop, desk, chairs, flipchart, books, manual, aids, xerox copies. Most of the time, the reality encountered in Romania is totally different from the country of origin, as a result, any detail observed in our country compared to the country of birth attracts the attention and curiosity of students, thus, the species of birds, animals, plants, the color them or the living environment, is an element of interest for the educated. They inventoried every aspect they faced on a daily basis, in everyday interactions, at home, in rent, in the dormitory, in the administration, but also in college. The organizers were initiated in letter format, and later they were techno-edited by computer on those padlets belonging to each group of students. It was found that the linguistic needs are similar, but the specificity and diversity of each group, the exoticism of the country or continent from which they come, led them to retain/note terms related to realities that they did not know and that aroused their interest.

The case study based on the 6 complete lists with common terms, respectively the padlets of the 6 teams that corroborated all the information and presented it in a much more accessible version for everyone, highlights that students acutely feel the need to know some frequently used verbs in the first months in communication such as to be, to have, to want/will, but also others such as to write, read, underline, go up, go down, open, close, have to.

Equally, in the first months, and not only, it is necessary to practice some language acts such as: greeting, addressing directly, presenting, requesting and offering information, expressing thanks and apologies, congratulations, identification, justification, preference, necessity, invitation, desire, order, prohibition, permission, the listed terms being frequently used in these communication situations.

Also, the research reflects the need to know the fundamental cardinal numerals for expressing prices, ordinal numerals, prepositions and essential conjunctions in order to elaborate short statements, but also to be able to understand sometimes even globally the message transmitted by natives in communication.

The second stage of the project involved the development of a guide for the foreign student who arrived in Romania for studies elaborated, in a simplistic way, also by some foreign students, but who, at the end of the second semester, managed to reach the threshold level B1. This stage, in which the members of the 6 teams each made a section of this guide, aims to develop, from their own, creative perspective, a tool for linguistic and cultural survival of foreigners who have arrived in Romania to continue their studies. The project has 6 sections that brings together a conversational structuring of the terms inventoried in the previous stage without any initial criteria, only the frequency of use of the term, the frequency of interaction with it, its impact in communication. They could also associate images, suggestive cultural symbols to the sections and subsections of the guide they created.

## 3. Results

Regarding the results of this research, they focus on two essential dimensions, namely: I. the linguistic component, of vocabulary and II. the attitudinal, affective component. Thus, from a linguistic point of view, the foreign students inventoried through the 6 lists/padlets the words frequently used in Romanian by a foreign citizen during the first months of verbal and social interaction with those around them, some of the terms constituted their vocabulary active, the other side, considerable, have substantiated the passive vocabulary, they can always recognize the meaning of some terms in context. From an attitudinal, affective point of view, the 6 groups acquired group cohesion, over time, their representatives communicated with each other, supported each other in overcoming obstacles, found creative solutions for all the problems they faced.

The guide designed in the second stage in the form of a portfolio with 6 units: 1. Social conventions – In society 2. Requesting information 3. Providing information 4. Expressing states 5. Determining actions 6. Remedial acts is a useful and creative tool, simple, organized with the help of the teaching staff and effective for heterogeneous groups of future students, because it holds the subjective, but original and personal perception of the students of this academic year on the first months of interaction with native speakers and beyond.

## 4. Conclusions

To conclude, one can highlight once again the challenges that the process of teaching a foreign language, which is not one of international circulation, entails to foreign citizens who look from different environments from many points of view, heterogeneous, complex groups, through the multitude learning needs and, not only, that they include. The methods used in teaching-learning-evaluation must be stimulating, motivating, accessible, only in this way the learners can optimally acquire the linguistic acquisitions necessary for cultural integration in a foreign country. The project method proves, once again, effective in learning foreign languages, especially if technology is involved with the facilities it entails. The active involvement of the student in the learning process is an effective one, he is responsible for what he knows or what he does not yet know, but he also assumes responsibility for his teammates or for those who, later, will consult the materials, they will have, thus, much easier to overcome some borderline situations.

Students' vocabulary crystallizes over time, communication skills and oral and written expression skills being essential for any foreign language to be assimilated and practiced by certain speakers. Their foundations are established from the beginning, and the awareness of the need for continuous practice through a permanent linguistic immersion is essential.

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# GAME-BASED LEARNING TECHNOLOGY INTEGRATED COOPERATIVE LEARNING IN GEOGRAPHY IN JUNIOR HIGH SCHOOL

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## Abstract

This study aims to investigate the effect of integrating information technology into cooperative learning on the learning motivation and achievement of junior high school pupils in geography. The research method is quasi-experimental, and research is conducted with unequal groups prior to and following the test design. The researcher drew research samples from two classrooms of second-grade middle school students. These classes represented the experimental group and the control group, respectively. A seven-week educational experiment was conducted. The experimental group integrated cooperative learning teaching methods with information technology, while the control group used conventional narrative teaching methods. Using the Geography Learning Motivation Scale, the Geography Learning Achievement Test, and the Teaching Feedback Sheet as research instruments, descriptive statistical analysis, the independent sample t test, and the paired sample t test are employed to determine whether there is a statistically significant difference between learning motivation and learning achievement. The findings of the study are as follows:

Learning motivation: The experimental group is significantly superior to the control group ($p<.05$), confirming that the integration of information technology into collaborative learning can effectively enhance the learning motivation of geography.

*Keywords*: *Cooperative learning, information technology integrated instruction, geography.*

## 1. Background

In recent years, the promotion of information education in Taiwan has centered on the establishment of a nationwide online learning system, the balanced development and sharing of digital resources, and the establishment of a culture of perpetual digital learning (Zhang Zhikai and Cai Jiaying, 2014). It is anticipated that students can use information technology to promote learning, utilize information, and enrich their knowledge, and that teachers can use information technology to enhance their teaching. Information technology is no longer a specialized field in the society of the digital age; it has been integrated into our daily activities and has become a part of our lives (Ministry of Education, 2016). Changes in the external environment and available resources necessitate constant innovation and dissemination of teaching strategies. Education in the era of the Internet must foster in students the fundamental skills of independent thought and problem solving. In terms of the future, the advancement of science and technology has brought about changes in society, labor, and learning. Information technology's significance has become irreplaceable.

Over the course of nine years, one of the curriculum's goals has been to cultivate and enhance students' communication and teamwork skills. Communication and cooperation skills are now required by society, and through teaching and practicing cooperative learning, students acquire these skills through discussion, communication, sharing, and collaboration, thereby doubling the effectiveness of learning.

The 12-year national basic education program is based on the principles of spontaneity, interaction, mutual well-being, valuing students as learning subjects, transforming the teaching style of teachers and students, turning the student into a one-way passive listener, and teachers discussing the teaching model directly. Choose diverse and appropriate teaching methods and models based on teaching objectives, learning content, student interests, individual student differences, etc., inspire student learning motivation, enable students to become independent learners, explorers, and builders, and to learn and collaborate with one another. Explore the respective strengths, abilities, and accomplishments of each student through instructional activities (Chang, 2014).

In actual geography teaching, he himself faced many challenges, for example, in the interpretation of the concept of natural geography, only using verbal or abstract word symbols to express, some students are frequently like ducks listening to a thunderstorm - they have no understanding; when explaining foreign geography of the region, the textbook content is slightly outdated, the contents are primarily data-based; paper textbooks or maps are difficult to fully represent. Geography courses are therefore susceptible to making students feel abstract, difficult, and uninteresting, thereby impacting their learning motivation and outcomes. Today, as a result of the development of the Internet, teaching multimedia, and mobile media, the incorporation of information technology into the classroom and the use of digital teaching materials have become crucial innovations in education. Information technology is swiftly evolving and diverse, and enhancing students' information skills and knowledge is a constant educational objective.

In education across the globe, the integration of information technology into teaching has become a widespread trend. However, determining how instructors should use information technology to achieve their teaching objectives remains a formidable challenge. Under a decade of educational reform, teaching integration into information technology has transformed the interactive method of teaching among teachers in the classroom, and holds the learning-based, technology-based teaching philosophy, actively concerned with how information technology is integrated to allow students to gain meaningful learning, cultivate students' high-level thinking organization and problem-solving ability, and thus build knowledge.

Geography teachers can implement multimedia instruction, mobile learning, or computer-assisted instruction at the appropriate moment and according to the school's teaching environment and equipment. After incorporating information technology into geography education, it is hoped that a variety of geographic charts, photos, animations, videos, APPs, online learning platforms, and real-time information will be incorporated, so as to make geographic charts strive to bring out the old and bring forth the new, and to make course content and teaching materials specific and clear. Students are provided with a substantial, diverse, and meaningful spatial understanding through the use of vivid localized examples or current international events, so that the integration of information technology is closely coordinated with the course content. In this manner, the course content is vivid, engaging, specific, and refined, allowing students to study geography with greater interest and efficiency.

## 2. Methodology

This study is based on the experimental design of the eighth grade taught by the researchers as the study object. Before implementing the teaching experiment, experimental group and control group students on the basis of their past geographic learning experience to fill out the geographical learning motivation table, and the geographic scores of the first semester of the school year 2022 as a pre-score for the geological learning achievement test, and then conduct a seven-week teaching experiments. After the instruction experiment process, two groups conduct the geography learning Motivation Table, geographic Learning Achievement Test post-test, to explore the impact of teaching experience on the student's geographic study motivation and learning performance.

## 3. Research findings

Quantitative analysis shows that the overall score of geo-learning motivation measurement for the two groups of students did not differ significantly before the teaching experiment, and that the geo learning motivation of the experimental group was higher than that of the control group after the instruction experiment, with significant differences. The study group also improved significantly after the teachings experiment. In the different scores of the four scores, the study group scored higher than the pre-measurement, and the study team scored better than the controlling group. But only in the "related" scores scored significantly.

The analysis of the impact of geoscience teaching on students' learning motivation is divided into three parts, the experimental group and the control group first explore the motivation performance of students on geo-learning before the teaching experiment, then the study group analyzes the impact on their geo learning motivations after the implementation of information technology integration and cooperative learning, and finally investigate whether the motivations of two groups of students have significant differences after teaching the experiment.

## 4. Conclusion

In geo-learning motivation, the student's geographic learning motivation score was analyzed statistically, and the results showed that after the teaching experiment processing, students who accepted the integration of information technology into cooperative learning received a higher overall geographic motivation rating than students who received the traditional narrative teaching method, and there was a significant positive boost.

Further to analyze the four scores of the geographic learning motivation scale, you can learn that after implementing the teaching experiment processing, students who accept information technology to integrate cooperative learning in four scales - attracting attention, physical relevance, building confidence, feeling satisfied with higher individual scores than students who receive the traditional narrative teaching method, especially in the "physical related" this scale has a significant increase.

Students originally felt that the learning content of Chinese geography was strange, unfamiliar, less related to their own life experience, and the willingness to learn was lower; but after the implementation of information technology into cooperative learning, the abstract, distant Chinese geographical knowledge was transformed into concrete images and videos, while the members worked together to learn, so that students significantly felt the relevance of geography teaching and their own bodies, thereby enhancing the student's learning motivation.

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# EDUCATION AND TRAINING AS COMPETITIVENESS ENHANCERS: THE PORTUGUESE CASE

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## Abstract

A nation requires the contribution of several factors to be able to achieve sustained levels of economic development over time. Economic competitiveness is generally seen as a valid index to judge a country's economic prosperity level. Several studies emphasize that, against the backdrop of a growing and highly globalized and competitive world economy, a competitiveness strategy oriented towards technological science and innovation is critical for increasing the competitiveness of countries and achieving long-term sustainable growth [Chankseliani & McCowan, 2021); (Doğan, 2016)]. Thus, one of the most important and differentiating indicators of a nation's success is the qualification of its population, which is reflected in the degree of sophistication, decision-making ability, and strategic vision of its leaders and elites. Education, skills, labour efficiency and technological innovation are key aspects of economic development, leading to greater competitiveness and better capacity to create wealth in the economy and higher income levels. Based on the Global Competitiveness Index developed by the World Economic Forum, focusing on the evolutionary behaviour of a group of 40 countries (top 20 most competitive and the European Union countries), between 2008 and 2017, this paper aims to determine whether a correlation can be established between the competitiveness of countries and the education and training indicators of societies. The results reveal that, to different degrees, there is a quantifiable relationship between education and training (during the active life) of the labour factor and the competitiveness of economies, which will be reflected in the level of development of nations, the creation of wealth, and the establishment of high and sustainable levels of social welfare.

*Keywords: Education, knowledge, training, competitiveness, economic development.*

## 1. Introduction

Competitiveness and consequently economic growth are desired by any country. Several authors point out that under the conditions of a highly globalised and competitive world economy, the competitiveness strategy oriented towards technological science and innovation is crucial for increasing the competitiveness of countries, but also for achieving long-term sustainable growth [(Secundo et al., 2020); (Doğan, 2016); (Mazzucato et al., 2020)]. Korez-Vide & Tominc (2016) conclude that efficiency-oriented countries have made greater progress in several pillars of competitiveness, which is reflected in their economic growth. The World Economic Forum (WEF) has developed an index that assesses the competitiveness of nations, based on the factors that determine economic growth and development and tries to explain why some countries are more successful than others in creating economic growth and income (WEF, 2008). In 2018, the WEF updated the model, including new concepts and new methods of data collection. The Global Competitiveness Index 4.0 provides new insights into factors that have grown in importance with the 4th Industrial Revolution: human capital, innovation, resilience, and agility (WEF, 2017).

Sahlberg (2006) concludes that instead of competition between education systems, networking, deeper cooperation, and open sharing of ideas at all levels are essential if the role of education in economic competitiveness is to be enhanced. On the other hand, Gyimah-Brempong et al. (2006) determine that all levels of human capital creation, including higher education, have a positive and statistically significant effect on the growth rate of per capita income, particularly in developing countries. Kruss et al. (2015) analyse the importance of education, skills, labour efficiency, technological innovation, and more sophisticated production for economic development. Training is one of the important predictors of the competitiveness of nations, i.e., excellent performance in the continuous

development of human capital is essential for nations to achieve high performance at the economic level. Pelinescu (2015) considers that growth focused on intelligence, sustainability, and inclusion, cannot be achieved without a relevant contribution of skills, knowledge, or value of people, commonly known as human capital. Several studies seek to assess the impact of education and training in a country on the country's economic growth and competitiveness [(Na, 2021); (Popkova & Zmiyak, 2019)].

## 2. Methods

To test the existence of a relationship between competitiveness and education, the methodology adopted consisted of developing correlation analysis models (Pearson's coefficient) for each year of the period under analysis and a multiple regression model for the last year in which there is available data. With this methodology, it was intended to understand the evolution of the values of the correlations over the period under analysis, with a particular incidence in 2017. The values associated with the variables included in the models were the inverted values of the rankings of the indexes of forty countries related to the Competitiveness Index (CI), Higher Education and Training (HET), Quality of Educational System (QES), and Extension of Staff Training (EST). Through this model, it would be possible to get data that would allow perceiving and quantifying the degree of the relationship between the independent variables (HET, QES, and EST) and the dependent variable (CI).

## 3. Discussion

The values of all the correlations indicate that the variables are associated with each other, although the impact of the independent variables is not the same over the years under analysis. Thus, the correlations between HET and IC, on the one hand, and between EST and IC, on the other, show reduced variations during the period 2008-2017, but both are always within the range of strong positive correlations of the Pearson coefficient scale. On the other hand, the correlations between QES and IC have a wider variation, that is, in some years, this coefficient fell within the range of moderate positive correlations, thus being variable with the least impact on competitiveness behaviour. This statement is confirmed by the systematic presence of the countries at the top of the rankings we adopted as independent variables among the ten most competitive countries: Switzerland, USA or Singapore.

Using the scatter plot of the correlation between HET and CI rankings (Figure 1), the difference between Germany and the remaining four most competitive countries is evident, being outperformed by nine countries with lower competitiveness indices. The data for Portugal confirms the model's correlation, with an association between the values for HET and the country's position in the CI ranking. However, it should be noted that Portugal's performance in HET is better than in countries with higher CI rankings, such as Malta, Poland and, mainly, Luxembourg. When we analyse the scatter plot representing the correlation between the SQ and the CI (Figure 2), we notice that, among the five most competitive countries, Germany is, once again, the one that loses more ground to the top, being again overtaken by Finland, Ireland, and Canada. In this indicator, Portugal performs quite well, clearly above the most competitive countries, such as Spain, France, Luxembourg, Austria, and Japan.

| | |
|---|---|
| *Figure 1. High Education and Training and Competitiveness.* | *Figure 2. Quality of Educational System and Competitiveness.* |
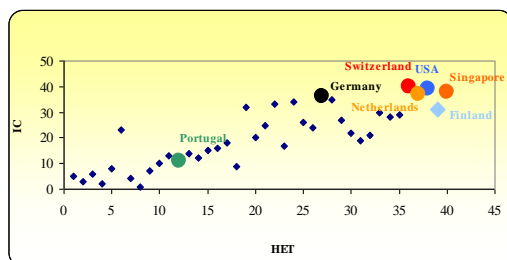


*Source: Authors' elaboration based on WEF (2008-2017)*
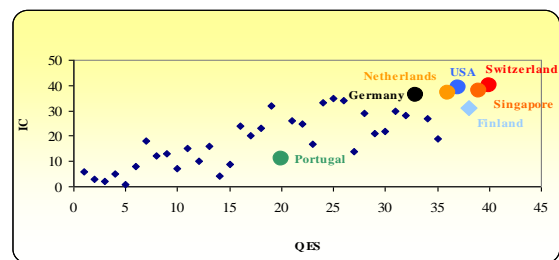
*Source: Authors' elaboration based on WEF (2008-2017)*

Finally, the scatter plot relating to the correlation between the EST and the CI (Figure 3) is clear in demonstrating the top 5 disruptions by the meddling of two countries with lower competitiveness rankings (Norway and Luxembourg), taking Germany and the Netherlands out of the top five for EST. Finland, which stands out in the other two indicators, has a lower performance in the EST than the seven countries highlighted in the chart and is even surpassed by Sweden. In this indicator, Portugal has its worst performance, being surpassed by countries with a lower CI such as Slovenia or Cyprus.

*Figure 3. Extension of Staff Training and Competitiveness.*
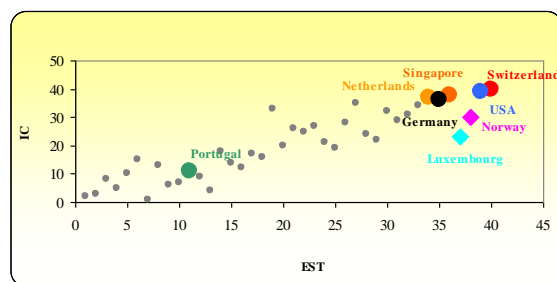


*Source: Authors' elaboration based on WEF (2008-2017)*

## 4. Conclusions

From the analysis of the correlations carried out, the relevance of education and training in the competitiveness of each country is perceptible, although there are differences in the weight of each of the indicators, as well as in the performance of each country. While Switzerland, the USA, and Singapore are consistently among the top five countries in terms of HET, QES and EST (Which helps to explain why they are the countries with the highest Competitiveness Index in 2017) it is possible to find in the same indicators the presence of countries (for example, Finland) that show better performances. Another conclusion that we can draw is that the values of the coefficients point to a greater impact of the EST on CI, with the weakest indicator being the QES, an indicator that has no statistical relevance in the regression model. In other words, the best performance of the country among the analyzed rankings is precisely in the QES, whose impact on the CI is weaker than it would be with any other of the indicators. For this analysis, we must bear in mind that these data refer to 2017, when Portugal reached only the 42nd place in the Competitiveness Ranking, starting to recover from falling two years in a row (from 36th in 2014 – then the best ranking to far – to 38th in 2015 and 46th in 2016), the 17th more competitive country in the European Union, below Lithuania and above Italy.

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# BLENDED INTENSIVE PROGRAMMES: PROMOTING INTERNATIONALIZATION IN HIGHER EDUCATION

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## Abstract

International strategies are ranked as one of the core activities in the development plans of Austrian universities. This has led to numerous promising activities in terms of internationalization (i.e. development of international degree programmes, increased staff and student mobility, and blended international projects). The latest innovative approach in terms of Erasmus+ are so called Blended Intensive Programmes (BIP) which combine jointly delivered teaching and learning elements of at least three participating ERASMUS universities in a virtual and short-term mobility setup. Students who participate in BIP can maintain their study plans at their home institution and include BIP as a parallel activity. This paper presents the experiences of this programme on the topic of sustainable computing hosted by the University of Applied Sciences FH JOANNEUM. By means of an online survey and face-to-face interviews with all stakeholders (20 students, 8 professors), the empirical study addresses the challenges of hosting an international blended learning programme (i.e. virtual phase and on-site intensive phase) and discusses the impact of such activities in terms of internationalization and Englishization. In this context, key roles are assigned to the development of future transnational and transdisciplinary curricula by considering innovative aspects for learning and teaching (i.e. virtual collaboration, research-based learning).

*Keywords: Internationalization, Englishization, short-term mobility, international teaching and learning.*

## 1. Introduction

Taking a closer look at the tertiary educational landscape in Europe, their Development Plans (DP) address internationalization as a central topic in which mobility (student and staff), international research cooperation and international master's and PhD programmes should be encouraged including trans-and interculturality. This is further strengthened by initiatives such as internationalisation at home and the teaching of degree programmes in English (EMI) and thus stressing the predominance of English as a lingua franca. Similar developments are also true for Austria where DPs for universities see English as a central element of internationalization (Dannerer et al., 2021)

A recent initiative by the ERASMUS+ are so called BIPs (Blended Intensive Programmes) which combine jointly delivered teaching and learning elements of at least three participating ERASMUS universities in a virtual and short-term mobility setup. Students who participate in BIP can maintain their study plans at their home institution and include BIP as a parallel activity. This form of mobility seems to be particularly interesting as students have the possibility to gain international experience and to motivate them to increase their international activities in the long run. For university lecturers, the BIP offers the possibility to set up international teaching collaboration, offering the possibility to strengthen their international network and thus finding future partners for research cooperation (erasmusplus.at).

## 2. BIP objectives

BIPs provide teachers and learners with new and creative opportunities for international educational collaboration and participation in jointly designed courses. In other words, BIPs are designed to provide a short period of study or training abroad that is conducted as part of a jointly offered course. A key element of BIPs is the mandatory virtual component, which should provide content preparation, support, and follow-up for the short mobility period. The scope and frequency of the virtual component needs to be discussed and set up according to the needs of the BIP programme and thus universities have a certain leeway how the virtual component should look like (erasmusplus.at).

From the organizational point of view, there are defined roles in the partnership. All participating universities need to be awarded with an Erasmus Charter for Higher Education (ECHE) and must be so-called partner universities of the hosting university. The host university is usually the coordinating university for the BIP which means that the host coordinates the organization, receives, and manages the organizational support for the BIP. The campus of the host university is usually the venue for the BIP.

The physical stay of the participants must be financed by the sending institutions. The coordinating university applies for funds on behalf of all partners to support the organization and implementation of the BIP. These are granted for a maximum of 20 Erasmus+ participants (€6000 for 15 participant and €8000 for 20 participants). After the BIP programme, a final report (qualitative and quantitative) on the results needs to be submitted to the respective International Office. Students participating in the BIP will receive at least 3 ECTS in their LA (Learning Agreement) upon successful completion (erasmusplus.at).

## 3. BIP sustainable computing @ FH JOANNEUM

With the rising use of mobile devices and the desire to purchase the latest models of hand-held devices, we harm our environment. Our behavior leads, among other things, to an increased energy consumption, the exploitation of scarce raw materials, the need for new landfill space, the production of hazardous waste, etc. Prolonging the lifecycle of already existing devices will not only reduce the adverse effects on the environment, but also promote access to the devices for people with lower financial means and therefore bridge societal divides. So-called 'refurbished' devices (i.e. in form of a second life cycle) are becoming more and more popular and are finding their way into people's homes, companies and public institutions alike.

Thus, the BIP suggests a three-tier programme. Firstly, the exploration of the ethical and environmental aspects of the short life-cycles of mobile devices, and development of approaches to tackle the problem, with a special view on security, data protection and programming perspectives. Secondly, the establishment of hands-on workshop in which refurbishment of digital devices involving a discovery process of "efficient algorithms" and security vulnerabilities should play a central role. Finally, the development and implementation of a university-integrated refurbishment process benefiting the society and the environment, while at the same time honing entrepreneurial skills and promoting social entrepreneurship.

The major projects during the BIP have been developed jointly by all participating universities:
1) Mobile App Development
2) Data Analysis and Big Data
3) Start-up: Sustainable Computing

The objectives of the Mobile App Development projects are manifold. Students are expected to show commitment to the importance of creating accessible documents. This increased awareness is based on a detailed knowledge of accessibility of mobile devices. The course aims of the start-up project provide general ICT users with the knowledge and tools to fight against climate change and addressing digital transformation through development of digital readiness, resilience, and capacity. Specifically, the course has the main objective of awareness-raising of digital pollution. In contrast to physical and visible pollution, on which much remains to be done but where we are making progress at an increasing pace, digital pollution is virtually invisible. It is not visible to the naked eye and, moreover, there are very few news items about it. The main aim of the course is to raise awareness of the environmental impact of excessive data consumption and propose simple and accessible measures to reduce it. When it comes to the project Data Analysis and Big Data, the contents of the workshops and lecturers discuss data mining and machine learning algorithms with the emphasis on analysing large amounts of data (Big Data). Starting by describing the data mining pipeline and basic machine learning algorithms, this course will later elaborate on tools for creating parallel algorithms that can process very large amounts of data Topics include: CRISP-DM standard process model for data mining, data acquisition and pre-processing techniques, model evaluation techniques, decision trees, frequent item sets and association rules, nearest neighbour search (for high dimensional data), classification rules, locality sensitive hashing (LSH), various dimensionality reduction strategies, recommender systems, clustering, link analysis, data streams, web and text mining.

## 4. Methods

By means of an online survey and face-to-face interviews with all stakeholders (20 students, 8 professors), the empirical study addresses the challenges of hosting an international blended learning programme (i.e. virtual phase and on-site intensive phase) and discusses the impact of such activities in terms of internationalization and Englishization. The qualitative study included an online questionnaire (tool: Moodle quiz) with 5 open-ended questions allowing the participants to express their point of views. In addition, short face-to-face interviews (5 students and 5 professors) addressed the participants' attitude and perceptions in more detail. Both, students and professors volunteered for the study. Data from the interview and the online survey was collected and one round of coding was conducted based on the thematic analysis by Clarke and Brown (2016). The following 3 themes emerged from the data: English as a lingua franca, international collaboration and online learning and teaching.

## 5. Findings (short summary)

### 5.1. English as a lingua franca

According to Smit (2010, p. 16) is the internationalization of European tertiary education in full swing. Motivated by the Bologna Process and several Erasmus initiatives, the common language of communication is English. Thus, Englishization is a natural consequence of international processes established by universities in terms of mobility, research collaboration and international teaching and learning initiatives (see for example Lanvers & Hultgren, 2018). This development is also seen by the teachers interviewed. Teacher 3 mentioned in the interview that due to several internationalization activities at her university her classes have to be taught in English: "I am not a proficient user of English, but my job asks me to have my classes in English. For a short mobility project its fine but in the long run I see myself more in our local language."

Students involved in the BIP programme embraced the opportunity to work in an international setting. Several students mentioned that they liked to discuss issues in English. They are used to operate in a globalized world, they are globally connected, and English has more or less become the norm.

### 5.2. International (online) collaboration

Internationalisation at Home has been defined as "…the purposeful integration of international and intercultural dimensions into the formal and informal curriculum for all students within domestic learning environments" (Beelen & Jones, 2015). This is exactly what the BIP programme offers: teachers and students alike have the possibility to engage in an international setting where certain objectives have to be met by collaborating online and face-to-face:

"What I enjoyed most about the BIP was the idea of working together in a team consisting of people from Finland, Spain, Slovenia, France and Austria. It was a challenge indeed – culturally but also from the content point of view" (Student 1, online survey). Labelling BIP as a challenging endeavor was also mentioned by several professors. Teacher 5 mentioned that "[he] was used to collaborate a lot due to [his] job at university, but the BIP was a different set-up. It needed a lot of time and preparation. We had numerous online meetings, but it took a while to get tings sorted out." (Teacher 5, interview).

### 5.3. Online learning and teaching

An important goal of the BIP is to engage and encourage faculty members to design learning units with colleagues abroad who have had (little) experience with this form of collaboration. Several professors mentioned that everyone was really thrilled about the idea of the BIP in the first run but when realizing how much workload it puts on the organization and additional teaching, the motivation was decreasing, and it needed a lot of commitment to get back on track. As expressed by Teacher 3 (online survey) "it was good that we did not opt for being the coordinating university. It was already stressful to set up the teaching units. Everyone has different ideas, different approaches, uses different teaching tools."

Similar concerns were raised by the participating students: "Since the BIP is an additional programme, it also needed some space for learning. The prep-phase was very exhausting, we all had different schedules, exam weeks – finding slots to collaborate online was always a challenge – but we managed and meeting then f2f was simply great (Student 12, online survey).

## 6. Discussion: What the BIP can do for internationalization & Englishization

The BIP does not only encourage local and international participants to deal with cultural diversity actively and consciously, but also helps to adopt an international perspective. Promoting exchange and cooperation may foster synergy effects in terms of teaching quality and student collaboration:

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# LEADERSHIP IN THE EDUCATIONAL ENVIRONMENT AND ITS CONSEQUENCES ON PSYCHOLOGICAL HEALTH

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## Abstract

Abusive supervision involves the expression of multiple verbal and nonverbal aggressive behaviours of a supervisor towards employees. As a stressor in the workplace, such leadership results in organisational inefficiency, absenteeism, and voluntary staff turnover. The cost of this supervision for American organisations is estimated at $2.3 billion (Seckyoung et al., 2016). An understanding of the predictors of abusive supervision in the workplace allows for intervention amongst organizations in order to significantly reduce the cost associated with these destructive behaviours. Empirical data shows that the perception of abusive supervision is associated with psychological distress, reduced workplace wellbeing, and low-quality supervisor-subordinate relationships. This study proposes an empirical exploration of the antecedents and consequences of abusive supervision in the education sector, which has been identified by certain studies (ACTU, 2000) as being a work environment where destructive leadership by school officials is particularly pronounced. Several variables, such as managerial overload or work intensification, the setting of imposing or unrealistic work objectives, high-performance human resource management practices or the frustration of managers facing a lack of resources can potentially predict the perception of abusive supervision. Supervisors' personality traits constitute mediating variables in this framework. The personality traits and attributions of subordinates influences the perception of abusive supervision. This study derives from a narrative literature review (1980-2020) on three keywords: abusive supervision, school management, and teachers. For this purpose, the databases PsychINFO, PubMed, ERIC (ProQuest), and Web of Science were consulted. References were sorted in the data processing software EndNote.

*Keywords: Abusive supervision, school management, teachers.*

## 1. Introduction

An American Psychological Association survey of 1,562 employees explored the nature of leadership within organisations. 29% of respondents highlighted that supervisors represent a significant source of stress at work. Furthermore, 32% of employees believe that their supervisors are not honest with them. Finally, 24% of employees had very little faith in their supervisors (American Psychological Association, 2014). These challenges related to personnel supervision have contributed to the scientific community's increased interest in the darker and more destructive side of leadership (Schyns et Schilling, 2013). Destructive leadership involves repeated behaviours that violate the legitimate interests of the organisation or its stakeholders (such as employees, administrative staff, etc.) by minimising or sabotaging organisational objectives; tasks, resources, and wellbeing in the workplace; workplace satisfaction; and/or efficiency of members of the organisation. Perceptions of abusive supervision constitute one of the components of destructive leadership. Subordinates' perceptions focus on the supervisory style of the manager as it pertains to teamwork. Perceptions of abusive supervision are guided by observation or the manifestation of several hostile verbal and non-verbal behaviours (except for physical aggression) of the supervisor towards employees. The measurement instrument associated with perceptions of abusive supervision involves asking employees about the frequency of these hostile behaviours. It is pertinent to present a sample of statements from this measurement instrument: 1) my supervisor shares negative comments about me with team members; 2) my supervisor lies to me; 3) my supervisor reminds me of my mistakes and failures; and 4) my supervisor undermines me in front of others (Tepper et al., 2017). Several

authors recommend measuring the incidence of inter-rater reliability in a work team in order to determine the extent of these abusive supervisory behaviours (Martinko et al., 2013). However, such an index does not guarantee the measurement's objectivity. Descriptive statistics reveals that a proportion of 10 to 16% of employees regularly experience abusive supervision. As a workplace stressor, abusive supervision fosters organisational inefficiency, absenteeism, and voluntary staff turnover. The costs of abusive supervision are estimated at 2.3 billion dollars for American organisations (Seckyoung et al., 2016). An understanding of the predictive variables associated with abusive supervision in the workplace allows for intervention in organisations with the purpose of significantly reducing the costs associated with these destructive behaviours. The collective research essentially focuses on the consequences of perceptions of abusive supervision. Empirical data shows that the perception of abusive supervision is associated with psychological tension (e.g., emotional exhaustion), diminished wellbeing in the workplace, and lower quality supervisor-subordinate relationships. Perceptions of abusive supervision are also associated with subordinates' predisposition to engage in counterproductive behaviour (e.g., intentionally wasting departmental resources). Employees that perceive abusive supervision obtain unfavourable performance reports. These employees partake in few team-building exercises compared to employees who do not perceive abusive supervision (Mackey et al., 2017). In sum, perceptions of abusive supervision are associated with a diversity of negative organisational outcomes. It is thus necessary to obtain a thorough understanding of the variables susceptible to predict perceptions of abusive supervision given the negative repercussions in the workplace. There exists a significant quantity of research on the consequences of perceptions of abusive supervision; however, few studies have been conducted on the antecedents or predictors of perceptions of abusive supervision (Zhang et Bednall, 2016). Studies by ACTU (2000) and Blase and Blase (2004) identified that 50 to 90% of bullying problems targeting teachers stemmed from administration. Several variables, such as an increased or intensified workload for managers, the defining of unrealistic or imposing work objectives, high-performance and potentially restrictive human resource management practices, and managers' frustration regarding lack of resources, are all possible predictors of perceptions of abusive supervision.

## 2. Objective

The objective of this research is to present a portrait of the situation.

## 3. Methods

This research is a narrative literature review (2010-2020) based on three keywords: abusive supervision, school management, and teachers. For this purpose, the databases PsychINFO, PubMed, ERIC (ProQuest), and Web of Science were consulted. References were sorted in the data processing software EndNote. Results obtained to-date suggest that the risk and protective factors for burnout observed in other types of populations (teachers, other management positions) also apply to school principals. In addition, previously unstudied factors have shown an association with burnout in this population (Boily-Legris, 2022).

## 4. Discussion

Every manager is confronted at one time or another with difficult situations in the workplace. They need to possess organisational and personal resources, such as perceptions of organisational support, political abilities in the workplace, work-life balance, psychological detachment from work, feelings of personal efficacy, and resiliency. Several authors recommend additional studies on the role of supervisor and employee personality traits on the development of perceptions of abusive supervision. Supervisor personality traits (professional conscientiousness, congeniality, neuroticism, narcissism, malignancy) are all potential moderating variables in the context of the relationship between antecedents and consequences of perceptions of abusive supervision (Eissa et Lester, 2017). It is also possible that many personality traits of employees (positive affect, notable professional conscientiousness and congeniality, low neuroticism) allow employees to better contend with various abusive supervisory behaviours. The work climate (e.g., psychological climate) constitutes a contextual variable that is likely to predict perceptions of abusive supervision (Kenan et al., 2016).

## 5. Conclusion

Abusive supervision is therefore linked to the manager's limited support amidst team members. This gradually becomes a source of stress or tension amongst employees. Indeed, this management style leads to considerable adaptative efforts on the part of employees in response to the manager's profile. Employees do not have sufficient psychological resources to contend with a reduced sense of personal efficacy, diminished self-esteem, and psychological distress generated by abusive supervision. Yet, personal resources such as feelings of self-efficacy and -esteem are associated with workplace engagement as well as the capacity to overcome stressful situations in the workplace (Seckyoung et al., 2016). Abusive supervision also reduces workplace performance and team-building behaviours amongst employees. In addition, it fosters the expression of counterproductive behaviours in employes (e.g., low investment in work, incivility) as well as symptoms of anxiety and depression and burnout. Employees confronted with abusive supervision seek to leave the organisation (Mackey et al., 2017). The conservation of resources theory posits that employees who do not possess adequate emotional resources to contend efficiently with abusive supervision are predisposed to experiencing emotional exhaustion. These employees prefer to create a psychological and physical distance between them and the abusive supervisor, who reduces the quality of exchanges and increases unpredictability in the workplace. The inability of employees to request feedback from an abusive supervisor contributes to a loss of resources. Indeed, feedback is essential to performance management and optimal coaching in the workplace (Whitman et al., 2014). Employees can conceivably avoid requesting feedback from an abusive supervisor to preserve the few resources currently available.

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# EDUCATION AND ECONOMIC GROWTH: A KEY RELATIONSHIP FOR UKRAINE IN THE POST-CONFLICT PERIOD

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## Abstract

Education is an essential factor for sustainable economic growth and development. There is widespread agreement that regions and countries that are better endowed in terms of human capital tend to grow more and be more resilient.

This paper aims to analyse the pivotal role that education will play in the growth and development of Ukraine in the post-conflict period. The accumulated learning losses caused by the pandemic have been greatly exacerbated by the current conflict, with persistent effects on learning. Following Ukraine's application for membership in the European Union, a reflection is required on the level of education in the country and the need to converge with European averages once the conflict is over.

The methodology used is the analysis of the main education indicators used by the World Bank, OECD, and the European Union, as well as the latest PISA Report, to assess the relationship between quality in education and economic growth. The comparison of statistical data with the European Union shows the shortcomings of an education system that will have to be strengthened. The statistical data underline the idea that enhancing the quality of education will be critical for Ukraine's near future.

*Keywords: Convergence, development, education, growth, human capital.*

## 1. Introduction

Education is a key factor for sustainable economic growth and development. There is a widely accepted consensus that regions and countries that are better endowed in terms of human capital tend to grow more and be more resilient. This relationship, well documented in the literature, shows that quality in education leads to individual and societal benefits.

This paper aims to analyse the crucial role that education will play in Ukraine's economic growth and development in the post-conflict period. The cumulative learning losses initially caused by the pandemic have been greatly exacerbated by the current conflict, with lasting effects on knowledge acquisition. These disruptions will cause persistent negative effects on learning. However, we need to reflect on the role to be played in the relationship between education and the economic growth needed in the post-conflict period. Following Ukraine's application for European Union (EU) membership, a reflection is required on the level of education in the country and the need to converge with European averages once the conflict is over.

In 2016 an ambitious reform of the Ukrainian education system called New Ukrainian School (NUS) was presented, starting in 2018. This reform tends to put Ukraine on the path to a more European-orientated education, with several key skills for students, of emphasis on foreign language communication, information technology proficiency, entrepreneurship, and civic education.

## 2. Theoretical framework: the relationship between education and economic growth

The relationship between education and economic growth is well documented in the literature. Early works show how important human capital is for individual productivity and returns. Solow's (1956) basic growth model was later extended to incorporate human capital, reinforcing the idea of the role of education as a factor of production (Mankiw et al. 1992). The human capital endowment of a country understood as the knowledge and skills embedded in individuals, is an increasingly relevant determinant of its long-term growth and development (Romer, 1990).

Human capital is a broader concept than educational attainment as it includes underlying capabilities, personal characteristics, and learning experiences, which may be pre-school or post-school and which build knowledge and enable people to be productive. The concept used in this paper relies on the education component of human capital and, as such, the terms *education* and *human capital* are used interchangeably here. More than the level of education achieved by the population, it is the quality of that education that seems to have a significant impact on the economic growth of a country. Hanushek & Woessman (2015) summarise a series of studies that emphasise the positive effect of the quality of education on growth and reinforce the idea that cognitive skills are the significant explanatory factor behind differences in long-term growth across countries.

Many of the existing empirical studies focus mainly on comparative measures of education, such as years of attendance in the education system or enrolment rates, presenting ambiguous and even sometimes contradictory results. Many of these problems relate to the measurement of the specification of human capital and the issue of the quality of education (Valero, 2021). Several studies indicate that literacy measures, as a direct indicator of human capital behave better in regressions when compared to traditional years of schooling indicators. This measure is a way to overcome the problem of imperfect comparison of education measures across different education systems.

## 3. Methodology and discussion of results

The methodology used consists in analysing some indicators on education, used by the World Bank, OECD, and EU, as well as the latest PISA Report, to assess the close relationship between quality in education and economic growth. The PISA program assesses the literacy of 15-year-olds attending school, in all modalities and training, through a cognitive test that is applied every three years. Three domains are assessed - maths, reading, and science. The latest PISA report currently available is the 2018 report. PISA 2021 has been delayed to 2022, due to post-Covid constraints, and the report is not yet available.

The comparison of statistical data between the EU and Ukraine shows the shortcomings of an education system that will have to be strengthened and whose reform that started in 2018, will have to be completed. We also compare the country with the group of Eastern European and Central Asian countries (EEAC) and, in particular, with Romania and Bulgaria. These two countries share historical and cultural links with Ukraine. The ten countries belonging to the EEAC and participating in PISA 2018 are Azerbaijan (Baku), Belarus, Bulgaria, Croatia, Georgia, Kazakhstan, Moldova, Romania, Turkey, and Ukraine. The comparative analysis of the average values of performance in PISA 2018 in the parameters *Reading*, *Mathematics,* and *Science* (Figure 1) allows us to see that the OECD shows better results than the EU, although not very far from each other, and that the EEAC countries have the lowest values, with differences of about 50 points in each parameter. OECD scores are very uniform, with a small difference separating *Reading* from *Mathematics* and *Science*. In the EU, the pattern is different, with performance in *Mathematics* standing out a bit more from the other two parameters. Finally, the averages of the EECA countries are considerably lower than those of the two blocks and show a similar pattern to the EU, with performance in *Mathematics* standing out.

*Figure 1. Average performance in Reading, Mathematics, and Science.*
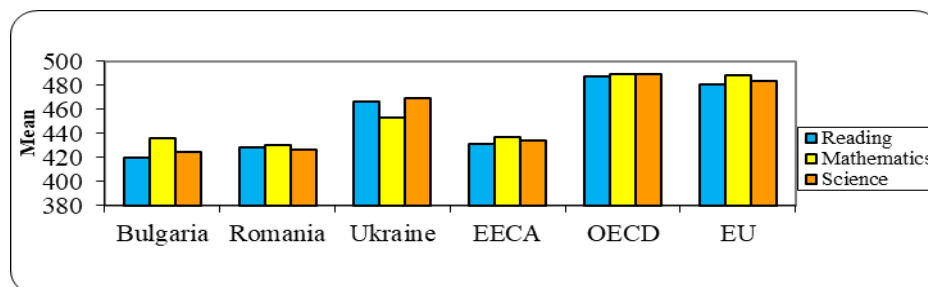


Source: Authors' elaboration based on OECD (2019)

Among the three EECA countries selected for analysis, Ukraine stands out from the start with the highest scores, both about the EECA averages and those of Bulgaria and Romania. Ukraine's figures are closer to the EU and OECD averages than to the overall averages of the EECA countries. However, its pattern is at odds with all the others, with *Mathematics* clearly below the other parameters. On the contrary, Romania and Bulgaria are lower than EECA, although Bulgaria is close to the average in mathematics performance. Between them, the two countries have similar values in *Science* but it should

be underlined that Romania excels in *Reading* and deviates slightly from the EECA standard as *Science* is the parameter with the lowest score.

A correlation between GDP per capita and average reading performance was developed, including Ukraine, EU-27 countries, and OECD and EECA averages.

*Figure 2. GDP per capita and average reading performance.*
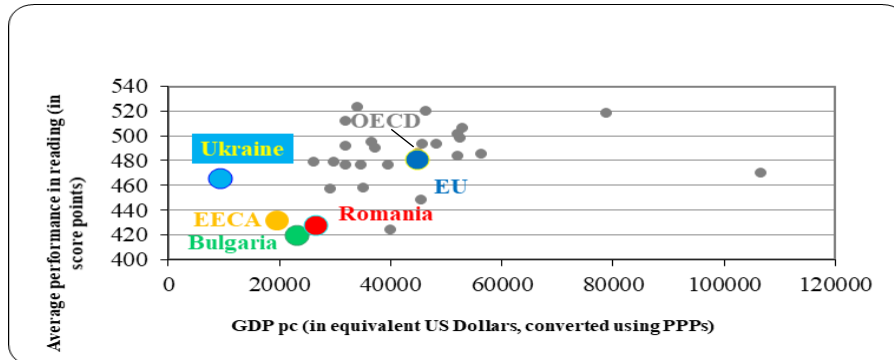


Source: Authors' elaboration based on World Bank (2019) and OECD (2019)

The analysis shows that there is a moderate positive correlation between GDP and average reading performance, meaning that the richer a country is, the better its students perform in reading. However, Ukraine scores much higher on average reading performance compared to countries whose GDP is higher. The country scores better than Romania and Bulgaria, both also above the ECCA average, and is even better than countries with much higher GDP such as Greece, Slovakia, Cyprus, and Malta, and ranking very close to Luxembourg.

## 4. Conclusion

In terms of various indicators, Ukraine shows values close to and even higher than those achieved by some EU member countries. The big challenge shortly, will be to recover all the lost learnings and to continue the ambitious programme of reconversion of the education system started in 2018. The figures show that Ukraine has great potential for educational convergence with the EU. The education reform, once consolidated and fully implemented, will be a central element for the country's economic recovery, as it will equip young Ukrainians with essential skills for active participation in the country's recovery.

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# EFFECTS OF LIFE EDUCATION ON ATTITUDES TOWARD WELL-BEING

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## Abstract

The purpose of the research related to Life Education should be concretely implemented in all stages of learning, to guide students to understand themselves from the process of exploring the meaning of life, and then to demonstrate unique life values, the importance of which is unmistakable. However, at present, the twelve-year state school only has a formal and systematic life education program, while the country and small and medium-sized adopted the teaching approach to integrate themes, therefore, this study aims to understand the impact of the life education programme on the attitude of life and sense of well-being, as well as the relationship of life attitude and feeling of happiness, in order to incorporate life education programs in the national stage.

*Keywords*: *Life education, attitudes toward life, well-being.*

## 1. Background

In 1979, an Australian pastor, Ted-Noffs (1926-1995) founded the Life Education Center in Sydney, originally intended to provide resources for anti-drug education for children and adolescents. In 1988, New Zealand established the Life Education Trust to help youth reject drugs, prostitution, and escape poverty and decadence(Huang, 2014).

Taiwan's life education began in 1998, when due to the frequency of adolescent suicide and murder events, the rapid social change made people float, the prevalence of multi-value values led to the youth to lose self, so that the society began to value the reform and upliftment of mental and human literacy, Ho (2001) with "social decline, decline in the situation, material and spiritual imbalance to accelerate the decline of society, economic miracles defeat the miracles of education" explained the social phenomenon of Taiwan at the time.With this in mind, at the time, the Taiwan Provincial Education Administration chief, Mr. Chen Yinhua, summoned scholars and experts to start promoting the "Life Education Implementation Program for National High Schools"(Niu, 2004).

In recent years, when researchers conduct life education courses, a remarkable phenomenon has been discovered, that students have expressed their interest in playing video games, or the increasing number of people who are becoming lost in the state of video game, there are more and more students say their future dream is to be a web, youtuber or e-sports player, this phenomena may represent the difficult situation of Taiwan scholars and the 3C world; although life education has been implemented in Taiwan for 20 years, but in view of the social situation in Taiwan, people's material standard of living has increased, but the level of the mind has not followed the steps of society's openness.

In addition to, when researchers conducted life education courses, a remarkable phenomenon was discovered: Students said that, according to data from the Department of Health (2019), the age of first-use of drugs in 2019 was 45 years, 20-29 years, 20.9 years, and more than 60 percent were young people. In addition, adolescent suicide whistleblowers in the past 10 years also show a year-on-year trend, the Center for Suicide Prevention and Control announced that in 2017 there were more than six thousand cases of 15 to 24 year-old adolescents who suicide (Administrative Academy of Health Suicid Prevention Center, 2019), and suicide has become the second leading cause of death among Taiwanese adolescents.

## 2. Methodology

This scale uses Tseng (2008) for the "mental health scale" compiled by university students, the scale content is based on the Keyes and Magyar-Moe (2003) proposed to measure the "subjective happiness" architecture of three directions such as psychological well-being, social happiness and emotional happiness, a total of 15 subjects to evaluate, a scale scale of five scale tables to answer, 1 point

expressed very disagree, 5 points expressed highly agree.The three tables are described as follows (Tseng, 2008):

The theme of psychological well-being was developed according to Ryff (1989) from the perspective of positive psychology, including individual autonomy, control over the environment, personal growth experience, building positive relationships with others, life purpose and sense of meaning, and self-acceptance.

Social happiness is based on the Keyes (1998) Social Happiness Index, which includes social belonging, social contribution, social achievement, social acceptance, and social consistency.

The theme of emotional well-being is mainly based on the definition of subjective happiness by Diener et al. (1999), as well as reference to Keyes and Magyar-Moe (2003) on emotional happiness definition, for positive emotion, negative emotion, life satisfaction, and awareness of happiness, a total of 4 subjects, for a scale of 12 to 15, of which the 13th is a reverse score.

## 3. Research findings

Based on the observation and interview, the study showed that the two indicators of "philosophy and life" and "personality integration and spiritual development" have a significant predictive ability for the three happiness indicators at the same time, indicating that the relationship between the attitude of life and the two aspects of personality and spiritual growth are of relative importance, and the greater the difference between the level of "privacy and personality" and the "spiritual development" of life attitude in the country, the happiness is more positive.

Therefore, this study assumes that "after the implementation of life education courses, the life attitude of a child in a country can predict his or her happiness", and that the attitude to life of a person in the country is supported for predicting a portion of his/her happiness, but life education program implementation has no significant influence on the predictiveness of life attitudes and happiness.

This study learns that the "philosophy and life" and "personality integration and spiritual development" of the life-attitude measure can significantly predict happiness, "philo-life" is from a philosophical perspective to think about the meaning of life, "personnel integrity and spiritual growth" is through philosophu to explore the harmonious development of the human body and soul, to improve the situation of life and toward good, both of which respond to each other, is to generate the wisdom of life after emotional internalization, to the integration of personality and know the practice of unity.

Tsai(2015) pointed out that a person's life attitude needs to be formed for a long time, and the measurement test is more inclined to the cognitive level, less easy to measure the emotional and behavioral aspects, therefore, should be combined with other multiple assessment methods, in order to have a more comprehensive understanding of the attitude of the students' life. The life education program observed by the Institute, because the teaching time is limited, must be integrated into the seven main aspects of life education in the fourteenth section of the course, it is really difficult to explore the various aspects in depth.

In addition, middle school students are in their adolescence, and there are more factors that affect their physical and mental level, which may also affect the results of this study.

Although the life attitude and happiness of students after the implementation of life education program did not show significant differences, but the scores of the pre- and post- measurement were high, from the feedback sheet of students also found that students have a positive perception of life attitudes, and can start to think about life-related issues, and the majority of students for life education programs like, happy, so the conclusion that life education courses for students' attitudes and feelings of happiness has a positive meaning.

## 4. Conclusion

In this study, to learn about the state of health in the country and the family atmosphere can most influence their attitude and well-being, so the inference that when adolescents worry about their own and family's health, as well as the work problems, economic stress and emotions caused by parents because of the shock of the epidemic, can affect the harmonious atmosphere in the home, the above are closely related to the youth's daily life, the study may also be one of the external factors affecting the results of this study.

Research has found that the use of positive thinking, enhancing self-efficacy, and positive hopes can help the resilience of people with epidemic depression, and alleviate the negative emotional problems caused by epileptic isolation, which shows that people under epidemics need to learn more stress adjustment methods (Wu et al., 2021).In the twenty-first century, people must coexist with the virus, and under the epidemic, education and life education can help people find the ultimate meaning of life in the midst of suffering.

Expecting teachers to integrate the theories of positive psychology and well-being into life education programs, such as positive optimism, gratitude, forgiveness, mindfulness and other courses in education, to help students define the value of self-life, and learn the ability to adapt to stress and positive thinking, will be a new development of life education under the epidemic.

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# VIRTUAL PRESENTATIONS

# INNOVATIVE STUDENT-CENTRED STRATEGIES IN HIGHER EDUCATION: AN EXPERIENCE OF ACTIVE FOREIGN LANGUAGE LEARNING

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## Abstract

To be innovative, the chosen methodological framework in higher education must encompass strategies centred on the student and his professional expectations linked to his training field, with the objective of also working on vital and adequate transversal skills according to the requirements of the labour market and with better results than traditional practices accomplish/have accomplished. A creative, collaborative and interdisciplinary work environment ensures the acquisition of multilingual skills and the development of plurilingual awareness in the digital age.

St-Jean & Dupuis Brouillette (2021) show that, thanks to pedagogical activation, the student effectively engages in his learning, progressing thanks to his ideas and their fulfilment. In project-based learning, the student must invest in developing a project, a dynamic strategy that requires collaborative work, the use of technologies and the creation of artefacts. The teacher's role is to supports learning.

The experience presented focuses on the learning of foreign languages through project pedagogy, using digital tools available mainly on android, tablet and computer equipment with undergraduate Media Studies students of the School of Education in Viseu (Portugal), in order that they may acquire skills in French and English for specific purposes. Students work on a project in the two foreign languages using strategies and skills specific to their future professional field. The methodology is presented and discussed, as well as the difficulties encountered and the results obtained, both from the point of view of the student and that of the teacher. Current research results tend to show that the use of active learning methodologies in the context of collaborative work, compared to traditional strategies, can increase student motivation and autonomy. They promote the interactive process among students and between them and the teachers, facilitating the acquisition of knowledge and skills as far as foreign languages are concerned. Our objective is to show the path followed by students and teachers, to describe the evolution of learning, with its positive aspects, stumbling blocks and difficulties, and to open up new ways of reflecting on the foreign language teaching/learning process in higher education, based on an experience carried out with students at this particular level. The conclusions taken highlight the need for forthcoming work projects in this area.

*Keywords*: *Higher education, foreign language for specific purposes, project pedagogy, digital tools, transversal competences.*

## 1. Introduction

The European Network for Quality Assurance in Higher Education (HE) has set fundamental standards, clearly stated in *Standards and guidelines for quality assurance in the European HE Area* (2015):

"Standard:─Teaching programmes/projects should not disregard the need for the active involvement of students in the learning process. Also, assessment should be in line with teaching approaches. Guidelines: Student-centered learning and teaching plays an important role in stimulating students' motivation, self-reflection and engagement in the learning process. Student-centred learning and teaching - tends to the diversity of students and their needs, allowing for flexible learning paths; - considers and uses different modes of delivery, where appropriate; - flexibly uses a variety of pedagogical methods; - regularly evaluates and adjusts the modes of delivery and pedagogical approaches; - encourages a sense of autonomy on the part of the learner, even though the teacher remains *a guide on the side*. (p. 14)"

In HE, the prevailing classical model of the teacher as *the sage on the stage* has evolved towards a pedagogy centred on the student and on his professional and social environment with a view to adaptation to social changes(Boelen & Chaubet, 2020). The use of digital tools allows the project-based learning (PBL) process to be included in the perspective of the socio-constructivist active methodologies, due to an easier development of transversal skills and the acquisition of student autonomy.

The current project, consisting in the implementation of active learning of foreign languages (FL) in HE, is a follow-up to previous work by the authors, being the corollary of the outcomes of earlier studies,

namely the importance of FL for the labour market (LEE project, Costa Lopes et al., 2018) and experiences of pedagogical innovation, FL and multimodal creativity (JASM project, Delplancq et al., 2021). The methodology implemented in the JASM project (PBL) was also followed in this project experimental design, so as to overcome the lacunae which the said project brought to light.

## 2. Active learning in HE

The importance of learners' awareness of how to be, teamwork and productive interactions, will hopefully lead to student autonomy and to the ability of evaluating the teaching/learning process in HE from within a learner-based environment and its standpoint. (Bégin-Caouette et al., 2021). The urgent need to provide students with hard and soft skills acknowledges the limitations of traditional teaching patterns, within which the risk of students' artificial understanding is an enduring concern. Such a scenario, in most cases, devalues the investigational dimension, essential in the current academic and professional contexts (Guo et al., 2020). Pedagogical activation requires students' effective commitment to their learning process, assuming their progress can only occur on the basis of their ideas, their proposals and fulfilment, which involves carrying out concrete assignments (St-Jean & Dupuis Brouillette, 2021). Students' benefits are many: greater motivation, better preparation for the labour market with the implementation of learning situations closer to real life, and the creation of a more open work environment (Jung et al., 2017; Khan et al., 2017). To foster proactivity, autonomy and critical thinking, active learning requires the use of active methodologies. Learners acknowledge that they prefer interactive, dynamic classes focused on practice and a prolific exchange between themselves and the teacher (Sousa et al., 2018).

A well-known example of pedagogical activation is PBL, where student involvement is a fact concerning the research they will have to carry out in order to develop a project, conducive to the construction of knowledge and the production of content/subject-matters related to their training field in a real world context (Krajcik & Shin, 2014). These authors point out the learning aims as a guiding issue. The other guiding dimensions in designing the strategies are students' participation in dynamic activities, collaborative work, the use of technologies and the creation of feasible artefacts. The need to be creative leads learners to work in teams, towards a coherent and consistent integration, application and construction of knowledge, with a view to ensuring the success of the project in a closely-knit link with students' training aims and professional demands. The teacher is a learning facilitator, providing support to students.

Besides, in order to be effective, the methodology developed by the teacher should also comprise other features (Fournier-St-Laurent et al., 2019): an appropriate structure for the development of interaction and individual responsibility, digital tools suitable for collaboration, information processing and production, motivating tasks for teamwork and a feedback routine at the different stages of the process. Within this framework, the use of digital tools enables the teacher to prepare motivating tasks to be fulfilled in collaborative assignments inside the classroom. This way, hopefully, students will overcome any reluctance they might have felt when the project they are involved in was first launched. Other key factors for success worth considering are the presentation of a clear rationale and framework for the planned strategies at the beginning of the course, the teacher's interaction with the class, a dynamic management of student interactions, the teacher's support as learning progresses and the clarity and transparency of assessment procedures.

## 3. The specific case of active learning using digital tools in FL teaching in HE

In HE training courses other than those in the field of a FL or languages, the concern with student motivation and the incentive to work with FL according to labour market needs, among other aspects, demand an increased effort on the part of teachers, involving a process of permanent reflection on their practices, their standpoint and consequent updating. Digital tools should allow for the redesign of learning processes (Habowski et al., 2019). The rational use of social media in FL learning in HE is definitely considered to be a powerful aid for the ease of access and the motivation and attention it induces in students, digital natives of the 21st century. The notion of space and time and the teacher-student relationship have been revolutionised to consolidate and regulate learning (Oliveira et al., 2020). A study by Saqr, Fors and Nouri (2018) highlights a positive correlation between student performance, classroom interaction and student-centred methodology due to the use of social media in HE.

One has developed a pedagogical approach relying on the use of social media which has received a positive response from both students and teachers. Nevertheless, the approach was implemented with caution; this methodology requires further studies and analysis so that its real impact can be understood, (Pickhart & Botezat 2021). Several authors also insist on the teacher's role at a time where the challenges of the digital world are increasingly evident and should be seen as assets for students' benefit. Student participation and interest in training and the level and quality of teaching are clearly improved by the use

of social media as part of the collaborative learning of FL skills (Eghtesad, 2020). Facebook and Instagram are social networks regularly cited in the literature concerning this field. However, the success of FL learning in this framework is not inseparable from the underlying methodology (Delplancq et al., 2019). Our concern also lies in controlling the perverse effects of the use of digital tools in the classroom, such as the lack of interest of some students, the difficulty of others in distinguishing fun from work, etc.

The PBL experience divulged in this article was implemented in the 2021-22 academic year and deals with a group of HE students in Portugal involved in the learning of French and English as FL. It presents the chosen work methodology, introducing social networks as agents of motivation, sharing and creativity, describes the working strategies developed and discusses the outcomes in the context of previous studies.

## 4. Active FL learning experience in HE in Portugal

### 4.1. Experimental group and framework

The 24 students included in this experiment attended the FL option *FL applied to the new media and cyberspace*, in the 2nd year of the undergraduate Media Studies course in ESEV during the 2nd semester of the 2021-22 academic year. This course intends to train media professionals (journalism, audio-visual production and direction and communication consultancy and develops research in these areas).

The chosen work methodology is in line with a PBL perspective, relying also on digital tools in a collaborative environment likely to promote autonomy as far as tasks preparation and completion are concerned. Moreover, it aims to deepen previously acquired knowledge in FL and the ongoing work on FL skills through activities conceived within the framework of projects to be developed during the whole semester, requiring not only that students resort to FL skills, but also to transversal and interdisciplinary competences, fundamental for students' forthcoming professional life and conforming to the profile of those soon to work in the Media Studies field. Students chose the themes for the projects freely, but with the requirement that they disclose the reality which permeates society and are feasible in terms of the collection of diversified and sufficient material to work regularly throughout the semester. They should also enable, as a result, presentations in the classroom and original and creative publications.

### 4.2. Methodology

The teachers presented the work proposal to the students in the 1st session of the semester: methodology, the learning strategies, the theoretical framework, the reasons for the adopted approach, the stages of development of the project on the evaluation phases (of the project, of the students by the teachers, of the students among themselves, of self-evaluation and of the teachers by the students), the expectations and expected outcomes, and the dissemination of this work. All the students agreed and were enthusiastic. The teachers also presented a negotiable proposal for evaluation throughout the semester, undergoing the principle of continuous evaluation, with regular delivery of work on the *Moodle* platform and a grade concerning participation and publications in terms of originality, quality and creativity. Students also agreed with this proposal. Then, a class representative was elected. The students formed groups, without any particular instructions on the part of the teachers inasmuch as to whether mixed ability language level groups should or should not be favoured over others, apart from other possible constraints. Eight groups comprising three students were created. Each group had to choose a spokesperson. The students had one week to decide which social network(s) they wanted to favour for sharing their work and the name(s) they had chosen for their account(s). They also had to determine the theme of the project and develop a work plan.

The assessment of the FL level was left for the 2nd session. It included the four usual written and oral skills of comprehension and expression, based on original tests designed according to the principles of the CEFR and inspired by the DELF, DALF and TOEFL tests. Each block of skills had a controlled answer time. The average English language level concerning the four skills was between B1 and B2; in terms of French, it was B1 for comprehension and A2 for expression. Throughout this same session, groups were also required to present their projects to the class, in the two FL. Improvements were introduced based on the interaction with teachers and colleagues. The work plans were revised and delivered on the *Moodle* platform, so that all registered students could consult them. A *Facebook* group was created for the whole class, ensuring that the demands of confidentiality were met and maintained, alongside with the request for institutional authorizations and information sent to friends, inviting them to follow the publications. Some groups realised the importance of going ahead with *Instagram* accounts as well. Requests were drafted for the interviewees to capture images and publish them on the social networks. In a first stage, the students researched the proposed themes, likely to enable them to acquire more knowledge conducive to a more consistent reflection. Then, the students began the contacts for the interviews that could be done face to face or remotely (mail, telephone, *Zoom*), under the assumption an image file would be available. The

teachers supervised the preparation of the list of entities to be contacted and the drafting of the requests, as well as all the interview scripts.

In the middle of the semester, the project team's expert in photography and digital art led a 90-minute session on the topic of *Documentary Recording*. He stressed the relevance of creativity as one of the fundamental abilities to leave one's unique imprint in the labour market, and underlined the fact that the specialised skills for the future profession should come alongside with other skills, namely concerning the handling of digital tools, for a relevant documentary photography. The students assessed this session as very positive, as it enabled them to have a new perspective on the project productions. This was the moment for students and teachers to reflect on the work developed so far and on the difficulties encountered when it came to the implementation of required improvements. Teachers' help in the reorientation of some projects was required and also encouraged more creativity on the part of students.

The groups carried out the capture of images and interviews throughout the semester. All texts and posts for social networks were presented by students to the class, after being corrected by the teachers. This allowed for language competences to be improved, which required collaborative work, together with the acquisition of autonomy in the conclusion of the tasks, with corresponding flexibility and rapid adaptation to the situation. The weekly self- and peer-evaluation work (students and teachers) guaranteed the learning path logic, confirming that all students felt comfortable with the project, while allowing for a better identification with the tasks on their part, the creation of a working environment favourable to the integration of all students in this new learning approach, a constant repositioning inasmuch as quality is concerned, and a reflection on the creativity and impact of the productions in FL. In order to promote the creative spirit, teachers fostered the use of online design platforms to diversify the images linked to the publications. Over time, students' productions evolved in terms of language level, diversity of text nature (theoretical and opinion articles, reports, interviews, ...) and creativity and a renewed enthusiasm in the publications. Students changed from simple editing of images with captions to proposing more elaborate and attractive posts. The work they delivered for assessment purposes confirmed this evolution.

At the end of the semester a final qualitative evaluation was carried out. Each group had to present and justify in both FL, in writing and orally, the whole route taken and synthesize the publications. This qualitative evaluation also formalised their self-evaluation regarding the project work and the improvement of FL skills and of transversal and complementary competences. The class was then engaged in the hetero evaluation both of colleagues and teachers and in the evaluation of the developed methodology. The quantitative assessment of the FL level evolution took place on the basis of the assessment of the works presented, published and delivered on the *Moodle* platform.

## 5. Discussion and conclusion

PBL is undoubtedly a motivating methodology for the students involved. Together with digital tools, it enables the development of FL skills in HE, while also helping promote key transversal competences required by the labour market. The whole process demands a strict organization from the beginning and the establishment of a culture of sharing, self-assessment and constructive criticism. It also presupposes the acquisition of a form of autonomy which is vital for the successful conclusion of the tasks. The *Moodle* platform proved to be a vital tool for sharing information and work, prior to its dissemination.

As far as the CU quantitative results are concerned, it became clear that all students' FL level increased by one degree, both in writing and orally. Regarding the monitoring of the activities and the qualitative assessment (carried out through conversations based on questions and free comments) throughout and at the end of the semester, it can be stated that students enjoyed the freedom of choosing the theme of the project and of designing the course. They acknowledged having acquired autonomy and feeling more comfortable with communicating in FL. The session on photography was seen as beneficial and the follow-up suggestions, reorientation and corrections by the teachers were regarded as very useful. They admitted, however, that they found it difficult to take advantage of all the benefits of autonomy, even when considering the collaborative nature of the work, due to a lack of innovative ideas and creativity in the various stages of the process. Students spontaneously confessed that they would have preferred to conform to more familiar tasks in the use or research of new digital tools to make the final result more attractive.

The role of the teaching staff is clearly to supervise the course chosen, which requires that they master new strategies, an excellent knowledge of the nature of the course in question and its features, flexibility, immediate adaptability, increased availability even outside the classroom, help with guidance when a problem arises and the capacity to offer different types of support even beyond the scope of the FL. No matter how paradoxical it might seem, the fact is that such support is clearly more demanding and requires a lot more work and rigour than the preparation of classes where the teacher adopts a traditional methodology. However, it is also much more rewarding regarding the learning environment inside and outside the classroom. The preparation of each session must follow strict criteria as far as work rhythm, timetable and evaluation are concerned. Teachers had to get better acquainted with digital tools, immediately identifying the ones easily manageable in the school context. They basically relied on the

smartphone and a sporadic use of the computer. In order to foster more creativity, they gave examples of good practices.

It is advisable that this experiment is repeated using other digital tools, accessible through smartphone applications. It would be stimulating to complete the research team with a specialist in digital communication who could also help boost students and teachers' creativity.

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# EXPERIENCES OF TEACHERS IN THE ENACTMENT OF SIMULATIONS IN 5E INQUIRY-BASED SCIENCE TEACHING

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## Abstract

Inquiry-based teaching and learning has been promoted in school curricula all over the world and it is described as an efficient method of teaching science in terms of understanding of the content and improving student attitudes towards the subject matter (NRC, 2012). Quintana et al (2004) defined inquiry as a process of raising questions and analyzing them with empirical data, either by manipulating variables directly through experiments or by creating comparisons using established data sets. Despite the widely reported benefits of inquiry-based learning such as developing critical thinking abilities, scientific reasoning, and a deeper understanding of science (Barrow, 2006), its implementation is still a challenge in many parts of the world. The research reported here is a part of a larger study that investigated South African teachers' use of simulating in enacting 5E (engage, explore, explain, elaborate and evaluate) inquiry. The 5E instructional model of inquiry is a model that can assist teachers in developing inquiry-based lessons (Ihejiamaizu et al., 2018) and it is a technique used by science teachers to produce students who are scientifically literate (Chitman-Booker & Kopp, 2013). Post-lesson interviews conducted with three teachers on their experiences of using simulations for 5E inquiry-based teaching. The interview data were transcribed and subjected to Saldaña (2009) coding to generate themes. The interviews focused mainly on the teacher's justifications of their pedagogical actions that they have employed when using simulations in enacting a 5E instructional model for inquiry. The results of this study showed that a simulated 5E inquiry lesson enables collaborative learning in the Explore phase of the 5E model where groups of students worked together to solve problems and complete tasks. The significance of this finding is that the use of simulations is an alternative to actual hands-on inquiry and can be effectively used to teach 5E inquiry. In particular, active and collaborative learning can be promoted through the use of simulations. The use of simulations could also address the challenge of resource inadequacy in South African schools. It is recommended that future research be conducted with a larger sample that includes a diversity of schools.

*Keywords: Computer simulations, inquiry-based learning, physical sciences teachers.*

## 1. Introduction

A number of studies have shown that IBL encourages learners to actively seek for answers, explore concepts rather than memorising (Herman & Knobloch, 2004; Slavin, 2006; Baker et al., 2008). Barrow (2006) argued that 'when students practice inquiry, it helps them develop their critical thinking abilities and scientific reasoning, while developing a deeper understanding of science' (p. 269). Despite the widely reported benefits of inquiry-based learning, its implementation is still a challenge in many parts of the world. Many authors have indicated that ICT offers different learning opportunities, and a need has been recognised to design a new 'integrated pedagogy' (Cornu, 1995). The aim of this study is to investigate the experiences of teachers in the enactment of simulations in 5E inquiry-based science teaching. In the case of the integration of ICT in the pedagogy of science education, it is necessary to understand how teaching and learning change as specific technologies are used (Koehler & Mishra, 2008). In education, ICT is significant as a means of supporting the teaching and learning process (Meyer & Gent, 2016). There is a consensus that ICT integration in teaching will improve teaching quality and the learning process (Voogt & Pelgrum, 2005).

## 2. Methodology

This research applied a case study approach in studying the experiences of teachers in the enactment of simulations in 5E inquiry-based science teaching. Post-lesson interviews were used to collect data and were based on the lessons presented by three teachers teaching in schools were ICT resources are being used. They focused mainly on the teacher's justifications of their pedagogical actions that they have employed when using simulations in enacting a 5E instructional model for inquiry. The data were then transcribed and coded according to Saldana (2009). Various statements on the transcripts were assigned codes. Following that, codes with similar characteristics were grouped together to form categories, from which themes emerged.

### 2.1. Sampling

This study was carried out using purposeful sampling. In a qualitative study, purposeful sampling is typically used to identify information-rich cases (Patton, 2002). The teachers in this study were chosen based on their support for an inquiry-based pedagogy and their recognition of the use of ICT in science teaching. Another criterion was that the teachers were teaching in schools with ICT resources, such as tablets. The sample comprised three Physical Sciences teachers from three high schools in Germiston, South Africa. These schools were also readily accessible to the research in terms of proximity to where the researcher was located.

### 2.2. Data collection and analysis

Teachers were asked to justify their pedagogical actions taken during each of the 5E stages. In order to stimulate teacher reflection, the researchers played segments of the video that were found to be important in terms of how teacher used an interactive simulation in their lesson. To analyse the post-lesson interview results, Saldaña (2009) coding was used. A verbatim transcription of the interviews was adopted, and various statements were given codes. Thereafter, codes were grouped together to develop categories that shared similar features, then different themes arose from the various categories and assertions were made.

## 3. Findings

The findings are presented according to the following themes that were generated from a qualitative analysis of the post lesson interviews.

**Theme 1: Pedagogical affordances of using simulations when teaching 5E inquiry**

Based on how Teacher 2 and 3 5E lessons unfolded, the teachers have said that simulations helped them in promoting collaborative learning (CL). This means that learners were given an opportunity to work in groups to enhance learning. The evidence of this was mostly seen in the Explore phase of the 5E when the learners engaged in hands-on activities using the PhET simulations in groups. CL is a teaching and learning educational approach that involves groups of students working together to solve a problem, complete a task, or produce a product (Laal & Laal, 2012).

See Teacher 2 and 3 excerpts below:

PhET simulation also allows learners to work in groups. Through these 5E lessons I have learnt that students become more active when they work collaboratively than individually. And when technology is involved, they work more actively. They just love working with technology. (Teacher 2)

The last point is that working with PhET simulation in a 5E lesson allows the learners to work together on something you know. I can say it promotes cooperation between learners. This gives the learners a chance to work in groups to make meaning. For example, learners were working together to construct circuits, after that they and to do group presentations. (Teacher 3)

Teacher 1 and Teacher 3 have said that simulations promote active learning. During the lessons, the students were actively involved in the learning process. The two teachers allowed the learners to participate more in the learning process. Studies have indicated that when students are actively engaged in the teaching process, they gain understanding (Biswas et al., 2005; Vreman-De Olde et al., 2013). See Teacher 1 and 3 excerpts below:

The affordances of using simulations in a 5E lesson is to promote active learning. Learners are involved from the start of the lesson to the end. Simulations promote experiential learning. Learners were able to gather information from their devices and in my years of teaching.I felt like this is a good method of teaching. (Teacher 1)

Another affordance of teaching using simulations is the discovery of new knowledge by learners. And I like this because if learners discover knowledge by themselves, in doing so they will

remember the knowledge for a long period, unlike when you directly teach in front of the classroom. (Teacher 3)

**Theme 2: The pedagogical limitations of using simulations when teaching 5E inquiry.**

Introducing a lesson during the Engage phase of the 5E lesson with a PhET simulation was challenging for teacher 2 and 3. The teachers said that PhET simulations may not support the Engage phase and the elaboration phase. Teacher 2 and 3 decided to use videos for introducing their lessons. See the teachers' excerpts below:

Firstly, as I have mentioned earlier, I feel like a simulation is not designed to introduce a lesson. Yes, some people can introduce a lesson using a simulation but as for me I was able to teach a portion of the 5E lessons using the simulations. As for the Engage phase and the Elaborate phase, using a PhET simulation was very challenging. (Teacher 1)

I have found it hard to introduce my lesson with a simulation. I don't know why. I could not think of any possible way to do it. But on the Explore phase I knew exactly what to do (Teacher 2)

**Theme 3: The pedagogical actions of the teacher in each of the phases of the 5E inquiry model when employing simulations.**

This section focused on the teacher's pedagogical actions and justifications of their pedagogical actions that they have employed when using simulations in enacting a 5E instructional model for inquiry.

**Engage**

Teachers 2 and 3 used audio-visual media which is a video as precursor to the PhET simulation. The teachers have said that they did this because videos centre the attention of students on the lesson. The teachers have also indicated that using a PhET simulation in the Engage phase posed a challenge to them as it was not clear how to use the simulation in that phase. This means that PhET simulations may not support all phases of the 5E instructional model. See Teacher 2 and 3 excerpts which support this statement below:

In this phase I have decided to use a  video because a video provides interest to students. I chose a video in this phase because it centres the attention of the students on the lesson and it was challenging to use the simulation. But I then thought of a different way to introduce the lesson. (Teacher 2)

I believe the purpose of introduction is to grab the learner's attention and to make them ready for the lesson. I have used a video as a precursor to simulation to make the learners interested in the lesson or to have their attention, but as for starting the lesson with a simulation it was very challenging. (Teacher 3)

**Explore**

Teacher 1 and 2 promoted hands-on activities using the PhET simulation. The teachers listed a couple of reasons for allowing hands-on activities. According to them, hands-on activities on the PhET simulation help students to explain things from evidence and it also allow learners to work with little dependence on the teacher. motivation to learn. See Teachers 1 and 2 opinions below:

Doing hands-on activities helps students to explain things from evidence. This is important because students learn to work with little dependence on the teachers. The simulation was featured in this phase. Students had to construct their series and parallel circuits and identify the relationship between the circuits. They also had to record allowing students to do hands-on activities honestly improves the students' motivation to learn. These days learners prefer doing experiments in the palm of their hands. (Teacher 1)

The reason why I allowed the learners to do hands-on activities is because it allows the learners to be less dependent on the teacher. They can play around with the simulation and draws conclusion. I believe that doing science or to discover knowledge means that students will remember this in the future. (Teacher 2)

In the Explore phase, Teacher 3 used group work to facilitate inquiry learning during the 5E lesson. The learners were working in groups to collect data from the PhET simulation. He did this so that students could be productive and support each other because they were not used to the PhET simulation. See his explanation below:

I think learning becomes more effective when learners are working in groups because they assist each other, and it becomes more simple to solve problems when working as a group. Since they are not used to simulations, I thought it would be good for them to work together so they can share ideas and assist each other in learning. In this groups I have grouped my highflyers with the low flyers so that the high flyers can assist the learners that are at risk. (Teacher 3)

**Explain**

On the Explain phase, Teachers 1 and 3 allowed learners to do class presentations using the PhET simulations. The learners were presenting the data findings. From the learner's presentations the teacher would ask the learners questions and accept all reasonable answers from the learners when they supported their claims using a PhET simulation or their recorded data. See Teachers 1 and 3 descriptions below:

> Yes, students arrived to the answers based on their use of simulations. Their use of PhET simulations supported their explanations. Most of their explanations where correct. They would use the simulation in front of the class and support their statements. And I would accept what they say based on what they see from the simulation. Plus, most of the questions were based on what they did on the Explore phase. (Teacher 1)

> I have asked these questions after the learners have engaged with their simulation. But in some cases, learners had to support their answers using their recorded data from the simulation. (Teacher 3)

**Elaborate**

Teacher 3 allowed students to use PhET simulation to study the main concept in broader context. This means that students engaged in activities using the PhET simulation that related what they learnt to new events with increased levels of difficulty. This helped students to reinforce the new learning from the explain phase and adapt it to various circumstances. The example that Teacher 3 used was for learners to design a circuit where light bulbs would shine the brightest:

> So here I wanted to give students space to apply what they have learnt in a broader context. The activities that I have given to the learners aimed at reinforcing new skills. Learners had to connect circuit when light bulbs to shine the brightest, how are you arrange them? (Teacher 3)

**Evaluate**

During the Evaluate phase, learners were given a post-lab assessment to solve problems quantitatively and check their answers using the PhET simulation. The simulation was used to confirm the learners' theoretical values by checking the experimental values from the PhET simulation. A theoretical value refers to the value that the learners have calculated, and an experimental value is the reading from the simulation. The teachers said that they have used the post-lab assessment to assess the knowledge that the learners have learnt throughout the lesson. See teachers 1 and 3 excerpts below:

> I have given the learners a quantitative problem to solve as a post-lab assessment to assess the knowledge they have learnt uhm … during the lesson. I have instructed the learners to check their answers through the PhET simulation. (Teacher 1)

> I therefore decided to give learners post-lab assessments so that the learners can clearly communicate their findings from the use of the PhET simulations. (Teacher 3)

## 4. Discussion

The findings of this study shows that while other teachers were able to use the simulation in the engage phase, others used videos as a precursor to simulation. This study revealed that some simulations are good for introducing a lesson and some simulations are good for the lesson delivery. Therefore, using an audio-visual media as a precursor to simulation in the Engage phase is important if the simulation cannot support the Engage phase of the 5E inquiry lesson. A simulated 5E inquiry lesson enables collaborative learning in the Explore phase where groups of students actively work together to solve problems and complete tasks. Collaborative learning in a simulated 5E inquiry is the best when students communicate and share different opinions when given a problem to solve or a task to complete. Teachers allowed the learners to actively engage in meaningful interactions and higher-order thinking activities. This finding is similar to what Dillenbourg (1999), Smith and MacGregor (1992) mentioned in their studies that collaborative learning encourages active learning by involving students in meaningful interactions and higher-order thinking activities. Another finding in the Explore phase, is that the learners worked together in finding answers to open ended questions asked by their teachers as they gained understanding of scientific concepts, rather than receiving all instructions on what to do, how to do it, and when to do it from their teacher (Hussain, 2015). A simulated 5E inquiry lesson allows learners to do calculations and check their answers on the simulations in the evaluation phase. This is important because learners can trace their progress due to its high degree of interactivity in terms of user control and dynamic feedback (Podolefsky et al. 2010). Behaviorism theories says that immediate feedback correct errors and promote positive re-enforcement (Skinner,1953). When the simulation confirms the learner's correct responses it can motivate them to learn.

On the Explain phase, the teachers allowed learners to do class presentations using the PhET simulations. The learners were presenting the data findings. From the learner's presentations the teacher would ask the learners questions and accept all reasonable answers from the learners when they supported their claims using a PhET simulation or their recorded data. According to Chen et al. (2022) depending on the cognitive level of the students, this process develops their verbal skills while also improving their literacies and abilities such as logical reasoning and analogy. The National Curriculum and Assessment Policy Statement (CAPS) aims to ensure that learners acquire and apply knowledge and skills that are relevant to their own lives (Department of Basic Education, 2011) and presentation or verbal skill is a skill worth learning in the South African context.

## 5. Conclusion

The results of this study showed that a simulated 5E inquiry lesson enables collaborative learning in the Explore phase of the 5E model where groups of students worked together to solve problems and complete tasks. The significance of this finding is that the use of simulations is an alternative to actual hands-on inquiry and can be effectively used to teach 5E inquiry.  In particular, active and collaborative learning can be promoted through the use of simulations.  The use of simulations could also address the challenge of resource inadequacy in South African schools. It is recommended that future research be conducted with a larger sample that includes a diversity of schools.

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# COMPARISON OF THE LEARNING PROCESS OF HIGH SCHOOL STUDENTS BEFORE, DURING AND AFTER THE PANDEMIC

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## Abstract

During the post-pandemic time period, it was observed an increased interest among scholars over studying the effects of online schooling regarding the teaching-learning-evaluation process and how the school has changed after the introduction of technology in teachers lives. However, there are few studies that treat the subject of how online schooling has affected students.

The main objective of this research is to compare the manner in which the teaching-learning-evaluation process has been carried out for both gymnasium students and highschoolers during the pre-pandemic, pandemic and post-pandemic period and to analyze how this process has changed for the students and how digital technologies are useful.

The used research method is the focus-group in a private high school from a large Romanian City, Bucharest, the Capital City of Romania. During the group interview, a structured interview with three essential parts has been used.

The present research is structured into four sections. The first section presented the context in which digital technology has entered students lives and how they have adapted to the changes, the second section presents a list of good practices used by teachers and the third section contains the results of the focus-group. The last section is composed of conclusions and recommendations over the main results.

The results of this study show that students appreciate the use of new digital technologies in the teaching-learning-evaluation process, and even if they returned to physical classes, teachers must continue to integrate digital resources and tools into their activities. Since all the participating students to the focus-group come from a private high-school, carrying out a similar study on a public school group, there could be major differences in the results obtained.

The implications of this study are useful to both teachers, that may pick up examples of good practices, and students.

In conclusion, the present study presents the lives of students during the pre-pandemic, pandemic and post-pandemic period and highlights the changes they have been trough and how the technology helped.

*Keywords: Students, learning, pandemic, Romania, private high school.*

## 1. The context of introducing digital technologies in the lives of students

Since all schools have switched to exclusively using digital technologies for teaching, both teachers and students have had to quickly adapt and use their digital skills for the teaching-learning-evaluation process to continue. Covid-19 has led to the closure of schools globally, providing an opportunity to reconsider the way education is conducted in all countries. (Pozo et. Al., 2021)

In the last decade, technology has impacted almost all areas. Education is one of those that has undergone major changes, starting from the way information is transmitted, the diverse sources of information that the internet offers, and up to the way learning and evaluating students takes place.

Digital technologies offer new learning environments, new methods for teachers to transmit the information, and lead to the emergence of new learning styles based on the use of the internet and various digital tools.

Laurillard states that the learning environments offered by new digital technologies trigger a different kind of relationship between teachers, students, and taught content. Collaborative technologies offer a range of new ways that support the learning process and allow students to share and exchange ideas, while creating their own digital products. (Laurillard, 2013).

Even before the pandemic, in some countries, distance education, mediated by technology, was taking place at a normal pace. This practice was common among adult education and students at different universities, but not in primary or secondary education. (Mannadhar & Luitel, 2020)

Even though the transition of all teachers and students to exclusively online teaching was sudden and forced by the pandemic, it didn't take long for teachers and students to adapt to the online environment because the internet and all the digital devices of today have been a great help and have eased their work. However, not all students had the necessary material resources available (laptop or desktop personal computer), neither a suitable home environment to learn and study or a good internet connection. (Cullinan et. al., 2021)

Although the use of technology seems to bring many benefits in online teaching, it also comes with a series of disadvantages like the lose of concentration and various health problems after spending a long time in front of the computer, the feeling of isolation and lack of socialization, as well as the costs of equipment and internet connection. Another major disadvantage is that students cannot actively participate in discussions, especially when a large number of students attend the course. (Armstrong, 2013)

## 2. Examples of good practices used by teachers during online teaching

The pandemic period has brought numerous challenges for both students and teachers, and many teachers had to adapt their teaching methods in order to continue providing high-quality education to their students (Mannadhar & Luitel, 2020).

One of the most commonly used good practices was the use of online platforms for synchronous and asynchronous communication (Laurillard, 2013). Many teachers used platforms such as Zoom, Google Meet, and Microsoft Teams to hold virtual classes and meetings with their students. This allowed students to continue receiving instruction and support from their teachers even while they were unable to physically attend school.

Another good practice used by teachers was the use of multimedia resources and interactive activities like videos, slideshows, podcast, articles, webinars, online applications to make online classes more engaging and interactive (Armstrong, 2013). Also, the teachers used a variety of teaching methods such as lectures, discussions, group work, and hands-on activities. (Meador, 2019) More than that, to enhance the learning experience and provide immersive learning opportunities, teachers used virtual reality and simulations, such as Google Earth or SketchUp. (Mannadhar & Luitel, 2020)

Additionally, some teachers made an effort to create a sense of community and connection with their students through the use of social media and other online platforms. This helped students feel supported and motivated to continue their studies despite the challenges.

Also, to organize course materials and facilitate communication with students, teachers have used various learning management systems (LMS), such as Blackboard, Canvas, or Moodle. (Armstrong, 2013). Furthermore, to facilitate and streamline the process of communication and collaboration among students teachers have used online tools such as Google Docs, Google Classroom, or Trello (Laurillard, 2013).

As well to personalize the learning experience and track student progress, teachers have used adaptive learning software such as Khan Academy or ALEKS. The ALEKS tool allows teachers to assess student understanding through quizzes and assignments, generate a student progress report and provides students with the opportunity to practice and receive constant feedback on their progress (Kumor, 2021).

*Table 1. Good practices used by teachers during the pandemic.*

| Online platforms | Multimedia resources | Create a sense of community | Learning management systems (LMS) | Virtual reality and simulations | Online resources | Adaptive learning software |
|---|---|---|---|---|---|---|
| Zoom | Videos | Social media | Blackboard | Google Earth | Videos | Khan Academy |
| Google Meet | Slideshows | Online platforms | Canvas | SketchUp | Podcasts | ALEKS |
| Microsoft Teams | Online applications | | Moodle | | Webinars | |

Source: author (27 December 2022)

Another good practice that teachers used was offering one-to-one support and tutoring to students who may need additional assistance or guidance with their studies. By offering personalized support and tutoring, teachers can help ensure that all students have the opportunity to succeed and reach their full potential. According to Ryan (2022), the main benefits of tutoring include a deeper and wider understanding of the subject matter, personalized learning, the encouragement of questioning and critical thinking, an improvement in confidence, and the introduction of accountability.

In conclusion, the pandemic period has presented numerous challenges for students and teachers in terms of adapting to online learning. To overcome these challenges, teachers have used a veriety of good practices such as using online platforms for communication, incorporating multimedia resources and interactive activities, creating a sense of community, using a range of teaching methods, utilizing learning management systems, utilizing online tools for communication and collaboration, using virtual reality and simulation, online resources to supplement traditional materials, adaptive learning software, and offering one-to-one support and tutoring.

## 3. Insights from focus group: High school students' experiences of learning in a pandemic

In the past year, the COVID-19 pandemic has had a significant impact on education, with many schools and universities transitioning to online learning. For more than 168 million children worldwide, schools have been completely closed for almost a year due to pandemic, according to the data published by UNICEF. (Farber, 2021).

The scope of the present research is limited to the experiences of high school students in a private school in Bucharest, Romania, before, during, and after the Covid-19 pandemic, regarding the use of digital technologies. The objectives of the research are to investigate how the use of digital technologies has impacted the teaching-learning-evaluation process for these students, and to identify any challenges or benefits associated with the use of these technologies.

The research is a qualitative study, based on a focus group discussion with a group of 10 high school students from grades 9 to 12. The focus group was conducted in the last semester of 2022, in the high school's library. The focus group, conducted in Romanian, lasted approximately 90 minutes and was moderated by the researcher. The session was audio-recorded and transcribed verbatim.

To guide the discussion and gather relevant information within the focus group, a predetermined interview guide was used. The questions in the interview guide focused on the teaching-learning-evaluation process and were grouped into three parts: before, during and after the pandemic.

The first questions focused on the period before the pandemic. Regarding the teaching process, most students stated that only a few teachers used digital resources or computers in the class. Even though all classrooms were equipped with computer and a video projector or smart TV. Additionally, when asked about digital resources or tools used by teachers, students provided examples such as: presentations, videos or resources from different educational websites.

In terms of homework, all students reported that they completed written assignments in their notebooks. Group projects were completed in face-to-face meetings and consisted in posters, boards, or presentations using applications such as PowerPoint or Google Slides.

When asked about the evaluation process, all students stated that evaluation was done through oral listening, projects, or written papers.

Therefore, it appears that the use of digital tools and resources in the classroom was limited before the pandemic. Some teachers used digital resources and computers during instruction and the students' use of these tools was limited to a few specific tasks. Additionally, the evaluation process primarily consisted of traditional methods such as oral listening and written papers, rather than digital tools.

During the pandemic period, the second part of the focus group aimed to understand the students' opinions on the use of digital tools and resources and how they integrated them into their lives.

The first question referred to the methods and strategies used by teachers for exclusively online teaching. All students stated that all their teachers used synchronous and asynchronous communication platforms. Students quickly identified the main advantages: real-time communication, course materials available anytime, good organization of the assignments, the ability to work in small groups and the multitude of video and audio resources shared in online meetings.

When asked about the digital resources used by teachers students provided several examples of applications, websites, and platforms. In the top of the preferred applications by students were those that allow collaborative work: Google Slides, Google Docs, and Padlet, applications through which students can practice certain concepts and receive immediate feedback: Kahoot, Slido, Mentimeter, and Wordwall, as well as applications used for evaluation: Google Forms, Socrative, and Quizlet. The students said that

the evaluation process has changes and most teachers evaluated students through digital tools or projects and few kept the oral and written evaluation.

Regarding homework, students said that most assignments were completed in writing in their notebooks, but added a few subjects for which assignments could be completed using online applications or platforms. They also stated that during exclusively online teaching, they used more of the benefits of the internet and digital tools to improve certain skills, practice, or research certain subjects. Therefore, online learning made students more aware of the advantages that digital tools and resources can bring, but teachers need to be careful about how students use digital technologies.

In relation to the projects students stated that they were completed exclusively during online meetings and with the help of collaborative work tools. All projects consisted of digital products like digital posters, digital presentations, and videos made in applications, such as Animoto, Canva or Prezi.

Finally, when asked about the communication with teachers during online learning, all students stated that they used email, chat, or discussion forums to communicate with teachers, but they missed the face-to-face interaction with teachers and classmates.

In conclusion, the pandemic period had significant impact on education and students appreciated the use of digital tools and resources.

The third part of the focus group consisted of questions about the post-pandemic period. Students stated that teachers continue to use certain teaching methods that involve the use of digital resources and applications. Regarding homework, students said that, depending on the subject and discipline they are completing homework for, they choose either written homework on notebooks, presentations made in certain applications, videos, digital posters, or digital book reviews.

When asked about group projects completed by students in the post-pandemic period, four students said that they physically meet their classmates to complete the projects, while six students said they use online communication platforms.

In conclusion, it is clear that the use of digital technologies in education has become more widespread and integrated, even in the post-pandemic period. While there are benefits to using digital tools in teaching and learning, it is important for educators and students to be aware of the potential drawbacks and take steps to mitigate them.

## 4. Recommendations for the main stakeholders

Based on the findings of this research, there are several recommendations that can be made for the main stakeholders, specifically in regard to the post-pandemic period when the teaching process is conducted in-person.

First, it is important for teachers to continue incorporating digital technologies and resources into their teaching methods, even when in-person instruction is resumed. The pandemic has shown the benefits of using technology to facilitate learning and engagement, and it is likely that students will expect and appreciate the use of these tools in the classroom.

Second, it is recommended that teachers continue to offer a variety of teaching methods, including lectures, discussions, group work, and hand-on activities, in order to meet the diverse needs and learning styles of students and it is important for teachers to continue using communication platforms with students because they can communicate more easily with the teacher, can have work meetings with their peers, can view course materials when needed, and can upload various tasks completed with the help of digital technologies.

Finally, it is important for teachers to continue offering one-to-one support and tutoring to students who may need additional assistance or guidance with their studies. This can help ensure that all students have the support they need to succeed, regardless of their learning style or needs.

## 5. Conclusions

In conclusion, based on the results of the present research, it appears that the teaching-learning-evaluation process for high school students has changed significantly during the pandemic and post-pandemic periods. Prior to the pandemic, the use of digital resources and tools in the classroom was limited, with most students completing written assignments and completing group projects through in-person meetings. However, during the pandemic, the shift to exclusively online teaching led to an increased in the use of digital resources and tools, including online platforms for synchronous and asynchronous communication, multimedia resources, and interactive activities.

Additionally, teachers made efforts to create a sense of community and connection with their students through the use of social media and other online platforms, and used a variety of teaching methods to engage students. While the integration of digital resources and tools in the learning process

has brought many benefits, it also comes with a series of disadvantages. Overall, this research suggests that digital technologies can be useful in facilitating the teaching-learning-evaluation process for high school students, but it is important to consider the potential challenges and ensure that all students have access to the necessary resources and support.

## 6. Research limitations and further research

Some potential limitations of this study include the small sample size of only 10 high school students from a private school in Bucharest, the reliance on self-report data, and the fact that the study was conducted in a specific location and time period. These limitations may limit the generalizability of findings to other high school students or schools in different locations or at different times.

In terms of further research, it would be interesting to replicate this study with a larger sample size and different schools, both private and public, in order to compare and contrast the experiences and perspectives of high school students in different contexts. It would also be useful to conduct follow-up research to see how the use of digital technologies has evolved over time and to explore any long-term effects on the teaching-learning-evaluation process. Additionally, it would be valuable to examine the perspectives of teachers and school administrators on the use of digital technologies in education, as well as the impact on learning and student engagement.

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# ANALYSIS OF THE INITIAL ACCEPTANCE OF THE BEE-BOT ROBOT IN STUDENTS WITH AUTISM SPECTRUM DISORDER

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## Abstract

Nowadays, pedagogical robotics is configured as a methodological trend in schools, conceptualized as a technology for learning and knowledge (TLK). Particularly, in the field of inclusive education, the use of CAT during the learning process of students with autism spectrum disorder (ASD) could imply a greater motivation towards the tasks by these students and, therefore, a greater focus of their efforts. Specifically, pedagogical robotics has a series of characteristics, such as predictability, high degree of control of the environment and sequencing, which are perfectly aligned with the educational needs of these students. Among them, the need for a controlled environment that favors error-free learning and decreases the high levels of frustration in the face of non-achievement of the task stands out. Thus, the purpose of the study is to analyze the initial acceptance, by students with ASD, of the Bee-Bot robot for teaching communication and social interaction skills. The proposed research presents a quantitative approach with a single-case quasi-experimental design. A non-probabilistic purposive sampling technique was used for the selection of participants. Thus, the sample of participants consisted of 11 students aged between 3 and 16 years old, attending specific communication and language units in schools in the city of Alicante (Spain). The instrument used is a field notebook designed *ad hoc* that evaluates the parameter called "initial acceptance". Regarding the procedure, an individual session with each participant lasted approximately 20 minutes. A descriptive data analysis for the calculation of frequencies and percentages was carried out with version 27 of the Statistical Package for Social Sciences (SPSS). The results indicated that more than 54.00% of the students indicated that they wanted to play with the robot, listened attentively to the explanations and pressed the robot's upper commands. Also, these results indicated that 90.91% approached the robot showing interest and 100.00% responded that they wanted to use the robot again. On the other hand, less than 28.00% of the students were frightened when the robot moved and covered their ears when the robot sounded. In conclusion, students with ASD accept the Bee-Bot robot, which makes it a potential tool for carrying out different activities.

*Keywords:* Autism spectrum disorder, robot, Bee-Bot, initial acceptance.

## 1. Introduction

Currently, Autism Spectrum Disorder (ASD) is understood as a neurodevelopmental disorder that manifests itself during the first years of life through difficulties in the areas of communication and social interaction and the presence of restrictive and repetitive behaviour patterns and behaviours (American Psychiatric Association [APA], 2013). From the perspective of inclusive philosophy, the teaching of students with ASD in such classrooms should be governed by a series of principles such as structuring, anticipation, visual support and error-free learning (García-Guzmán, 2021).

Rapid technological progress in the 21st century has made possible to extend the use of ICT to different areas, including schools (Kandel, 2022). Specifically, ICT is increasingly used as a tool to facilitate access, participation and learning for students with ASD (Nikolopoulou, 2022). Among the tools that could be adapted to these principles, pedagogical robotics can be distinguished as a space for dialogue between the disciplines of engineering, didactics and pedagogy that allows the analysis of the possibilities of robots as tools to support learning (Ghitis & Vásquez, 2014). Until now, different research has been carried out with robots and have demonstrated the advantages of its use in this field. These include attracting the attention of students with ASD (Boccanfuso et al., 2017), eliminating sensory overload (Robins et al., 2009) and allowing learning to be practised in a controlled situation (Nadel et al., 2022).

The present study brings as a novelty the use of a floor robot, called the Bee-Bot robot, to work with students with ASD on aspects related to the area of communication and social interaction. This robot had not previously been used with students with ASD for this purpose. The Bee-Bot robot is a bee-shaped robot whose design allows it to adapt to students of different ages and needs (Pérez-Vázquez et al., 2022). Due to the high cost of educational robots, this research proposes the Bee-Bort robot as a low-cost alternative accompanied by a task protocol for the development of communication and social interaction skills of students with ASD. This bee-shaped robot is programmed by means of simple commands to move through the boxes of the play maps used for each of the activities.

## 2. Objective

The present manuscript is part of a large-scale project whose main objective is to explore the application robotics to promote communication and social interaction skills in students with ASD. Specifically, this manuscript aims to answer the following research question derived from the main aim:

Do students with ASD show initial acceptance in the use of the Bee-Bot robot?

## 3. Method

This section refers to the research approach and design, the characteristics of the participants, as well as the instrument used, the intervention developed, the process and the data analysis.

### 3.1. Methodological approach and design

The research has been developed from a quantitative methodological approach because it uses data collection and analysis to answer the research question, relying on numerical measurement to establish patterns of behaviour (Maciejewski, 2020). Specifically, a quasi-experimental design (Maciejewski, 2020) was implemented, due to the fact that participants are selected to be part of the large-scale research project in two groups (control and experimental) to compare the efficacy of an intervention (Maciejewski, 2020). In this case, to test the efficacy of robotic-mediated interventions. A case study design is also implemented, because, as Ridder (2017) points out, this type of design allows for investigations in deep natural contexts. In this regard, this manuscript analyses the degree of acceptance of the robot experienced by students with ASD, belonging to the experimental group, in a pilot session developed in the classroom.

### 3.2. Participants

The present study was conducted with eleven participants who were chosen through the implementation of non-probability purposive sampling (Bueno, 2008). Following Bueno (2008) in this type of sampling, the sample is selected on the basis of criteria previously established by the researchers on the basis of the typical characteristics of what is to be investigated. In this regard, the criteria implemented for the selection of the sample are reflected in Table 1.

*Table 1. Criteria for the selection of the sample.*

| |
| --- |
| - Diagnosis of ASD based on DSM-5 criteria (APA, 2013). |
| - Schooled in specific special education classrooms (communication and language classrooms). |
| - Schooled in pre-school, primary education or compulsory secondary education. |
| - Authorisation from legal guardians to carry out the experience. |

Source: own elaboration

In particular, the group consisted of seven boys and four girls. The mean age of the participants was 7.00 years. Regarding the degree of ASD, 9.09 % were level 1, 72.73 % were level 2 and 18.18 % were level 3. In relation to the type of communication, four used oral language and seven used an augmentative alternative communication system (AACS) because they did not have verbal communication. As far as the level of curricular competence is concerned, two pupils had a pre-school level of education, and the remaining nine pupils had a primary level of education.

### 3.3. Instrument

In order to implement the intervention, a questionnaire was designed ad hoc with the aim of obtaining information on the behaviour of students with ASD participating in the use of the Bee-Bot robot for teaching communication and social interaction skills. The questionnaire is divided into two parts. The first part is intended to obtain demographic data (sex assigned at birth, age) and data from the socio-psychopedagogical report (level of ASD, type of communication, type of classroom, type of school,

current level of pupils' competence). The second part contains seven items that try to assess the parameter "initial acceptance of the Bee-Bot robot". These items are measured using a dichotomous response (yes, no) to try to reflect the presence or absence of the behaviours, i.e. the occurrence. The questionnaire was developed using the Google questionnaire tool for quick and easy application.

*Table 2. Items used to measure the initial acceptance of the Bee-Bot robot.*

| | |
|---|---|
| 1. | Indicates that he/she wants to play with the robot. |
| 2. | Listens attentively to the explanations. |
| 3. | Approaches the robot showing interest in the activity. |
| 4. | Presses the robot's commands. |
| 5. | Gets scared when the robot moves. |
| 6. | Covers his/her ears when the robot sounds. |
| 7. | Responds that he/she wants to use the robot again when asked. |

Source: own elaboration

## 3.4. Intervention

The present research was undertaken in one session. This session was developed in the regular classroom where they conduct their daily activities. Each of the participating pupils developed the session individually. When they entered the classroom, they could find, first of all, the story "El monstruo de los colores" by Anna Llenas, a play mat, the Bee-Bot robot and the A5 cards to help them with the programming commands. In this sense, the session can be divided into different blocks.

- Block 1. Introductions. In this first block, students were introduced to the activities they were going to carry out by means of a preview panel with pictograms. Thus, it was explained to them that we were going to play with the Bee-Bot robot during the session and they were exposed to it.

- Block 2. Reading the story. Next, we proceeded to the reading of the story "The colour monster" where emotions are explained. The story is adapted to the perceptual and comprehension characteristics of students with ASD. In this sense, an A2 size is used for the pictures of the story and the text is adapted with pictograms.

- Block 3. Explanation of the commands. The programming commands ("forward"; "backward", "turn", "pause", "delete") were explained to the students by means of the A5 help cards. At the same time as all the commands were explained, they were programmed. In addition, the students were asked to program them themselves.

- Block 4. Playing with the Bee-Bot robot. In this block, the pupils have to program the Bee-Bot robot from its initial position on the game carpet so that it reaches different points of the carpet, which will allow us to check whether the pupils have understood the contents of the story. Figure 1 shows one of the participants carrying out the activity.

*Figure 1. Student working on the activities with the Bee-Bot robot.*



In this sense, the researcher gives the following instructions to the student to do the activities: The researcher says: *What colour is the monster when he is happy?* (She will wait for him to answer orally or with the communication board) Then, she will say: *Take the Bee-Bot robot to the box with the yellow spot;* Secondly, the researcher will ask the student: *Where is the yellow monster?* Then she will say: *Take the Bee-Bot robot to the square with the yellow monster;* Thirdly, the researcher asks: *Where is the yellow jar?* Then she says: *Take the Bee-Bot robot to the box with the yellow jar;* Fourthly, she asks: *Where is the picture of the happy girl?* Then you say: *Take the Bee-Bot to the box with the picture of the*

*happy girl;* Finally, you say: *Where is the happy face?* Then say: *Take the Bee-Bot robot to the box with the happy face.* After questions have been taken, the session will be closed.

## 3.5. Process

For the development of the research project, contact was firstly made with the school through the institutional e-mails. Secondly, once this contact was established, a meeting was held with the centre's management team and the educational guidance team where a more detailed explanation of the project was given, specifying the work objectives and its structure. Then, thirdly, a new meeting was scheduled with the tutors of the centre's Special Education classrooms. At this meeting, they were provided with the authorisation and consent documents to be sent to the families of students with ASD who had expressed their interest in participating in the project. Thus, this documentation was approved by the Ethics Committee of the University of Alicante (UA-2021-09-06-1). Likewise, the day of the intervention was planned jointly, in order to introduce it into the dynamics of the class. Once permissions had been obtained, this pilot session was developed. The Special Education classroom teacher, the educator and the main researcher, who was in charge of interacting with the pupils, took part in the session. This session was developed individually with each student and lasted 20 minutes.

## 3.6. Data analysis

In the present study, a descriptive analysis of the data obtained through the ad hoc questionnaire was carried out. Specifically, firstly, the frequency was measured in order to obtain the number of students who presented each of the behaviours. Secondly, an analysis of the percentages was carried out in order to identify the proportion of students for each of the behaviours. Version 27 of the Stadistical Package for Social Sciences (SPSS) was used.

## 4. Results

The results of the study on the initial acceptance by students with ASD are presented below.

## 4.1. Results related to the acceptance of the robot *Bee-Bot*

The results indicated that more than 54.00% of the learners: wanted to play with the robot (item 1), listened attentively to the explanations (item 2) and pressed the robot's top commands (item 4). Also, the results indicated that 90.91% of the participants approached the robot showing interest (item 3) and 100.00% responded that they wanted to use the robot again (item 7). On the other hand, less than 28.00% of the participants were frightened when the robot moved (item 5) and covered their ears when the robot beeped (item 6). In table 3, Table 3 shows the detailed results of the descriptive analysis conducted.

*Table 3. Results of the initial acceptance of the Bee-Bot robot.*

| ÍTEM | | $f$ | | % | |
|---|---|---|---|---|---|
| | | YES | NO | YES | NO |
| 1. | Indicates that he/she wants to play with the robot. | 8 | 3 | 72,73 | 27,27 |
| 2. | Listens attentively to the explanations. | 6 | 5 | 54,55 | 45,45 |
| 3. | Approaches the robot showing interest in the activity. | 10 | 1 | 90,91 | 9,09 |
| 4. | Presses the robot's commands. | 7 | 4 | 63,64 | 36,36 |
| 5. | Gets scared when the robot moves. | 2 | 9 | 18,18 | 81,82 |
| 6. | Covers his/her ears when the robot sounds. | 3 | 8 | 27,27 | 72,73 |
| 7. | Responds that he/she wants to use the robot again when asked. | 11 | 0 | 100,00 | 0,00 |

Source: own elaboration

## 5. Discussion

The main objective of this research has been to explore the initial acceptance by students with ASD of the use of the robot as a support tool in the learning process. In this sense, in reference to the results obtained, it can be observed that more than half of the participating students want to play with the robot, listen attentively to the explanations and press the commands on the top of the robot. These results may be due, as Silvera-Tawil et al. (2022) explains, to the fact that the robotic tools are predictable for

students with ASD, as they create a very structured environment that adapts very well to students with ASD. In this sense, these results may be due to the clear and simple instructions provided by the robots, which are perfectly aligned with the characteristics of students with ASD and allow them to follow the curricular guidelines. Regarding the results that indicate that most students with ASD approach the robot showing interest and respond that they want to use it again, these can be explained by the fact that, as Gudlin et al. (2022) point out, students with ASD find robots very attractive, due to their non-anthropomorphic structure and their mechanics (lights, sounds, movements). Finally, the results show that students with ASD do not express fear when they see the robot move, nor do they cover their ears when the robot sounds. These results could be related to the previous training carried out on a daily basis in Special Education classrooms to work on hypersensitivity, having developed previous sensory integration activities (Huerta, 2014).

## 6. Conclusions

In conclusion, students with ASD accept the Bee-Bot robot, which makes it a potential tool for conduct activities in the classroom context. Last but not least, the present research has different practical implications. In this sense, one of them is related to the fact that the activities designed for the Bee-Bot robot application could be used in a generalised way with other students with ASD, including other students with specific educational needs. Another practical implication could be to introduce the Bee-Bot robot into the regular classroom dynamics.

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# HARNESSING PEDAGOGICAL AFFORDANCES OF ONLINE TOOLS TO ENHANCE GRADE 11 PHYSICAL SCIENCES LEARNERS' CONCEPTUAL UNDERSTANDING OF ELECTROMAGNETISM

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## Abstract

This study explored the utilization of online tools to enhance grade 11 Physical Sciences learners' conceptual understanding of Electromagnetism. The empirical investigation adopted a quasi-experimental design and involved purposively selected grade 11 Physical Sciences learners as participants. Quantitative data was collected through the administration of a questionnaire. The questionnaire was administered as a pre-test and post-test with a view to evaluate the efficacy of the utilization of online tools as an instructional intervention. Findings emanating from the study demonstrated that the utilization of online tools served to enhance grade 11 Physical Sciences learners' conceptual understanding of Electromagnetism as a key knowledge area. There is a crucial need for teachers to fully embrace pedagogic innovation to improve learner outcomes in Physical Sciences teaching and learning. Theoretical implications for pedagogic innovation are discussed.

*Keywords: Conceptual understanding, affordances, Physical Sciences, pedagogic innovation.*

## 1. Introduction

Physical Sciences is perceived to be a difficult subject by most learners. One of the Physical Sciences topics that learners find difficult is Electromagnetism (Raduta, 2005). Various research studies revealed that learners have misconceptions associated with Electromagnetism (Raduta, 2005; Bozzi et al., 2019). Online tools can be used to enhance learners' understanding of Electromagnetism. There are several online tools for teaching and learning such as simulations and game-based applications. The utilization of information and communication technology (ICT) has grown in popularity in education by virtue of its capability to provide dynamic and innovative teaching and learning environments. Teachers are required to integrate ICT in their teaching with a view to supersede traditional methods with modern tools and facilities (Ertmer, 1999). ICT refers to the hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information as well as related services (Evoh, 2007). According to Perron et al (2010), information and communication technologies are described as technologies used to convey, manipulate and store data by electronic means. These technologies include electronic mail (e-mail), short message service (SMS), video chat, online social media (e.g., Facebook, Mix-it) as well as different computing devices (e.g., laptops, desktops and smart phones) that carry out a wide range of communication and information functions. All these electronic tools constitute ICTs and are used to convey, manipulate and store information (Perron, *et. al.*, 2010).

## 2. Purpose of the study

The study examined pedagogical affordances of online tools as a means to enhance grade 11 physical sciences learners' conceptual understanding of electromagnetism. The empirical investigation was underpinned by the following concomitant objectives.
- To explore the effect of the utilization of online tools on grade 11 physical sciences learners' conceptual understanding of Electromagnetism.
- To identify grade 11 physical sciences learners' misconceptions associated with Electromagnetism.

## 3. Research design and methodology

The empirical investigation adopted a quasi-experimental design and involved purposively selected grade 11 Physical Sciences learners as participants. Quantitative data was collected through the administration of a questionnaire. The questionnaire was administered as a pre-test and post-test with a view to evaluate the efficacy of the utilization of online tools as an instructional intervention.

## 4. Research findings

### 4.1. Findings emanating from the administration of the Electromagnetism Test

Figure 1 below shows pre-test and post-test scores emanating from the administration of the Electromagnetism Test.

*Figure 1. Pre-test and post-test scores.*
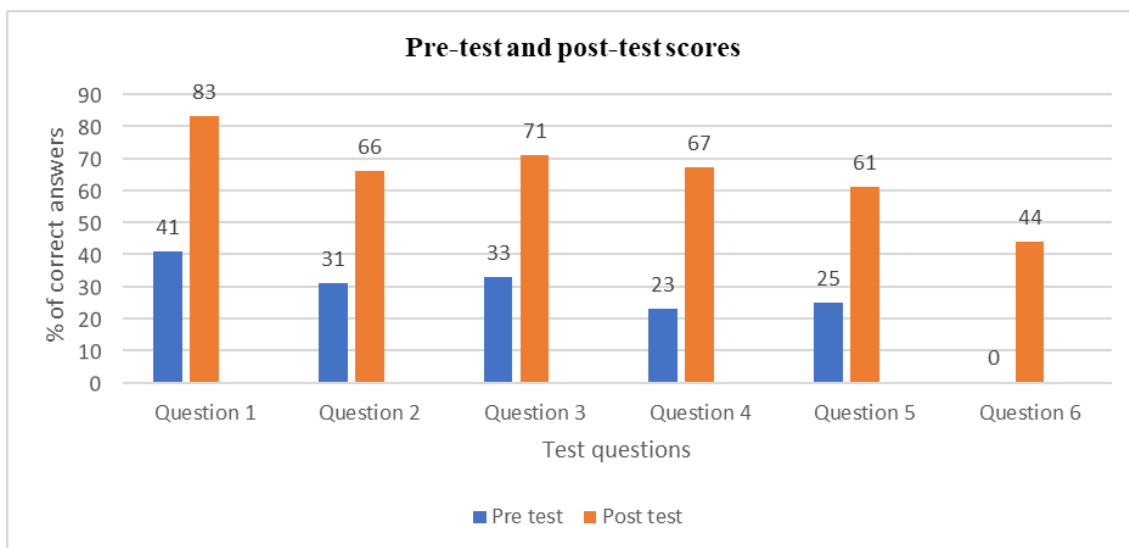


The findings indicate that learner academic performance improved significantly as a result of utilization of online tools. This implies that pedagogical affordances of online tools ought to be harnessed as part of pedagogic innovation to enhance learner academic performance in Physical Sciences teaching and learning.

### 4.2. Learners' misconceptions associated with Electromagnetism

The learners exhibited misconceptions about the direction of the magnetic field around the current-carrying conductor. The prevalence of misconceptions about the direction of the magnetic field around the current-carrying conductor is depicted in Figure 2 below.

*Figure 2. Prevalence of misconceptions about the direction of the magnetic field around the current-carrying conductor.*
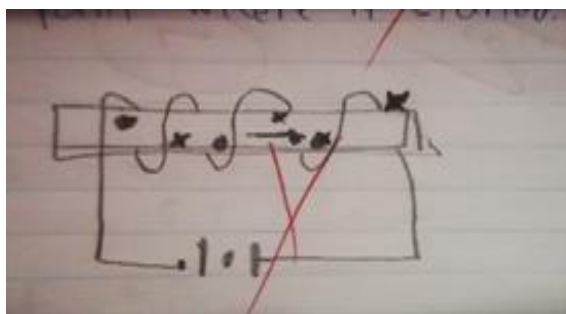


The learners confused the direction of electric current and the direction of the magnetic field as illustrated in Figure 3 below.

*Figure 3. Prevalence of misconceptions about the direction of electric current and the direction of the magnetic field.*
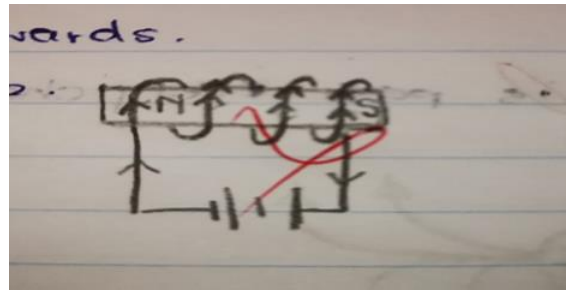


The learners demonstrated inadequate understanding of the effect of movement of the magnet on galvanometer reading. The inadequate understanding is reflected in the following excerpts.



## 5. Discussion

Learner academic performance improved significantly as a result of utilization of online tools. This implies that pedagogical affordances of online tools ought to be harnessed as part of pedagogic innovation to enhance learner academic performance in Physical Sciences teaching and learning. However, the method used by the teacher to teach electromagnetism is another important factor to consider. If the usual conventional method of teaching is used in science classes, students are likely to memorize concepts without meaningful conceptual understanding (Akinsola, 1994; Ireogbu, 1998; Ukoh, 2012). Physics education goals cannot be achieved by conventional science teaching but that most Physics lectures generally are teacher-centered and theoretical (Rivard & Straw, 2000). It is imperative to develop a meaningful understanding of Electromagnetism as a key Physical Sciences topic. According to Guisasola et al. (2008), electromagnetic interactions play a very important role in explaining the natural world. Learners should have good understanding of electromagnetic concepts to harness advantages of electromagnetism through application of knowledge (Maloney et al., 2001). The learners exhibited misconceptions about the direction of the magnetic field around the current-carrying conductor. In addition, the learners confused the direction of electric current and the direction of the magnetic field. Furthermore, the learners demonstrated inadequate understanding of the effect of movement of the magnet on galvanometer reading. These findings are consistent with a study conducted by Thomas et al. (1995) which revealed that most students find electromagnetism to abstract and difficult.

## 6. Conclusion

The utilization of online tools is promising as a means to enhance learner academic performance in Physical Sciences teaching and learning. The development of scientific literacy hinges to a large degree on pedagogic innovation. There is a crucial need for teachers to fully embrace pedagogic innovation to improve learner outcomes in Physical Sciences teaching and learning in particular.

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# LEARNING STYLES, TECHNOSTRESS & BLENDED LEARNING – IMPLICATIONS FOR THE EDUCATIONAL MODEL OF THE FUTURE

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## Abstract

Although the blended learning teaching format has been existing for several years, the COVID-19 pandemic has shown us once again how important digitization is in the education industry. The aim of this study is therefore to find out what opportunities and risks blended learning has as a teaching format from the perspective of students with the learning style "pragmatist" and to what extent technostress will be relevant in this context. A qualitative study was conducted in which 11 undergraduate students with the learning style "pragmatist" were asked about their personal experience and opinion regarding the three teaching formats face-to-face, distance and blended learning in order to find out the individual advantages and disadvantages. The results have shown that blended learning is suitable as a teaching model from the students` perspective. However, attention must be paid to good organization and communication in order to be able to take advantage of both teaching formats, namely face-to-face and distance learning. The effects of technostress could not be determined after the COVID-19 pandemic as an external influencing factor strongly affected the students' perceptions of distance learning.

*Keywords: COVID-19 pandemic, learning styles, face-to-face learning, distance learning, blended learning, technostress.*

## 1. Introduction

Due to the rapid spread and severity of the 2019 coronavirus disease, also known as COVID-19, the situation was globally classified as a pandemic on March 11, 2020, by WHO Director-General (World Health Organization, 2020). In response, governments have enacted various restriction measures to prevent further contagion (Saidi, Sharip, Abd Rahim, Zulkifli, & Md Zain, 2021).

After educational institutions had to be closed in the course of social restrictions, these institutions were forced to switch from face-to-face classes to the online format immediately and indefinitely (Saidi et al., 2021). Despite the many benefits of distance learning (Sadeghi, 2019) that have allowed academic education to continue during the COVID-19 pandemic, it also came with some limitations and it cannot generally be said that this format will replace traditional face-to-face instruction in the future (Sadeghi, 2019). Therefore, the question arises whether a mixture of both educational models (blended learning) would be the ideal solution for the future of education. This could combine the benefits of face-to-face and distance learning (Harding, A., Kaczynski, D., & Wood, L., 2005).

In this context, care must be taken to ensure that the teaching/learning processes to be used ensure that the information is received and processed by the learner as efficiently as possible (Costa, Souza, Valentim, & Castro, 2020). Scholars such as Kolb (1984) and Mumford and Honey (1992) have recognized this necessity early on and have focused their research on determining different learning styles to assist educators in developing teaching/learning methodologies.

In this regard, technological progress also plays an important role, which should not only enable greater access to knowledge, but also provide better learning and teaching (Tuapawa, 2017) – but this also comes with bad effects as well. One of these effects is the so-called technostress, which was first used by Brod (1984). Currently, there is a dearth on studies on whether and to what extent technostress matters in the context of academic education (Upadhyaya & Vrinda, 2021). One of these studies was conducted by the authors Upadhyaya & Vrinda, 2021, whose findings revealed that even tech-savvy students suffer from moderate levels of technostress, which in turn negatively affects the students' performance.

Consequently, the aim of the study at hand is to answer the question: "what opportunities and risks arise with regard to the blended learning format from the students` perspective with the learning style "pragmatist" and what significance can be attributed to technostress in this context?"

## 2. Theoretical background

For the study at hand, the educational model of blended learning, various learning style models, and the phenomenon of technostress were examined.

### 2.1. Blended learning

Blended learning combines traditional and digital teaching methods for knowledge transfer with the aim of achieving an improvement of the learning outcomes for the students (Singh, H., & Reed, C., 2001). Face-to-face learning complies to the traditional teaching method (Titthasiri, 2013). Knowledge transfer takes place within the physical presence of students and teachers in an educational institution, especially in a classroom with blackboards, whiteboards, books, projectors, etc. (Titthasiri, 2013). This form of teaching is considered teacher-centered because the teacher sets the structure of the lesson, including breaks and classroom discussions (Rashty, 2003; Titthasiri, 2013). The course material is elaborated with the participation of the entire class (Rashty, 2003; Titthasiri, 2013).

In contrast, distance learning provides access to education for geographically dispersed students, i.e., through the use of electronic devices, students can participate in classes, course materials are provided to them, and contact between students and instructors is also established through its use (Sadeghi, 2019). The U. S. Department of Educational Research and Improvement defines Distance Learning as „the application of telecommunications and electronic devices which enable students and learners to receive instruction from some distant location" (Bruder, 1989, p. 30). Thus, by introducing blended learning, the advantages of the traditional classroom format can be combined with the opportunities from online classes (Harding, A., Kaczynski, D., & Wood, L., 2005).

### 2.2. Learning styles

The learning process is an essential part of the life cycle of a human being (Dantas & Cunha, 2020). In the course of a person's lifetime, social skills and behaviors are learned and developed, which is why the learning process plays an important role in the organization of cultures, in the educational system and, last but not least, in the creation of new knowledge (Dantas & Cunha, 2020). However, individuals use different methods to ensure their personal learning success, such as graphical representations or discussions (Dantas & Cunha, 2020).

James and Blank (1993) define learning styles as „the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn" (S. 48). Learning is best understood as a process that involves some kind of exchange between the learner and his or her environment, while also considering that person's adaptability (Kolb, 1984; Kolb & Kolb A.Y., 2013). In „Experiential Learning Theory" Kolb (1984) attempts to connect various factors using a unified learning cycle while dividing them into distinct phases: **concrete** experience (CE), **reflective** observation (RO), **abstract** conceptualization (AC), and **active** experimentation (AE) (Coffield, F., Moseley, D., Hall, E., Ecclestone, K., 2004; Dantas & Cunha, 2020). From this, Kolb (1984) derives the following learning styles: converging (abstract, active), diverging (concrete, reflective), assimilating (abstract, reflective), and accommodating (concrete, active) (Coffield, F., Moseley, D., Hall, E., Ecclestone, K., 2004; Dantas & Cunha, 2020). Based on Kolb`s (1984) research, Mumford and Honey (1992), created "The Learning Styles Questionnaire", a questionnaire that surveys the participant's behavior in order to obtain an improvement of this learning style theory (Coffield, F., Moseley, D., Hall, E., Ecclestone, K., 2004). In 2013 Vega, M. C., & Patino, M. D. reduced the size from the original 80 questions to now 32 questions without loss of quality, which is why the name CHAEA-32 questionnaire was created.

Following Kolb`s (1984) learning cycle, the learning style "pragmatist", is essential for this study, as (Coffield, F., Moseley, D., Hall, E., Ecclestone, K., 2004; Honey, P., & Mumford, A., 2000).

### 2.3. Technostress

One of the most significant inventions is certainly the computer, which has not only helped humans to solve tasks faster, more efficiently and more accurately, but has also led to a drastic change in society (Brod, 1984). The human-computer interaction, if imbalanced, can have an impact on the human brain and negatively affect a person's personality (Brod, 1984). Brod (1984) refers to these effects as technostress and defines them as follows: "technostress is a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner. It manifests itself in two distinct but related ways: in the struggle to accept computer technology, and in the more specialized form of overidentification with computer technology." (Brod, 1984, p. 16). Typical symptoms that indicate technostress, in addition to a psychological change that resembles the behavior of a computer, are physical symptoms such as headaches, fatigue, muscle tension, shortness of breath and stomach ulcers (Brod, 1984).

The complex construct of stress development is described by Lazarus and Folkman (1984), in their work „Stress, appraisal, and coping". According to this, a trigger, a so-called stimulus, is called a stressor as soon as it triggers a stressful situation in the person affected (Lazarus & Folkman, 1984). The primary assessment analyzes whether and to what extent the stimulus is to be classified as positive, irrelevant or dangerous or stressful (Lazarus & Folkman, 1984). If the situation has been classified as dangerous, the secondary assessment evaluates the available resources, situational factors, and the effectiveness of the coping strategy. (Lazarus & Folkman, 1984). Afterwards, it is determined whether a situation was dangerous and thus triggered a stress reaction (Lazarus & Folkman, 1984).

To make technostress measurable in organizations in the area of human-computer interaction, Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007), have developed a survey and divided this influencing factor into five dimensions, namely "techno overload", "techno invasion", "techno complexity", "techno insecurity" and "techno uncertainty". The study at hand focuses exclusively on the dimensions of techno-overload, techno-invasion, and techno-complexity by Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007).

## 3. Methodology

In order to answer the research question, a qualitative approach, which was supported by selected quantitative instruments, was applied. The aim was to specifically pick a sample of undergraduate students of the learning style "pragmatist". Thus, students of a specific undergraduate program of an Austrian university, were asked to participate in an online survey using Google Forms, potentially followed by an approximately 45-minute one-on-one interview.

The aim of the online survey was to identify the predominant learning style (activist, pragmatist, reflector and theorist). The learning style "pragmatist" was chosen because the introduction of blended learning attempts to achieve the greatest possible learning outcome for students. This is done by combining different methods and media to deliver theoretical content electronically and learn or apply practical skills in face-to-face classes. To identify students with this learning style, the simplified CHAEA-32 questionnaire was used including a Likert scale, allowing the respondents to select their agreement from 1 - "not at all" to 4 - "very much".

Through this process 11 students with a pragmatist learning style could be identified and were invited to join the interviews. Since all of the interviewees have already experienced all teaching formats during their studies, namely face-to-face, distance, as well as blended learning, the interview was used to highlight the advantages and disadvantages of each teaching format and to find out about the participants' attitudes towards the blended learning format and their perceived technostress.

In order to accurately grasp the different dimension of technostress, the questionnaire developed by Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007) was used as a basis for the respective questions, which were adapted in order to fit the qualitative research approach. Each interview was first analyzed by applying the "circular deconstruction" analysis method developed by Jaeggi, E., Faas, A., & Mruck, K. (1998), and subsequently subdivided into different categories by using MAXQDA in order to enable a systematic comparison between the interviews in the second analysis phase.

## 4. Results

In this section, the results are presented according to some of the individual categories of the 11 participants with the learning style "pragmatist".

### 4.1. Category 1: specificities of the institution
Here the reasons why the interviewees have chosen to study at the respective institution are given as: (1) System of the university, (2) Face-to-face-component, (3) full time component, (4) duration of the program, (5) worked-based learning and (6) reputation of the university.

### 4.2. Category 2: success factors for teaching
The respondents state that interactive lectures, the lecturers' teaching methods, and the use of theory in a practical application have a positive influence on personal learning success. Some students find individual work and assignments very helpful, while others prefer group work. Additionally it was found that the learning environment plays an essential role and that the lectures should not be too long.

### 4.3. Category 3: favorite lectures
Interviewees indicate that they found both face-to-face and distance learning lectures exciting, as well as classes that were initially taught as face-to-face and then had to be switched to distance learning due to the COVID 19 pandemic. Some of the students stated that they felt the face-to-face classes were better than distance learning lectures.

## 4.4. Category 7: electronic devices

Smartphones, computers/laptops/Macbooks and iPads/tablets are used on a daily basis. The switch to distance learning has significantly increased usage. In general, the participants describe themselves as technologically neutral to savvy/active/interested in the use of new technologies.

## 4.5. Category 8: reaction to the COVID-19 pandemic and shift to distance learning

The switch from face-to-face to distance learning as a result of the COVID-19 pandemic was associated with mixed feelings. In terms of their studies, many were grateful that their studies could continue and that this relieved some of their concerns about the pandemic. In addition, the circumstances were initially perceived as exciting because nothing comparable had ever happened before and the situation was underestimated. In all cases, this event had an impact on students' private lives. Some students spent more time with their families as a result, but less with friends. Due to the restriction measures, it was initially problematic for some to make a clear cut between the university and their private life, but this has improved significantly with the relaxation of the restriction measures.

## 4.6. Category 10: preferred teaching format

Finally, students were asked which teaching format they would choose if they had the choice to do their studies again. In response, seven chose blended learning and three chose face-to-face learning. One decision in favor of blended learning was invalidated during the text analysis due to inconsistencies.

## 5. Discussion

The results of the study show that students are favorable toward the blended learning format because the combination of face-to-face and distance learning mitigates the disadvantages of both formats, resulting in more advantages. Many of these advantages are also confirmed in a study by Titthasiri (2013), in which students appreciate, among other things, the group work and group discussion, the social contacts, and the learning atmosphere of face-to-face classes, and positively perceive the time and cost savings as well as the geographical independence of E-learning. Although most students surveyed chose blended learning as their preferred method of teaching, face-to-face instruction also remains popular, while distance learning is largely rejected by students. This rejection is particularly interesting given that students describe themselves as neutral to savvy in their use of new technologies.

To determine whether and to what extent technostress plays a role in relation to the blended learning format, participants in this study were surveyed about their physical and mental state in the context of a lecture in face-to-face and distance learning. Students have reported feeling better in face-to-face classes, but perceived difficulty concentrating, eyestrain, headaches, and mental fatigue/inertia in distance learning. According to Brod (1984), some of these symptoms could be due to technostress, but in this context, the COVID-19 pandemic must be considered as an external influencing factor that led to an intensification of the distance learning format.

## 6. Limitations

This study has several limitations. The sample size is relatively small, with only 11 participants with the predominant learning style of "pragmatist." The study is also limited to surveying students from a single undergraduate program. Another factor to consider is the identification of learning styles based on students' self-assessment of the CHAEA-32 questionnaire. It was not possible to determine whether and to what extent technostress mattered due to the COVID-19 pandemic that was prevalent at the time. Future studies could collect more data from different educational institutions after the pandemic ends to confirm or add to the findings of this study.

## 7. Conclusion

The results have shown that students have a favorable attitude towards the blended learning format and that there are more advantages than disadvantages to the mix of face-to-face classes and distance learning. This teaching format provides more flexibility for the students and leads to a mitigation of the disadvantages of both teaching formats. A crucial factor to be considered is good organization and communication to ensure the success of this teaching format. Adapting learning plans can thus expand the reach of students, save time and money for students and teachers, and reduce costs for educational institutions by designing new campus structures.

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# AUGMENTED REALITY PROMOTES SOCIAL RESPONSES IN AUTISM SPECTRUM DISORDER SUBJECTS

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## Abstract

Inclusive education is a pedagogical proposal that pursues the basic right to a joint education for all students. In this line, the increasing prevalence of students with Autism Spectrum Disorder (ASD) in the classroom requires a greater understanding of their academic abilities, experience and outcomes. Given recent education reform processes, experts are actively developing opportunities for the educational and personal fulfilment of this group. Among these is the use of a set of technologies that take into account the characteristics of learners. It is for this reason that the need arises to talk about the application of technologies in the classroom, which invite reflection on the teaching-learning process. In this sense, this study aims to apply Augmented Reality to enhance social responses in students with Autism Spectrum Disorder. This research is based on a quantitative approach with a quasi-experimental design with a control group and an experimental group. The sample is made up of 12 students with ASD who are enrolled in a Special Education Specific Unit. Regarding the participant selection procedure used in this study, it was non-probabilistic sampling with an available or accidental nature and easy access or accessibility. The study variable is the social response that has been studied based on three parameters: the greeting at the beginning of the session, the farewell at the end of the session and the communication presented throughout the session. Regarding the instrument used in the educational intervention, the research was carried out through a field notebook designed *ad hoc*. Subsequently, once the intervention and data collection had been planned and implemented, data analysis was carried out using the SPSS statistical package for Windows (Statistical Package for Social Sciences) version 25. The results obtained show that from the first session more than half of the students in the experimental group (83.33%) said hello at the beginning of the session, as opposed to the control group (16.67%). Likewise, with regard to saying goodbye, the percentage of learners who produced this skill was higher in the experimental group than in the control group. Finally, in terms of communication presented throughout the sessions, the same results were obtained for both groups from the third session onwards. As future lines of research, we propose the continuation of the study with the possibility of applying this tool to a larger group of students, as well as the study of other variables.

*Keywords: Autism Spectrum Disorder (ASD), Augmented Reality (AR), social communication, social interaction, intervention.*

## 1. Introduction

Since the 1990s, the term 'inclusive education' has gained traction in research, policy, and practice (Kielblock and Woodcock, 2023). In this sense, inclusive education can be defined as an educational approach that proposes schools in which all learners can participate, and all are treated as valued members of the school (Moriña, 2017). Furthermore, Mansur (2018) adds that inclusive education is achieved when the educational community, i.e. teachers, families and students work together to minimise the barriers that children face in learning and promote the participation of all children in school. In this perspective, successful inclusive education requires school transformation and systems change. However, much of this reform is focused on design and does not require many resources. It is important to underline, as Schuelka (2018) puts it, that inclusive education means that all children are together in regular classrooms for most of the day, proving to have positive effects on student achievement and social well-being, being much more efficient and effective than special schools and classrooms. It is noteworthy that although the term 'inclusive education' is often made synonymous with education for children with

disabilities, it will be inclusive for all children with very different attributes, such as ethnicity, language, gender and socio-economic status (Schuelka, 2018).

This inclusive school has been reinforced in the Salamanca Statement (UNESCO 1994) adopted at the world conference that recognised education for all as an institution. According to Messiou (2017), it can be interpreted that all children can learn, all children are different, and that difference is a strength, therefore, the quality of the learning process must be improved through collaboration with students, teachers, parents and society.

On the other hand, within the large group of students in school classrooms, Autism Spectrum Disorder (hereinafter ASD) is a topic of interest for current educational issues due to the prevalence figures. According to the World Health Organisation (WHO, 2022), one in every 100 children in the world is diagnosed with ASD. Specifically, the American Psychiatric Association (2013) defines ASD as a disorder characterised by difficulties in communication and repetitive behaviours, presenting persistent impairment in social interactions and communication in different situations, including the destruction of mutual socio-emotional relationships. As Abdollahi and Ershad (2023) point out, ASD is diagnosed and recorded according to the severity of symptoms as well as the amount of support needed in social interactions. Authors such as Vargas and Gutiérrez (2023) indicate that these deficits in social interaction lead to a delay in the effective development of social skills, which are considered essential for the individual's future autonomous decision-making. Therefore, taking into account the above, the importance of training individuals with ASD in social skills has been demonstrated, and it is essential to stop seeing it as a difficulty that has no solution and to start taking actions to improve the quality of life of these individuals (Vidriales, et al., 2017).

Along these lines, Newbutt et al., (2020) suggest that people with ASD are impacted by the way people relate to the environment through perception, communication and interaction. Furthermore, Lorenzo et al., (2016) state that students with ASD are characterised by extremely specific visual preferences and learning needs. It is this preference for visual learning that has encouraged the use of new emerging technologies such as the use of Augmented Reality (AR). In this regard, AR is presented as an emerging and motivating technology to be included in teaching-learning processes and allows the combination of digital information and physical information in real time by means of different technological supports, such as tablets or smartphones, to create a new enriched reality (Cabero-Almenara and García-Jiménez, 2015). The possibility of experimenting with the object provides great opportunities for learning, improving attention, motivation and memory; consequently, the technological possibilities of AR can be used to help children with ASD (Lim et al., 2019).

## 2. Objectives

The main objective of this project is to apply Augmented Reality to enhance social responses in students with Autism Spectrum Disorder. The following research questions have been extracted from the general objective underpinning this intervention:

1. Do students with ASD say hello at the beginning of the session?
2. Do students with ASD say goodbye at the end of the session?
3. Do students with ASD communicate throughout the session?

## 3. Method

This project has been carried out thanks to the collaboration of all the members of the IncluTIC research group. Specifically, the method of this work is a quantitative approach, with a quasi-experimental design with a control group and an experimental group. Participants were selected using a non-probability sampling method with an available or accidental nature that was easily accessible or accessible. To prepare for the creation of the AR environments, an interview was conducted with tutors, therapists, psychologists, and speech therapists.

### 3.1. Description of the context and participants

The sample consisted of a total of twelve students with ASD aged between 4 and 24 years, with an average age of 13.66 years. With regard to the degree of ASD according to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) (American Psychiatric Association, 2013), 16.67% of the students have level I ASD, 50% have level II ASD and, finally, 33.33% have level III ASD. On the one hand, 6 of the subjects attend a Special Education centre and, on the other hand, 6 of the students attend a Specific Special Education Unit. Both locations are in the city of Alicante.

### 3.2. Study variable and instrument

In this research, the social response of students with ASD based on the intervention carried out with the application of AR through the use of the tablet has been selected as the study variable. In this line, the research variable has been studied based on three parameters: the greeting when the session begins, the farewell when the session ends and the communication presented throughout the session.

Regarding the instrument used in the educational intervention, it consists of a field notebook designed *ad hoc* to collect the information. For this purpose, a descriptive statistical analysis of the participants was carried out to calculate frequencies and percentages.

### 3.3. Procedure and data analysis

The educational intervention is based on the design of a set of activities that the students have to carry out and that constitute the instruments for collecting information. To this end, visual learning is promoted in such a way that, in the event of any success, the AR system reinforces this behaviour, and, in the event of any error, the system guides the student towards the correct path. In order to develop the research, a series of steps have been carried out, which are detailed below.

1. Selection of the subjects who took part in the study.
2. Preparation of the intervention through the design of activities.
3. Implementation of the activities in the control group and the experimental group.
4. Data collection throughout the sessions.

Once the intervention had been planned and implemented and the data had been collected, the results obtained were analysed using the SPSS statistical package for Windows (Statistical Package for Social Sciences) version 25.

## 4. Results

With respect to the results, following the analysis of the data obtained, a table has been created in which the responses to the three study parameters, derived from the main variable, chosen for this research, can be seen.

*Table 1. Values obtained for the three study parameters.*

| Session | Value | | Greeting at the start | | | | Farewell at the end | | | | Oral communication | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Control group | | Experimental group | | Control group | | Experimental group | | Control group | | Experimental group | |
| | | | f | % | f | % | f | % | f | % | f | % | f | % |
| 1 | Valid | No | 5 | 83,33 | 1 | 16,67 | 6 | 100 | 3 | 50 | 3 | 50 | 1 | 16,67 |
| | | Yes | 1 | 16,67 | 5 | 83,33 | 0 | 0 | 3 | 50 | 3 | 50 | 5 | 83,33 |
| 2 | Valid | No | 4 | 66,67 | 1 | 16,67 | 4 | 66,67 | 0 | 0 | 2 | 33,33 | 1 | 16,67 |
| | | Yes | 2 | 33,33 | 5 | 83,33 | 2 | 33,33 | 6 | 100 | 4 | 66,67 | 5 | 83,33 |
| 3 | Valid | No | 4 | 66,67 | 0 | 0 | 3 | 50 | 0 | 0 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 2 | 33,33 | 6 | 100 | 3 | 50 | 6 | 100 | 5 | 83,33 | 5 | 83,33 |
| 4 | Valid | No | 6 | 100 | 0 | 0 | 2 | 33,33 | 1 | 16,67 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 0 | 0 | 6 | 100 | 4 | 66,67 | 5 | 83,33 | 5 | 83,33 | 5 | 83,33 |
| 5 | Valid | No | 4 | 66,67 | 1 | 16,67 | 1 | 16,67 | 0 | 0 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 2 | 33,33 | 5 | 83,33 | 5 | 83,33 | 6 | 100 | 5 | 83,33 | 5 | 83,33 |
| 6 | Valid | No | 4 | 66,67 | 0 | 0 | 2 | 33,33 | 0 | 0 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 2 | 33,33 | 6 | 100 | 4 | 66,67 | 6 | 100 | 5 | 83,33 | 5 | 83,33 |
| 7 | Valid | No | 4 | 66,67 | 1 | 16,67 | 2 | 33,33 | 2 | 33,33 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 2 | 33,33 | 5 | 83,33 | 4 | 66,67 | 4 | 66,67 | 5 | 83,33 | 5 | 83,33 |
| 8 | Valid | No | 4 | 66,67 | 2 | 33,33 | 1 | 16,67 | 2 | 33,33 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 2 | 33,33 | 4 | 66,67 | 5 | 83,33 | 4 | 66,67 | 5 | 83,33 | 5 | 83,33 |
| 9 | Valid | No | 5 | 83,33 | 1 | 16,67 | 2 | 33,33 | 0 | 0 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 1 | 16,67 | 5 | 83,33 | 4 | 66,67 | 6 | 100 | 5 | 83,33 | 5 | 83,33 |
| 10 | Valid | No | 3 | 50 | 0 | 0 | 1 | 16,67 | 0 | 0 | 1 | 16,67 | 1 | 16,67 |
| | | Yes | 3 | 50 | 6 | 100 | 5 | 83,33 | 6 | 100 | 5 | 83,33 | 5 | 83,33 |

Specifically, in relation to the first parameter of the study, greeting at the beginning of the session, we show the number of students with ASD in the control group and the experimental group who greeted at the beginning of the session in each of the sessions carried out. In reference to this first parameter, it can be seen that, from the first session, more than half of the students in the experimental

group (83.33%) greeted at the beginning of the session, compared to the control group (16.67%). Similarly, the data concerning the second parameter of the study can be seen. In particular, it is reflected that the percentage of students who produced this skill was higher in the experimental group than in the control group. Finally, with regard to the communication presented throughout the sessions, the same results were obtained for both groups from the third session onwards.

## 5. Discussion and conclusions

Based on the research questions derived from the general objective of this study, these questions are answered in conclusion.

In general, it can be seen that students with ASD who have made use of AR greet a higher percentage at the beginning of the sessions than students who do not make use of AR. This fact, as Kellems et al., (2022) argue, could respond to the lack of interest on the part of some individuals with ASD in the use of traditional instructional models. Because of this, students in the control group start the sessions with less predisposition towards the work, obtaining, as indicated by Frolli et al., (2022), a weak rate of motivation towards the initial social response.

In relation to the farewell, the results show that students who have made use of the tablet with AR have responded on a greater number of occasions to the final part of the session. In this regard, Romero et al., (2020) affirm that AR generates positive results, as it proposes a pleasant environment to the subject, which is evidenced by an improvement in participation, a reduction in the level of stress and a predisposition to work and perform new tasks, which can help, according to Almurashi et al., (2022), to prevent students from getting bored quickly. Also, in line with Adnan et al., (2018) the use of this tool provides satisfaction and confidence in the use of AR applications among learners with ASD and this generates an improvement in the response of subjects with ASD to stimuli from other people.

Regarding the oral communication presented in the sessions, the same number of responses was observed from the third session onwards by both working groups. However, the subjects who made use of AR began to communicate orally from the first session onwards. In this line, as in other research using Augmented Reality compared to a traditional methodology, AR increased the emergence of expressive language. Specifically, Nubia et al., (2015) points out that Augmented Reality applications stimulate oral and expressive language through the reproduction of onomatopoeias and sounds representative of the elements in contrast to the traditional method. Similarly, Almeida et al., (2015), illustrate the potential of AR systems to be used in the development of language skills due to the significant increase in interaction and communication initiated by children.

Finally, in reference to the general objective of the study, it can be affirmed that the use of Augmented Reality has been beneficial in increasing social responses in students with Autism Spectrum Disorder, as it has promoted social interaction to a greater extent before starting and after the sessions than students who have made use of a traditional methodology. In this sense, authors such as Lee et al., (2018) support the idea that the use of Augmented Reality can help promote greeting behaviours in individuals with ASD, helping to foster improved understanding of non-verbal social cues and, in this way, they learn to reciprocate when interacting socially with others. However, it should be noted that how AR intervention affects oral communication needs to be further studied, as no relevant results have been found in this regard.

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# A FICTITIOUS VEHICLE MANUFACTURING COMPANY
# AT A UNIVERSITY AS INTERDISCIPLINARY FRAMEWORK TO COMBINE
# STUDY PROGRAMS

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## Abstract

Interdisciplinary thinking is becoming an increasingly important competence for meeting the challenges of our time, for example in the areas of sustainability or even digitalization. Successful value creation can only be achieved if all subject disciplines work together. Universities, too, must adapt to these needs and anchor the teaching of these competencies in their courses of study. In this context, interdisciplinary cooperation cannot be limited to the curricula, but must also bring together the teachers and the learners in a common context. Traditionally, universities have found it difficult to develop interdisciplinary scenarios. The teaching scenarios themselves must already provide interdisciplinary content and learning objectives. The challenge here is multi-level. First, it is a great challenge to connect the modules of a course of study in a thematically meaningful way. Second, it is the linking with other study programs that brings about the most sustainable interdisciplinary effects. One possible solution, which has been tested for several years, is to set up a fictitious company as a digital learning factory, which serves as a basis and reference for the interlinking of individual modules of the various courses of study. The scenarios that can be depicted here are extremely application-oriented, which means that not only can internal university modules be very easily aligned with them, but external partners, can also get a simple participation. Furthermore, the participating courses of study can continue to maintain their original core competencies while participating in the interdisciplinary scenarios via the modules that are aligned accordingly with the learning factory. A company from the vehicle construction sector was selected as the business model in order to be able to map another focus at the same time, autonomous driving. The individual departments of the company are linked professionally with the contents of the individual courses of study. Study programs, such as industrial engineering, form the design department, whereas technology-oriented study programs, such as business computing, represent technical development, in particular the area of driver assistance system development. In addition, the relevant departments also include economics and so on. The special feature, however, is the fact that real products in the form of vehicles on a scale of 1:14 are also created and continuously developed, which is an important success factor of the learning factory. The following article transfers the experiences made into a scheme of different levels of interdisciplinary forms of teaching within the framework of the learning factory and classifies and explains the existing scenarios accordingly. Furthermore, the teaching formats used, which have proven to be effective in imparting competences, are described.

*Keywords: Higher education, science and technology education, educational environment, technology in teaching and learning, new learning and teaching models.*

## 1. Introduction

Even though universities are an established and traditional institution for training professionals, they are not immune to disruptive change and the constant need to reinvent themselves. Several aspects come together here and justify the increased need for new teaching formats. As described in Morris-Lange (2019), demographic change, in this case related to Germany, is leading to declining capacity utilisation and more competition for new students. Furthermore, as described in Putrienė (2015), the demands of the labour market for interdisciplinary and application-related competences of graduates are increasing in order to meet the needs of the fast-moving world of work. Acquired competences count more than the name of the degree program. As explained in Ehlers and Kellermann (2020), the so-called future skills are the focus of these developments. Braßler (2020) sees interdisciplinarity as one of the possible options for solving this problem. Interdisciplinarity in teaching should, as described in Frehe,

Klare, and Terizakis (2015), represent an interplay of subject content, didactic form and its organisational embedding. The approach of a university-wide learning factory described below, as it has been tested in practice at this university since 2017 and is constantly being expanded both horizontally and vertically, represents an application-related solution to the challenges listed above.

## 2. Overview of the pilot learning factory

As already mentioned, this learning factory was launched in 2017 as a university-wide format. This was preceded by in-depth considerations of how future teaching formats at a university of applied sciences can meet the increasing need for practical orientation and interdisciplinarity in the future. As described in Abele et al. (2017), the concept of learning factories is not new and at the same time in many different uses. In this work, the learning factory teaching format is used as an open format, constrained both internally and externally and thematically only by the lived business model. Thus, the present learning factory "Wildauer Maschinen Werke - WMW" is not limited to the field of production engineering or finance, but includes all relevant courses of study that can be aligned with the business model of an automotive manufacturer. Figure 1 shows the assignment of courses of study at the university with the classic departments of an automotive manufacturer. In the assignment, care was taken to highlight as many core competencies of the degree programs as possible and to dock them onto the WMW as classic job profiles. Students of industrial engineering, for example, function as classic design engineers (Construction) in the context of WMW-related lectures, whereas students of business computing function as development engineers (Technical Development) in the area of driver assistance system development. According to this system, courses in economics up to logistics or automation technology are also involved in the respective departments.

*Figure 1. Assignment of departments of the learning factory to study programmes.*
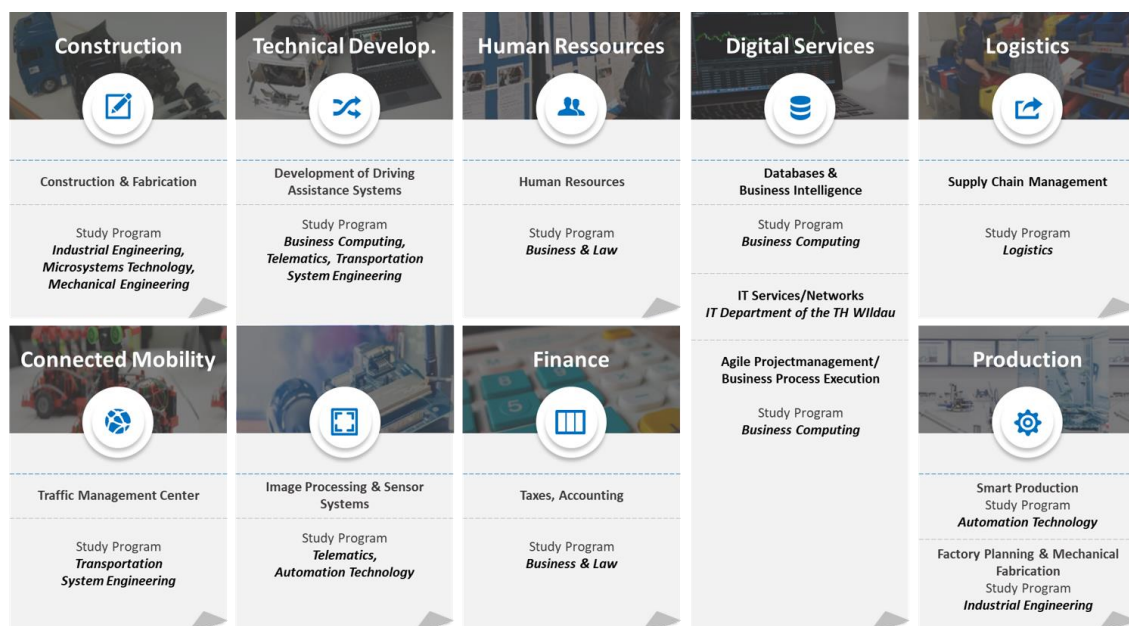


A significant feature of WMW is the fact that it is not only a fictitious business model, but that real products are also designed, manufactured and further developed. Figure 2 shows a vehicle from the WMW fleet. The fleet itself is implemented on a scale of 1:14, although there are also extensions in the context of industry cooperation with vehicles on a larger scale. The fleet vehicles are completely self-designed (computer-aided design) within the framework of lectures, projects and theses and are predominantly manufactured at the university (3D printing, computerized numerical control milling, etc.). In addition to in-house design, the development of autonomous driving functions and the corresponding equipment of the vehicles represents a further focus of the learning factory, via which a large number of study programs can be integrated. The vehicles are equipped with the corresponding state-of-the-art electronics for sensors (lidar, ultrasound, cameras, GPS, WLAN), actuators (servo motors) and computing technology (AI-capable developer kit). The components are networked via the Robotic Operating System (ROS), which enables lightweight processing and use of the vehicle data. Students can develop driving functions using various programming languages (Python, C/C++) or model-based development

frameworks (MathWorks MATLAB/SIMULINK) and test them on the vehicles. Thus, an environment is provided that enables the further development of all relevant areas of the learning factory within the university itself, but in such a consistent, application-oriented and practical way that students, prospective students as well as internal and external partners can participate very easily.

*Figure 2. Example of a self-designed vehicle of the WMW fleet.*



## 3. Scheme for classifying the scenarios according to the levels of interdisciplinarity

In the following, the teaching formats tested so far, which could be implemented in the learning factory, will be explained in more detail with regard to their interdisciplinarity and practical relevance by means of examples. Figure 3 shows a proposal for a scheme, which helps to classify the level of the characteristics accordingly by a corresponding classification.

In the interdisciplinarity dimension, connection and reference points in courses with an increasing level of interdisciplinary networking within and beyond the boundaries of the study program are plotted. In the practice orientation dimension, abstract teaching formats are plotted in ascending order with respect to practice orientation. Four quadrants can be derived from these dimensions, which can be used to cluster the following application examples of the learning factory and facilitate understanding. Further formats are conceivable, but only the examples tested so far will be discussed.

*Figure 3. Dimensions of interdisciplinarity and practise-orientation in learning factories.*
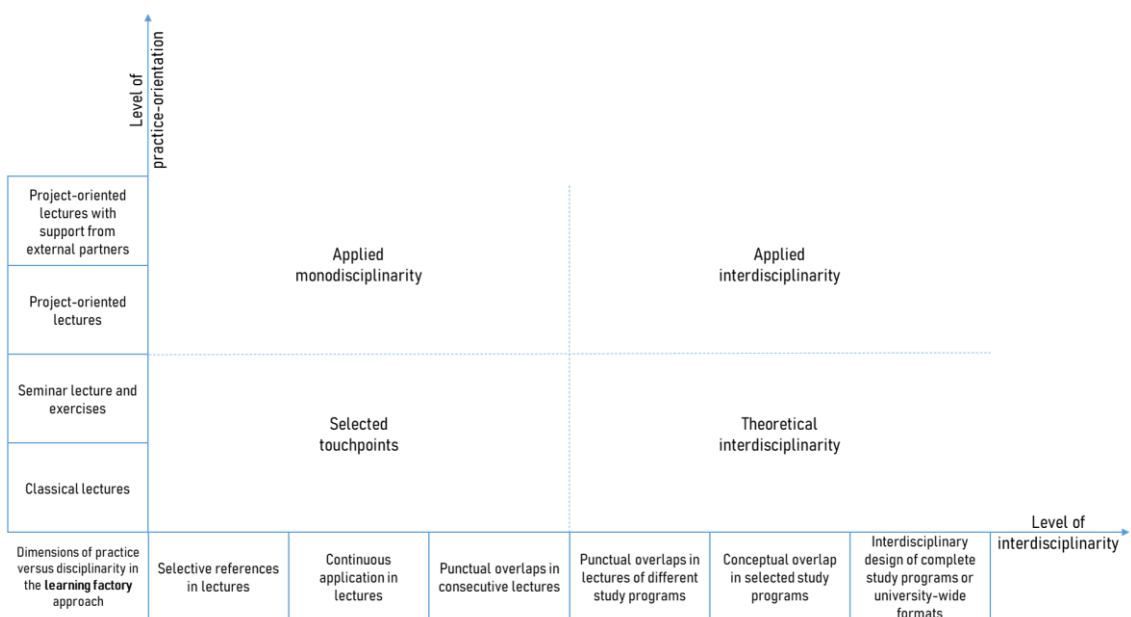
## 3.1. Selected touchpoints

This quadrant represents a mixture of classic teaching formats and initial content linkages from the content of the learning factory. Selected references in a classic format is, for example, the lecture Investment and Financing in the Business Administration study program, which refers to the WMW production facilities on campus. In selected exercises, students apply their acquired knowledge to calculate depreciation and procurement of these production facilities. In addition, students visit the production facilities on campus to gain real-world exposure to items in their calculations that would otherwise be covered only in theory.

An example from the continuous adaptation of a lecture with the contents of the learning factory is the database course in the study program business computing. Here relational database models are used and built up in lectures and exercises using the example of WMW, i.e. the requirements of a manufacturing company. Aspects such as employee and customer administration, production locations and also the vehicles themselves are modeled in a normalized data structure.

Based on this lecture, the following lecture Business Intelligence in a later semester was adapted accordingly. This module deals with the visualization and analysis of data. In the context of the learning factory, the already known data sets are now used for learning visualization and analysis techniques. For the students, this can provide a faster and deeper learning effect, since the WMW data structures are already known and they can fully concentrate on the new technical content, instead of having to understand new accompanying case studies with each new lecture, as was previously the case. This increases the understanding of the big picture from a data perspective.

## 3.2. Theoretical interdisciplinarity

In this quadrant, touchpoints in lectures of different courses of study are addressed with reference to the learning factory, which at the same time remain predominantly in the classic lecture format and few references to external topics. This type of overlap is still relatively rare and will be expanded more in the future. One example of selective overlaps of two study programs is the lecture risk management in the European management study program with the seminar-oriented lecture function development in the study program business computing. In this case, the students of both lectures come together for several joint dates in the current semester. The business computing students present their respective group work in the area of WMW function development. The European management students then begin to apply the theoretical knowledge they have previously acquired about risk analysis and avoidance to the WMW topics. In further follow-up sessions, the risk analyses are further refined together and the final reports are then distributed to the entire group. The students of both groups experience very practically and from both sides what is important in such audits as well as the developments.

## 3.3. Applied monodisciplinarity

The lectures in this quadrant are characterized by a high level of practical orientation, partly also with strong references to topics of external partners in the context of the learning factory, although at the same time only one study program is involved. One focus here is on lectures dealing with the mapping of WMW's driver assistance systems department. The development of autonomous driving functions is an important innovation topic for mobility companies and offers a large number of study programs potential for linking up. In particular, the project-oriented lectures of the Business Computing program are worth mentioning. In this setting, students in the Bachelor's and Master's programs work in an agile context over several semesters on the implementation of various user stories in the area of driver assistance. This includes, for example, the modeling of assistance functions for WMW fleet vehicles or the development of simulation environments. At the same time, various cooperations with external partners, for example an automobile manufacturer, a supplier and a research company, could be achieved in this format, which contribute their own user stories in the context of WMW to the project events. The WMW scenarios are thus supplemented with real content from the business world. Students get to know representatives from practice and these in turn gain access to future specialists.

## 3.4. Applied interdisciplinarity

Lectures in this quadrant represent the highest level of interdisciplinarity and practical orientation. The activities surrounding the ongoing design and production of the WMW vehicles themselves represent a link between several study programs that has been practised from the very beginning. Analogous to real companies, the product is constantly evolving due to internal and external requirements. In the case of the WMW learning factory, for example, the car body must be constantly adapted to the requirements resulting from the driver assistance electronics, for example, in the design of modified car body parts for the integration of sensors. Here, the students involved in the development of autonomous driving functions for the WMW, which include the study programs automation technology,

telematics, traffic systems engineering, logistics and business computing, coordinate with the students from the design department, whereby here the study programs in industrial engineering and mechanical engineering with their computer-aided design lectures and agree on corresponding task packages. The interdisciplinary experience gained here is not only of a technical nature. Nontechnical topics, such as conflict management in the event of non-compliance with agreed deadlines or insufficient implementation because requirements were not specified in sufficient detail, are also included and result in invaluable experience, especially for later professional life.

An example of the simple integration of external topics in this context is the cooperation with a regional vehicle construction company, which is developing a new chain-driven, floatable vehicle for use in disaster scenarios. For later equipping with assistance systems, for example autonomous fire-fighting water procurement, the vehicle was also implemented on a scale of 1:14 by the WMW design students. Subsequently, the corresponding WMW electronics were integrated into the vehicle by the students of the driver assistance system department and the first assistance systems were developed and demonstrated.

## 4. Conclusion and outlook

In summary, it can be said that the interdisciplinary and practice-oriented characteristics of courses in the context of the learning factory are very diverse. The learning factory was established bottom up through the involvement of committed colleagues. There are many more examples of links between different courses of study in the WMW, for example in the areas of logistics, human resources management or IT administration. In the next step, the learning factory should also serve the aspect of internationality more strongly, which is why, similar to real companies, other universities are being sought to expand the location. The goal is to have students from all participating universities work together or in competition on learning factory scenarios and thus train the corresponding competences already during their studies. In the meantime, the learning factory is also being developed top-down as a strategic instrument of the university, for example by founding further learning factories with other business models, as not all course competences can be combined in the business model of a vehicle manufacturing company. For this reason, the "Wildau Software Factory - WSF" was founded, which deals with student software development and consulting projects in teaching. This learning factory also works together with the WMW on an interdisciplinary basis, for example when an accompanying software solution is needed for the WMW and this is implemented by WSF students on behalf of the WMW. Another learning factory that is currently being founded is the "Wildauer Bike Factory - WBF", which deals with solutions for cycling. In this case, a joint venture was agreed between the driver assistance system department of the WMW and the WBF, since the study programs subsumed there do not teach electronics skills and such cooperation constructs also make sense in the real economy.

Last but not least, another university-wide instrument has been derived from the approach of the learning factories in order to sustainably anchor the interdisciplinary and project-oriented approaches in all study programs. The so-called "Interdisciplinary Module" will be a fixed module with constantly changing internal and external topics in several study programs from the summer semester of 2023. The respective topics are worked on jointly by students from different study programs at the same time, allowing completely new teaching and learning formats to be combined with interdisciplinary experiences.

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# ONLINE TEACHING, LEARNING, AND ASSESSMENT: LESSONS IN AFFECTIVE EDUCATION AND SKILL DEVELOPMENT DURING THE PANDEMIC

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## Abstract

The Covid-19 pandemic disrupted higher education classrooms and required faculty, across disciplines and irrespective of their skill or preference, to transition their pedagogical approaches to virtual/online formats. This transition appears permanent. For example, data collected in the United States found that distance education courses are on the rise, with 75% of undergraduate students in the US being enrolled in at least one distance education course in the fall of 2020 (National Center for Education Statistics [NCES], 2022). Most certainly, online education creates unique challenges in the ways that professors address the various domains of learning. This switch from classroom teaching to virtual instruction is particularly salient in the fields that require significant affective education, instruction, and skill development. This is significant in the social sciences such as Human Services, Psychology, and Social Work, where intervention skills and affective change is equally as important as cognitive gains or shifts.

Bloom's taxonomy proposes three learning domains of learning: cognitive, affective, and kinetic/psychomotor (Bloom, 1956). While translating cognitive knowledge is rather simple, the bigger challenge is translating affective and kinetic learning from in-person experiences to those online. Affective learning involves students' attitudes, values, and emotional connection to the material and fellow classmates. In the social sciences, for example, this requires teachers to change how students understand, value, and intervene while working with a client in crisis.

In 2019, The Virtual Learning Leadership Alliance and Quality Matters group assembled a committee of experts (the National Standards for Quality team) which created "best practices" for on-line courses. Originally designed for K-12 settings, these standards are also applicable to higher education environments. These practices include six standards for the development of online courses (National Standards for Quality [NSQ], 2019). Two of the standards address instructional design and learner assessment, both of which ground this presentation.

In this session, we will share lessons learned and teaching tips from our transition from face-to-face skill-based classes to online formats (both synchronous and asynchronous). In particular, this session will explain how to facilitate meaningful online discussions and structure role plays so that each member of the triad (i.e., counselor, observer, client) have a meaningful experience. The workshop will also provide specific examples of how to translate emotional and kinetic learning experiences to an on-line environment. Finally, the session will also share assessment tools such as rubrics that clarify assignment expectations and promote student engagement and learning in a digital educational environment.

*Keywords: Online teaching, affective teaching, learning.*

## 1. Introduction

The Covid-19 pandemic disrupted higher education classrooms and required faculty, across disciplines and irrespective of their skill or preference, to transition their pedagogical approaches to virtual/online formats. In fact, it was estimated that over 98% of worldwide learners (1.725 billion) from pre-school through higher education were impacted by July of 2020 (United Nations, 2020). With very little notice and no guidelines, parents, students, and teachers had to adjust to a new pedagogical experience with mixed results (Lemay, Bozelais, & Doleck, 2021). This transition appears permanent. For example, data collected in the United States found that distance education courses are on the rise, with 75% of undergraduate students in the US being enrolled in at least one distance education course in the fall of 2020 (NCES, 2022). Most certainly, online education creates unique challenges in the ways that professors address the various domains of learning. Not surprisingly, during the pandemic, students were prevented from developing natural, face-to-face connections with one another and noticed this lack of connection. For example, Lemay et al. (2021) reported that over 75% of students either disagreed or strongly disagreed

with the statement "I interacted with my classmates." This switch from classroom teaching to virtual instruction is particularly salient in the fields that require significant affective education, instruction, and skill development. This is significant in the social sciences such as Human Services, Psychology, and Social Work, where intervention skills and affective change is equally as important as cognitive gains or shifts.

## 2. Discussion of frameworks

Bloom's taxonomy proposes three learning domains of learning: cognitive, affective, and kinetic/psychomotor (Bloom, 1956). While translating cognitive knowledge from in-person experiences to those online is rather simple, the bigger challenge is translating affective and kinetic learning for students. Affective learning involves students' attitudes, values, and emotional connection to the material and fellow classmates. In the Human Services classroom, this requires us, as professors, to change how students understand, value, and intervene while working with a variety of clients such as young children, the elderly, or those in the midst of a mental health crisis.

To further advance Blooms' original taxonomy, Krathwohl, Bloom, and Masia (1956) created a five-level hierarchy for the affective domain. The first level, Receiving, involves the student's awareness and willingness to acknowledge the presence of emotional stimuli. Responding is the second level and refers to the student's motivation to engage with the material and respond to others in a satisfying manner. The third level, Valuing, is the ability to understand, accept, and express preference regarding one's values and beliefs. The fourth level, Organization, "…refers to the learner's internalization of values and beliefs involving (1) the conceptualization of values; and (2) the organization of a value system. As values or beliefs become internalized, the learner organizes them according to priority" (Krathwohl et al., 1956). The final level, Characterization, is the highest level of value integration. In this stage, students create a value set and can consistently practice from this frame or perspective. This classification system is helpful in "Setting the stage" as we offer our lessons learned in transitioning our in-person classroom activities to those online.

In 2019, The Virtual Learning Leadership Alliance and Quality Matters group assembled a committee of experts (the National Standards for Quality, or NSQ, team) which created "best practices" for on-line courses. Originally designed for K-12 settings, these standards are also applicable to higher education environments. These practices include six standards for the development of online courses (NSQ, 2019). Standard A focused on course overview and support which includes policies and procedures related to course expectations, grading, and the role of the syllabus. Standard B discusses the role of course content including issues related to accessibility and ensuring course materials are aligned with course objectives. Standard C involves instructional design issues. Key aspects of this standard involve creating activities and opportunities for students to engage with the material, each other, and the instructor. Standard D examines learner assessment and addresses the need for varied and flexible assessment strategies. Standard E focuses on accessibility and useability for all types of learners. The final standard (F) explores technological issues such as learning platforms and internet programs (NSQ, 2019). For our discussion, we used the principles and techniques that are most closely aligned with Standard C (Instructional Design) and Standard D (Assessment). Taken together, Krathwohl, Bloom and Masia's five-level hierarchy for the affective domain and the NSQ Standards around instructional design and assessment allowed us the most support in designing intentional, effective, assessment tools and instructional activities that were well-suited for the achievement of our online course objectives.

## 3. Examples of virtual classroom activities

### 3.1. Receiving level

The first level of the hierarchy is Receiving, and this level addresses the student's willingness to acknowledge the presence of emotional stimuli (Krathwohl et al., 1956). As instructors in a Human Services and Counseling Department, the Receiving level requires us to consider how, from the initial class meeting, we create an environment conducive to emotional learning which relates well to the NSQ's Instructional Design Standard. We take care to facilitate meaningful introductions between the class as a whole and within small groups, which is a format we frequently use to allow students the ability to create safe space to discuss emotionally laden material. We not only discuss rules and expectations of the course, but also how, in an online format, to adhere to appropriate virtual classroom etiquette standards and interaction expectations. We use the first-class meeting to create a sense of community within the classroom, develop student-led behavioral expectations, and discuss safety in topics often raised in our classrooms such as substance use, physical abuse, and suicide.

An additional strategy to prepare students for emotional learning is the use of guest speakers to role-model engaging in affect-laden material. Guest speakers are often used to present content as a replacement for or supplement to the professor's instruction. We suggest using guest speakers to demonstrate how to connect with emotional topics. For example, a guest speaker will share their personal

journey as a helping professional. They will discuss how they manage complicated issues like countertransference and vicarious trauma. The guest speakers demonstrate what we expect students to do later in the course- develop a self-reflective practice that explores the meaning behind the work, not just the work itself.

## 3.2. Responding level

The Responding level refers to the student's motivation to engage with the material and respond to others (Krathwohl et al., 1956). An excellent example of Responding activities and Standard C (Instructional Design) is the use of creative and intentional discussion boards. Certainly, discussions (pre-pandemic) in the classroom needed to continue despite the transition to online platforms. However, we observed that the prior tendencies that occurred in face-to-face classrooms (e.g., several students doing most of the contributing, introverted students allowing others to answer most of the open-ended questions posed by the instructor, etc.) were only amplified by the online platforms of Zoom or Teams. Therefore, from an instructional design perspective, we adapted our use of discussions to include both synchronous and asynchronous courses and provided more structure for students in both settings. For example, when we hold online, synchronous class meetings, students are provided with the discussion prompt using the chat feature in addition to the verbal directions. Typically, the instructor provides context and information first, and then leads the class in a large (or small) group discussion. Regardless of the type, students are given expectations ahead of time such as "we will take our first break after everyone in the course has made at least one contribution" or "students with opinion A must pair themselves in a group with at least one student holding opinion B." That way, despite the distance, students feel obliged to contribute. Sometimes students are also given the choice to contribute one of two ways: "off-mute" (verbally) or in the chat (non-verbally). It is encouraging to note that multiple students who remain introverted during synchronous class verbal discussions have slowly taken over a large presence in the chat feature of a discussion held virtually.

In asynchronous course modules, students receive even more instruction and structure around discussion expectations from the professor. For example, after watching several video clips, students will be required during an asynchronous class to contribute to a discussion thread. In each discussion, students are required to make two contributions: an initial post and an interaction post. They are told in the initial post to include things like which video they have selected to summarize and why (e.g., most helpful, generated the most questions, made them think of a related topic previously discussed, etc.). They often summarize the key points or takeaways and offer the most relevant or helpful information to those students who chose a different video. Then, in the second part, their interaction post*s* usually include questions to classmates. They are often asked to select one person with whom they agree and one with which they disagree. In many instances, we have observed that this format can generate more balanced, rich discussion than when compared to in-person interactions between students.

Related to the idea of Responding to material is the process of receiving feedback from the professor. An important component of NSQ Standard D (Learner Assessment) is the need for varied and flexible assessment strategies (NSQ, 2019). Some important lessons from our transition to on-line modalities included the need to transition from heavily weighted assignments that were due at the end of the semester to projects that were broken down into smaller parts with due dates spread throughout the semester. This approach also allowed for frequent faculty feedback on various project components (e.g., outline, presentation topics, presentation delivery strategies) instead of one-time feedback at the conclusion of the project. Students were also given more flexibility regarding the construction of assignments. For example, students could present their group project either live, or as a pre-recorded video. In addition, several instructors changed their examinations procedures from everyone completing the exam on a specific day/time to a model in which the exam is available for a period of time (e.g., 5 days). Exams are still timed (e.g., no more than 90 minutes) and students have only one attempt, but they can choose the day/time that is best for them.

## 3.3. Valuing level

Valuing is the ability to understand, accept and express preference regarding one's values and beliefs (Krathwohl et al., 1956). A good example of Valuing activities is the use of role-plays and peer-to-peer feedback. In Human Services, many courses in our curriculum are skill-based and hands-on such as Cognitive Behavioral Therapy, Small Group Dynamics, and Counseling the Substance Abuser. Embedded in these courses is the frequent use of peer feedback. Since the courses involve the development of important counseling skills, the habit of engaging in clinical supervision is also part of the learning. The courses include significant amount of class time for role-playing and skills practice. Since it is impossible for the instructor to be present at every practice session, students need to learn how to give honest, supportive, and helpful feedback. They also need to develop the skills needed to engage effectively in supervision; these skills are grounded in the experience of accepting constructive feedback and incorporating that feedback into their practice. For many activities, students are divided into triads:

counselor, client, coach. Each student in the triad will have the opportunity to play each role. The coaching role is vital and offers students the opportunity to give feedback to the "counselor" in the triad. A common expectation of the "coach" is to offer one area of strength and one of needed improvement.

Considering the importance of assessment (NSQ Standard D), students are asked to understand and express their values and beliefs as they move through our sequence of coursework. In our Introduction to Human Services class, student complete a self-assessment instrument exploring their strengths and weaknesses on certain counselor traits like empathy, acceptance, and genuineness. In an essay, they discuss their findings and design a plan for areas they wish to improve. In our classes that require group work, students often use a rubric that they complete midway and then again after the final presentation is submitted. Students rate themselves and their group members on criteria such as Listening Skills, Preparation, Leadership, and Openness to Others' Ideas (Altman, 2009). We have found that these tools aid in clarifying assignment expectations and promote students' ability to self-assess and monitor their progress throughout the semester. Finally, students express their values and beliefs through a number of writing assignments as they work in internships. For example, students conduct a cultural competence assessment as well as an ethics assessment in which they use their observations of their placement to compare and contrast what they have learned in their coursework. Expressing their preferences for their values and beliefs is especially important when what they observe as interns in the field contradicts what they learned in the classroom. The subsequent discussions with their supervisor about these discrepancies are often rich and productive conversations that students report as being novel and often very impactful.

## 3.4. Organization level

Organization refers to the student's ..."internalization of values and beliefs involving (1) the conceptualization of values; and (2) the organization of a value system. As values or beliefs become internalized, the learner organizes them according to priority" (Krathwohl et al., 1956). During and after the pandemic, faculty have had success with several online activities, rituals, and behaviors that promote students' learning (both emotional and kinetic) at the Organization level.

Regardless of delivery mode (online, face-to-face, hybrid), we believe that the most meaningful work on the Organizational level of the hierarchy occurs in our field experience courses where students work in the field for 15, 20, or 30 hours per week under the supervision of a Master's-level professional and then attend a seminar-style class on campus with faculty to promote additional reflection and education. Predictably, they face many practical and developmental challenges that test their belief systems such as the maintenance of professional boundaries and the on-going need for self-care. During each virtual class meeting, students engage in the topic of boundaries and self-care through small, breakout discussions, student-led facilitations of the entire group, and through their reported "check-in" about how their experience on the job is going. The rich discussion that follows often helps to reinforce their emerging abilities to problem-solve and highlights the nuances involved in the shift from student to professional.

Moving to an online teaching modality created challenges in the ways that students were able to bring their successes and vulnerabilities into the seminar course. It was important for us as faculty to cultivate a classroom culture in which sharing, albeit on the computer screen, remained a central focus of the curriculum. The organization or internalization of values and beliefs happens as students experience their field placements and interact with clients. This internalization is bolstered by our efforts as faculty to get them talking about the meaningful takeaways of their placement and the way this learning has either reinforced what they learned in the classroom or challenged what they have been taught. As instructors, we send out prompts for this week's topic, related events in the media that may spark additional interest from the group, and directions about any additional assignments or activities that they should anticipate.

In terms of assessment, we have shifted significantly how a student earns their grade in the field course; that is, participation, engagement, and professionalism during class is more heavily weighted to incentivize students to anticipate their contributions and plan for their time as the contributor of our classroom content. It seems that as we expect students to organize their experiences and beliefs and subsequently prioritize them, we too should place a priority on their ability to communicate those beliefs as and reward them accordingly.

## 3.5. Characterization level

Characterization is the highest level of value integration. In this stage, students create a value set and can consistently practice from this frame or perspective (Krathwohl et al., 1956). Similar to the Organization level, the Characterization level is best exemplified in our students as they are completing their Senior Experience as an intern in the field of Human Services and Counseling.

As virtual students, the seniors in this course are more comfortable with the structure of online course delivery, and this makes it easier as an instructor to ask them for additional input during class meeting times. They often report being offered jobs from their internship placements towards the end of the semester, and we create discussions for students to offer advice to one another about not only

job-seeking, but also the refusal of job offers, networking with colleagues, and the pursuit of higher education (as a Master's degree in Counseling has become more necessary in our field). The peer-to-peer feedback is an important concept in the senior-level course as it allows for students to show their value set and then explore, through their peer relationships, how to articulate, adjust, and benefit from that clarity of perspective.

A second example of Characterization is students using an ethical decision-making model to examine an ethical dilemma they have encountered in the field. In the Senior Internship class, students present an example of a situation that they have faced since joining the field of Human Services as a Practicum student. Typically, the selected example represents one that generated a significant emotional response from the student, as it might include an unexpected response from a supervisor or an agency's position on an issue that a student only recently learned about in the classroom. The discussion in the classroom informs the student's subsequent paper on the topic. Students report this exercise is particularly meaningful as the support received in the classroom often allows for a better response or behavioral shift in the workplace. It is only through the Characterization level that a student is able to consistently practice using their values developed over the course of the formal and informal education on campus and in the workplace.

Finally, our virtual students are engaging more and more with telehealth principles and practices. One shift since moving to an online format occurred in a senior-level counseling class that addresses trauma in clients. Often, the students are role-playing counseling skills with one another in addition to completing modules organized by various course topics. At the end of the semester, the student can choose to write a letter to their future, clinical supervisor introducing themselves or they can choose to make an introductory video. It has been very gratifying to watch the group of students over the last few semesters transition from the comfort of the letter writing to the relative ease that they create dynamic, interesting, and personal videos aimed at introducing themselves to a future supervisor. In the video, they talk about their needs in (and out) of supervision, their areas of strength and vulnerability, and their emerging theoretical orientation. As instructors, it is very exciting to see our students become adept at technological advances, so much so that they eagerly embrace online platforms in mental health treatment. This particular assignment represents well how our students are able to fully integrate and practice from a set of values by the completion of their senior internship course.

## 4. Conclusion

Like virtually every other industry, higher education was significantly disrupted by the Covid-19 pandemic. The transition from face-to-face course meetings to virtual class meetings, both synchronous and asynchronous, appears to be an enduring shift for college students and faculty. Using Bloom's taxonomy and the National Standards for Quality best practices for on-line courses, the authors offered strategies for engaging students in the online classroom. In particular, the promotion of affective learning was emphasized using the Krathwohl et al. (1956) hierarchy for the affective domain. From the first class meeting in which affective engagement begins, to the ways in which assessment is conducted, the authors offer ideas and tools for engagement in the affective domain of a student's development.

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# SUSTAINABLE FASHION DESIGN PRACTICE IN THE STUDIO-BASED CLASSROOM

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## Abstract

Today's prevailing fashion industry system has become extraordinarily polluting and wasteful. Many have already criticized the considerable waste generated during the current manufacturing process. Fashion practitioners have also proposed plenty of modest attempts. However, as one of the most vital aspects supporting the current industry paradigm, fashion design education must take its sustainable responsibilities thoroughly. Few studies investigate ways to implement sustainability practices in classroom teaching, and literature about creating an unfettered environment for fashion design students to come up with solutions is still relatively rare. With the increasing awareness of environmental issues, fashion design education has reached its curving point. Many researchers have addressed the necessity for an alternative teaching and learning approach in fashion education. How to bridge the gap between values and collaborations, academic practices, and industrial expectations is a paradigm-shifting question to be responded to. In this paper, the authors have set out their experience conducting an innovative sustainable fashion design workshop in the studio-based classroom by outlining the holistic teaching and learning process and proposing critical questions and reflections around pedagogy and projects. The authors wish to provide a reflective example for further discussions around new pedagogical norms, which might generate the collective evolution of a new curriculum to educate future designers to contribute to the sustainable fashion industry.

*Keywords:* Sustainable fashion, Fashion practice, Fashion design education, Studio-based teaching, and learning.

## 1. Sustainable fashion practice and education

Today, our prevailing system of the fashion industry has become extraordinarily energy-consuming and wasteful; with its utterly linear way of production, distribution, and consumption, the fashion industry has become the second most polluting industry globally. According to the report of the Ellen MacArthur Foundation (2017), during the conventional garment production process, 25 percent of the material is cut off on average. This figure can sometimes be 40 percent or more, with less than one percent of the factory offcuts recycled into new clothing. The rest is landfilled or incinerated, which leads to a detrimental impact on the environment. Transitioning this current production process to a more efficient one by minimizing offcuts and eventually making it a new normal has become an urgent requirement for fashion designers. Many practitioners have already criticized the considerable waste of the contemporary fabric cutting way. Rudofsky (1947) was among the first to formulate such a critique. By comparing the Western pattern-cutting method with historically efficient cutting examples, such as the ancient Greek dress, he questioned the modernity of fashion. Various methods are then being practiced to reduce fabric waste. Many fashion designers have demonstrated such methods, such as Ernest Michahelles' TuTa in 1919, Zandra Rhodes's Chinese Squares in 1980, Issey Miyake's A-POC in 2002, and Holly McQuillan's Make/Use in 2018. Despite these modest attempts, fashion design education, one of the most vital aspects supporting the current industry paradigm, has not yet taken its sustainable responsibilities thoroughly enough.

Only some studies investigate ways to implement sustainability practices in classroom teaching, and literature about creating an unfettered environment for fashion design students to come up with solutions is still relatively rare. With the increasing awareness of environmental issues in the fashion industry, the necessity to evoke an unconventional teaching and learning approach in sustainable fashion design education has already been addressed by many practitioners and researchers (Fletcher & Williams, 2013; Gardetti & Torres, 2013; Kennedy & Terpstra, 2017). "How to form a bridge between the values

and approaches of collaborative, ecological fashion practice and the expectations of the mainstream industry" (Fletcher and Williams, 2013, p. 86) is a paradigm-shifting question to be responded to. Wals (2011) recommends adopting new forms of teaching and learning within emerging practices, focusing on "real" issues for engaging students, shifting the learning goals to learning processes, and enabling students to find ways to engage in sustainability as practice. Hansen and Lehmann (2006) suggest that partnerships between universities and industries should be established and enhanced to forge the collective evolution of new curricula to educate future designers as agents of change and to develop grounded perspectives regarding their potential. In this paper, the authors described the experience of conducting a sustainable fashion design workshop, adopting the studio-based approach. By outlining the holistic teaching and learning process, proposing testing questions, and critical reflections around pedagogy, activities, and projects, the authors wish to provide a reflective example for further discussions around new pedagogical norms, which might hopefully generate "a continuous recreation or co-evolution, where both education and society are engaged in a relationship of mutual transformation" (Orr, 2001, p. 9).

## 2. An innovative lining workshop

### 2.1. Workshop introduction

The workshop was conducted in Politecnico di Milano (POLIMI), School of Design. In the workshop, the international undergraduate fashion design students were encouraged to experiment with new visions of the traditional lining designing a capsule collection of coats and jackets by embracing sustainability in their designs, generating little or no fabric waste to make the design process more sustainable. The textile material used for the workshop was high-quality lining, sponsored by the Tessitura Marco Pastorelli, a four-generation family-run Italian company founded in 1961 that adopts social and environmental sustainability practices during the production process.

*Figure 1. Onsite visit to the company Tessitura Marco Pastorelli.*



### 2.2. Background information

Lining generally is an inner layer of fabric sewn inside a garment; this distinctive element enriches construction and appearance and ensures comfort and wearability. In recent years, the lining has transpired from a habitual hidden part of a garment to an overwhelmingly important feature of the entire piece. It has become an instrument of diversification and personalization with remarkable potential. In Italy, the production line of lining is somewhat unique. According to Franco Ghiringhelli, president of the International Association of Users of Artificial and Synthetic Filament Yarns and Natural Silk (AIUFFASS), the supply chain of lining is made up of several small, strongly interconnected links, all essential in giving know-how and quality. If one link is missed or fails, the whole system will freeze. This chain, unique in Europe, involves approximately 2,000 people and is mainly concentrated in the provinces of Varese and Como. It is a partly hidden treasure of extraordinary skills, not acquirable elsewhere, extensively desired by Italian and international fashion designers. Ghiringhelli believes that projects that merge academic and industrial reality could lead to originated achievements. This is an essential step towards a sustainable industry-university partnership and eventually contributes to the current fashion system.

In this workshop, we encourage students to research and work with manufacturers in textiles and clothing for new visions of Made in Italy. By adopting zero-waste methods during the design process, fusing different cultural perspectives with contemporary language, creating new sustainable designs, and providing new meaning to the traditional lining. This design experimentation can be seen as a pilot example, demonstrating new possibilities for fashion designers to engage with fashion manufacturers that may not currently exist.

### 2.3. Studio-based approach

For classroom management, the instructors intended to create a more democratic learning environment by putting students at the center of class time to deliver students the most extensive knowledge of the fashion design process and leave them more space to explore sustainable practices. In the workshop, a studio-based model is adopted for teaching and learning, which is also a distinguishing characteristic of the POLIMI design education (Lin, 2019).

In fashion and design education, "studio" is one of the most signature methods. This educational innovation emerged at the end of the seventies. Those who supported this innovation considered learning not as the product of the teaching process but as a process in which direct experience activates the learner (Lin, 2018). The "studio" concept was associated with a place where various kinds of experiments are conducted. However, in the last few years, the idea of a didactic practice based on a studio approach has evolved (Fasano & Casella, 2001). It does not necessarily coincide with the common conception of a laboratory but transformed as a creative environment embedding "research, exploration, creative thinking, critical reflection, and observation of others' practice, in a creative community environment that encourages risk-taking and experimentation" (Zehner et al. 2009, cited in McWhinnie and Peterson 2017, 1655). The studio model is based on an intersubjective exchange between students and teachers, through a democratic and unfettered collaboration, allows not only transmitting knowledge but, very often, shaping new paths towards knowledge. In studio-based learning, students would be able to learn by doing. They are encouraged to experiment and consolidate intangible ideas, "the nature of the work in the studio may progress from early, vague understandings of the product requirement and finally arrive at a superior outcome" (Green & Bonollo, 2003, p. 271).

### 2.4. Design process

Although innate talents could help fashion designers stand out, without a thorough understanding of the systematic structure of the design process, fashion designers would not be able to control and vary their talented abilities when confronting different complex problems. By guiding students walk through a complete design process embedded in concrete projects, students would be able to develop their design thinking roadmaps, in turn, become "sensitive to or aware of problem […] bringing together available information […] searching for solutions […] and communicating the results" (Torrance & Myers, 1974). The workshop was, therefore, constructed out of the following creative stages. Here we offer a vignette of practice-based students' work to bring the holistic design process to life better.

### 2.5. Example of student work: Hallucination

The concept of this group comes from our everyday modern life; with high levels of working and living pressure, people might manifest hallucinations or deceiving behaviors. The project intends to call attention to mental health problems caused by social forces. The mood expressed the vivid and substantial feeling perceived to be associated with external objective space, which does or does not mimic accurate perception (Figure 2. left). The group has decided to work on an autumn-winter capsule collection (Figure 2. right). They chose to use the sponsored material for the lining (the inner part) and the contrast (the secondary outer part), with self-purchased wool and satin fabric for the shell (the outer part). The choice of the textile and color of the material is inspired by the mood board; with different light effects and movement of the design piece, "deceiving" tonality and silhouette could be created.

*Figure 2. Left: Project's mood board, color palette, and fabric selection. Right: Capsule collection overview.*



Inspired by various zero-waste methods, each team has developed five looks utilizing different pattern templates. One final look was chosen to be prototyped. The modified pattern could allow a fluid drapery silhouette, at the same time, minimize fabric waste during the design process. Only 3.33% of fabric waste in this group has been created (Figure 3. left). Based on the cut pattern, a toile (the draft version of the final design) is stitched and then fitted on the model; the necessary adjustments have been made at this stage in new patterns before the final cutting. When the toile version is tested and perfected,

the "real" fabric can be cut and assembled into the final garment. When the garment is finished, students are encouraged to use their creativity and imagination to piece together their outfits with models, locations, and setting for the final shooting. For this group, they chose to photograph the design piece in an art museum. The manipulation of the light and the movement of the model have successfully translated their concept into convincing visual stories (Figure 3, right).

*Figure 3. Left: Scaled toile test and prototype development. Right: Final shooting of the design piece.*



## 3. Reflective insights

The project introduced above raises some testing questions for studio-based classroom practices around sustainable fashion. In the following paragraphs, the authors offer their reflections on some themes.

### 3.1. Bridging the university-industry gap

As mentioned by AIUFFASS's president, companies' external network with universities can lead to originated achievements, which is crucial for their innovation capability. Interaction between knowledge, experience, and perspectives could complement the companies' in-house competency. However, gaining a mutual contextual understanding between various stakeholders is one of the fundamental challenges in narrowing the university-industry gap (Wallin et al., 2014). Since universities and industries have different drivers, difficulties in interpreting and appreciating common goals are inevitable (Siegel et al., 2003; Burnside & Witkin, 2008). Rynes (2007) advises that setting up interactive sessions where people from various organizations could work together may reduce the boundaries between academia and industry. Wallin et al. (2014) believe that to build instant contributions, university-industry interactions should be "relevant, visual, tangible." A studio environment, in this case, with its nature of bringing together "disparate thinking into a forum of discussion and idea exchange" (Green & Bonollo, 2003, p. 271), is a perfect facilitate condition to bring people together to share and co-create, by organizing meetings and visits, involving the company for design process critiques, to achieve a mutual understanding. Nevertheless, the authors suggest that, due to the unfamiliarity with each stakeholder's background, support from intermediate facilitators is indispensable to avoid misinterpretations. These facilitators should speak academic and industrial languages by interpreting the implicit message of the contexts to encourage meaningful intercultural and interdisciplinary conversations and eventually balance long-term goals with short-term achievements (Lin, 2019).

### 3.2. Critique as a method in the studio

In the design studio classroom, critique is central to the design process. Whether it is self-critique, peer critique, or expert critique (this is also the session when companies could be involved in visiting or through virtual online interchanges), it is a moment when independent thinking is nurtured, and self-analysis and reflection are mastered (Scagnetti, 2017). However so, the authors noticed that many students were utterly dependent on the studio leader's opinion of their work; they were using the critiques received from the studio leader to know if their design was working or not, which obstructed them from experimenting with new possibilities, this is not what critiques for. When students are doing their professional practice, they should know how to reflect on that and identify their weaknesses or areas for improvement. Instead of concentrating on shallow visual outcomes, the focus should be on cognitive analysis and synthesis processes (Fletcher & Williams, 2013). The authors recommend that methods of practice-led research should be included in studio teaching, for instance, what critique is, how to design a particular way, and how to reflect on practices, to help students reflect on their practice actively. Consequently, when the course is finished, students will have a clear idea of what they are trying to achieve and what mastery is in real terms of practice, and eventually contribute to the sustainable fashion industry, making connections between academic knowledge and practical applications.

## 4. Conclusion

With the increasing awareness of sustainable fashion issues, fashion design education has reached its curving point. More profound environmental, cultural, and ethical dilemmas are requested to be addressed in the curriculum to encourage students to reflect on real-life issues and pursue fashion design as a sustainable practice. Common exchanges between industry and academia in the fashion sector have also accelerated the paradigm shift in current educational norms. Universities are pushed forward to explore the boundaries of flourishing and redefine their development and knowledge exchange methods. In this paper, the authors have described her experience conducting an innovative sustainable fashion design workshop, adopting the studio-based approach. By throwing up some critical questions for the fashion industry and its education, the authors wish to provide a reflective pedagogical example with critical insights which might hopefully generate the collective evolution of a new curriculum on educating future designers as agents of in-depth change to contribute to the sustainable fashion industry.

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# ANALYSIS OF THE EXAMINATION METHODS OF GARDNER'S INTELLIGENCES IN THE DIGITAL ENVIRONMENT

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## Abstract

The subject of this research was the examination of the dynamically changing and widely applied theory of Multiple Intelligences (Gardner, 1983; 1999; Gardner, 2009), and its possible manifestations (Dezső, 2012; 2015; 2020), in relation to kindergarten education (Gyarmathy & Herskovits, 1999; Sándor-Schmidt, 2019; Ábrahám, 2022). The aim of the research was to implement the "Everyone is Intelligent in Different Ways" (EIDW) method (Sándor-Schmidt, 2016; 2019; 2022) into the digital environment. The EIDW is used for the investigation and development of Multiple Intelligences and is a methodology based on an independent adaptation of the Project Spectrum concept (Gardner, Feldman, & Krechevsky, 1998), but differs from it in many points.

With the spread of mobile devices and the Internet, as well as the digital work schedule outside the classroom, digital devices and the online space play a key role in children's lives. In the 21st century, everything is given to realize the examination of Multiple Intelligences in the digital space. The affordable, accessible, and easy-to-use mobile devices are essential to the digital world of digital natives (Prensky, 2001). Based on these thoughts, the following questions arose: Can the examination of Gardner's Multiple Intelligences be realized in the digital space? Is the EIDW method (Sándor-Schmidt, 2016) applicable in the digital environment? To what extent is the method transferable, and what difficulties arise when implementing it in the digital space?

The goal of the research was, on the one hand, to analyse how the activities related to the seven knowledge areas based on Gardner's eight intelligences of the EIDW method can be transferred into a software solution, and on the other hand, to define the appropriate software and audio-visual elements. As a result, an application was created that runs on a tablet or mobile phone, and it was established that the activities of the EIDW method can be transferred to the digital environment, if not entirely, but to a significant extent. In addition to the implemented application, the research aims to provide a comprehensive concept of the possibilities of examining Multiple Intelligences with software tools.

*Keywords: Multiple Intelligences concept, examination method, digital environment.*

## 1. Introduction

Thanks to the opportunities provided by technology, the quantity and quality of available knowledge about the complex phenomenon of learning has changed. This change enabled a more thorough understanding of the learning processes, the development of previous theories and practical methods, and the creation of new theories and methods. Digital education already goes beyond the digitalisation of educational methods. It mostly means supplementing, enriching and rethinking the process by involving digital devices. A current task that needs to be solved is how technology can be used to increase the efficiency of learning, support differentiated teaching, increase student persistence, increase attention, and maintain motivation (Molnár, Turcsányi-Szabó, & Kárpáti, 2020).

The environment where children play and study have also been transformed. The accessibility of digital devices gives them the opportunity to interact with new, diverse learning environments and other children in a global community (Arnott, 2017). Children are connected to technology from birth, thereby acquiring skills that allow them to easily transition and move between the real and virtual worlds (Marsh, Plowman, Yamada-Rice, Bishop, & Scott, 2016).

## 2. Objectives

The aim of the research presented here is to implement the existing, validated "Everyone is Intelligent in Different Ways" kindergarten education method (Sándor-Schmidt, 2019; 2022) into the digital environment. This method is used for the examination and development of Gardner's intelligences in a kindergarten environment. Our goal is to present a new perspective in the investigation of Gardner's intelligences in early childhood in relation to the digital space.

## 3. Theoretical framework

Gardner's (1983) theory of Multiple Intelligences breaks with the singularist notion that there is a general intelligence, and that the g-factor, which is at the top of the hierarchy of partial abilities, may define all our intellectual abilities (Dezső, 2012; 2015; 2020). Gardner uses the concept of intelligence in the plural, as he distinguishes between linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic intelligences as eight independent units. In his perception of the intelligences he describes, each person reaches a certain level, the differences may be traced exclusively in the extent and pattern of the levels (Gardner, 2009; Dezső, 2015; Dezső, 2021).

## 4. Method

The "Everyone is Intelligent in Different Ways" (EIDW) method created by Barbara Sándor-Schmidt (Sándor-Schmidt, 2016), is an independent adaptation of the Project Spektrum kindergarten education methodology based on Multiple Intelligences (Gardner, 1983) and Nonuniversal Development (Feldman, 1980) theory. According to the Project Spectrum approach, every child has a unique and individually identifiable intelligence profile. By using these profiles, we can develop individualized educational programs for the children (Gardner, Feldman, & Krechevsky, 1998).

The EIDW method is associated with seven domains of knowledge. These are language, math, music, art, social understanding, science, and movement. The domains of knowledge are closely related to the eight intelligences formulated by Gardner. The domains of knowledge and intelligences are connected to each other as follows: the movement domain of knowledge is connected to bodily-kinesthetic intelligence, language is for linguistic intelligence, math is for logical-mathematical intelligence, science is for naturalistic intelligence, social understanding is for intrapersonal and interpersonal intelligence, art is for spatial intelligence, and music is for musical intelligence (Gardner, Feldman, & Krechevsky, 1998; Sándor-Schmidt, 2019).

Different activities belong to these domains of knowledge. The activities focus on the development of children's personalities, taking into account differentiation and diversity. The activities of the EIDW method include predefined game accessories, methodological procedures, game descriptions, and measurement and evaluation strategies, based on which the activities are performed (Sándor-Schmidt, 2022). The making of the game equipment is a complex and time-consuming task, as the accessories are not commercially available, and in many cases, they must be modified to the given test group. During the examination transporting and taking care of the equipment is also challenging.

## 5. Digitalisation

The idea of the digitalisation of the EIDW method occurred because we wanted to keep up with the trends of the time and create a solution that is simple, easy to use, durable, affordable, compact and available for everyone. The process of the digitalisation started with the analysis of the EIDW's activities, game descriptions and methodological procedures, in order to determine which methods and techniques can be transferred to the digital environment, and what is necessary to implement a software solution. We also conducted research on which mobile devices are the most suitable for the investigation in the early childhood.

Children are attracted to using tablets because the screen size, which is smaller than a PC and larger than a smartphone, the portability, ease of use, and multifunctionality (Chaudron S. , 2015). Aziz's (2013) study reveals that at the age of 2, children still struggle to perform multi-touch gestures (flick, slide, drag and drop, rotate, pinch and spread). Similar problems also occur during multi-touch rotations, pinches and spreads in case of 3-year-old children. The background of all this is the development of their fine motor skills, which is still in the early stages of learning at this age. However, children between the ages of 4 and 12 successfully perform all 7 major finger gestures such as tap, drag/slide, free rotate, drag and drop, pinch, flick and spread (Aziz, 2013). Currently, we would like to examine the pre-kindergarten (4-5 years old) and kindergarten (5-6 years old) groups. Considering the above, we concluded that the tablet is the most suitable mobile device for using the application and examining this age groups.

After the analysis of the feasibility, the functions of the software were determined. Transferring the activities to the digital space consisted of describing how the application works, creating the application's media elements, and designing the look of the user interface.

Among the activities of the EIDW method, we considered the activities that examine logical-mathematical, naturalistic, musical, linguistic and spatial intelligences to be easier to adapt to the digital space, so we focused on these and transferred eleven games into the application. The activity examining inter- and intrapersonal intelligences was transferred to the digital environment during a previous research, therefore this will not be detailed here  (Sándor-Schmidt & Ábrahám, 2021). The activities that are examining the bodily-kinesthetic intelligence will be implemented later, because they are more complex and require further research due to their physical nature.

Logical-mathematical intelligence is examined with the *Dinosaur* and *Bus* games. These activities are used to test numerical conceptual understanding, counting skills, as well as rule-conscious and task-oriented behaviour, and to explore strategic thinking. The *Reporter* and *Storyboard* games are used to investigate linguistic intelligence. Language functions, the ability to narrate, and the ability to manage information play an important role in these games. Activities belonging to naturalistic intelligence are the *Treasure Hunt* and *Swim or Sink* games. These activities are designed to explore the ability to make logical conclusions. When examining musical intelligence, the focus is mainly on vocal-musical activity. Examining this intelligence includes the *Melody Recognition*, *Listen and Match*, *Error Recognition* and *Play and Match* activities. In order to examine spatial intelligence, a portfolio of artworks created by children has to be assessed during the original activity. During the evaluation, the quality of the spatial integration, the quality of the work, the level of recognition and the artistic value must be taken into account. Also, the placement of objects and people in the pictures plays an important role. (Sándor-Schmidt, 2022) In the digital implementation of this activity, we created the *Colour and Place* game, which is a digital colouring book. Children have to colour the included figures and then place them in a picture.

## 5.1. Operation of the application

Like the original EIDW method activities, one game lasts 10-15 minutes. The games can be played in two difficulty levels (pre-kindergarten and kindergarten mode). The examiner who has to be present throughout the whole examination, explains the tasks and how to use the application at the beginning of the activity and follows the child's activities. The application contains animated, movable and sound-emitting graphic elements, videos, images, and the simulated physics of certain objects. Consequently, the examined child engages in various interactions (tap, flick, drag and drop, rotate) with the application.

Some examples of the techniques used in the application and their interactions: During the *Swim or Sink* game (see Figure 1a), which examines natural intelligence, kindergartens can drop various objects into water, predicting beforehand whether the given item will float or sink. In the application, objects sink or float on water in the same way as in real life. In this game, the technique of drag and drop and the simulated physics of objects gave the possibility to adapt the original activity. There are four game activities to explore musical intelligence (see Figure 1b). In these activities, tapping on elements, moving them, dragging them on top of each other, and playing sounds are the dominant techniques. In these games, children have to recognize and match individual sounds and familiar melodies. We also used the drag and drop technique in the *Storyboard* activity (see Figure 1c) that examines linguistic intelligence. In this activity, different figures have to be placed on the storyboard, from which the kindergartners have to create a fictional story. In the *Bus* game (see Figure 1d), that examines logical-mathematical intelligence, the bus transports passengers from one stop to another, which is realized using pre-animated technology.

We are aware that it is not possible to fully transfer the games to the digital space, however, we have kept the originality of the game descriptions and game equipment in the application. Based on experience, the EIDW method is applicable in the digital environment, and the majority of the game activities can be transferred to the digital space. As a next step, we would like to investigate the differences between the examinations carried out in physical and the digital space.

## 6. Conclusions

Examining Multiple Intelligences in the digital space provides a safe and neutral environment. The application doesn't judge, doesn't get tired and doesn't lose patience. The application performs the repetitive exercises in the same way and as many times as necessary, thus allowing the child to progress at his own pace. In addition to all this, taking advantage of the possibilities of the digital space can also help to minimize the subjective nature of the examination. Further advantages of the application are that it is compact, simple, easy to use, portable and accessible for everyone. Instead of the time-consuming development of complex game equipment, only one application needs to be downloaded to the tablet. As a further development, we would also like to digitalise the process of the evaluation.

*Figure 1. The graphical user interface of the application. (a) Swim or Sink game, (b) Error Recognition game, (c) Storyboard game, (d) Bus game.*
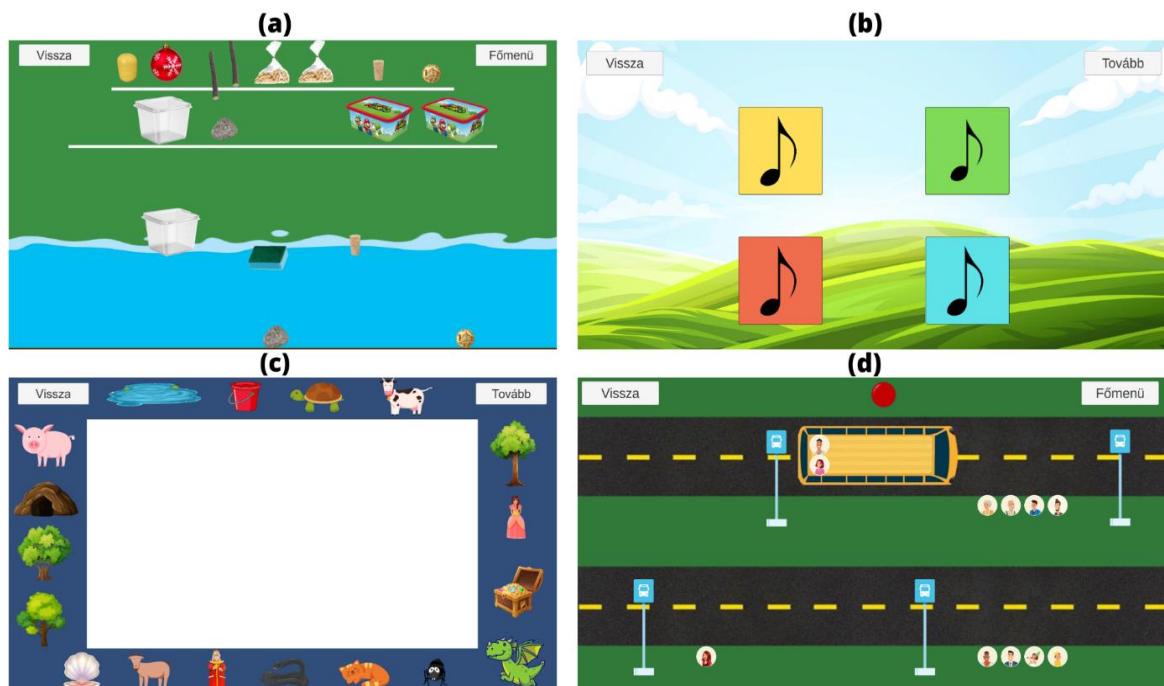


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# TEACHERS' PERCEPTIONS AND INTENTIONS ABOUT INTEGRATING COMPUTATIONAL THINKING INTO SCIENCE INSTRUCTION

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## Abstract

This study explored teachers' perceptions of integrating computational thinking in South African science classrooms using the Technology Acceptance Model (TAM). This research adopted a combination of informal discussions and closed and open-ended questions to elicit responses from fifty science teachers in an education circuit in Johannesburg, South Africa, via a google form. Responses from the open-ended questions and informal discussions were analysed using content analysis, and data from the structured questions were analysed using correlation analysis. It was found that teachers demonstrated a positive perception towards the integration of CT in their science classrooms but lacked appropriate technological knowledge and technological pedagogical to teach the concepts of CT in science lessons, affecting their CT teaching efficacy beliefs. The findings of the study revealed a strong positive correlation between teachers' interest in CT and behavioural intention (r = 0.539), perceived ease of use of CT with behavioural intention (r = 0.543), perceived usefulness of CT with behavioural intention (r = 0.599), and a moderate positive correlation between teachers' attitude and behavioural intention (r = 0.312). However, there was no statistically significant relationship between teachers' self-efficacy and behavioural intention. Based on these findings, it is recommended that teachers engage in practical training programs that will provide them with the pedagogical experience needed to develop their self-confidence in using CT concepts and practices to teach science. Besides that, teacher education programs need to introduce students to the knowledge of CT and provide learning experiences that can promote the development of teachers' interest, knowledge and efficacy in using CT to teach science content.

*Keywords: Computational thinking, perceptions, science instruction, teachers, intentions.*

## 1. Introduction

Computational thinking is recognised as an essential skill in the twenty-first century across all disciplines, particularly in STEM education, as it trains students to have the cognitive flexibility to deal with complex problems in the Fourth Industrial Revolution (Riley & Hunt, 2014). Computational thinking is "the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent" (Wing, 2011, p. 1). In addition to being based on ideas that are fundamental to computer science, computational thinking is also crucial to current research and problem-solving in Science, Technology, Engineering and Mathematics fields (Henderson, Cortina, & Wing, 2007). As a result, the Next Generation Science Standard of the United States specified that students should engage in computational thinking as one of the core scientific practices needed to construct scientific knowledge (NGSS Lead States, 2013). CT is naturally embedded in STEM in the reflection of creativity, procedural thinking, critical thinking, problem-solving and cooperation skills. Barr and Stephenson (2011) suggested nine major computational thinking concepts and abilities that can be used across core content areas in K-12 classrooms to enhance the integration of computational thinking in education. These include data collection, analysis, representation, problem decomposition, abstraction, algorithms and procedures, automation, parallelisation, and simulation. Framing computational thinking with ideas such as decomposition, pattern recognition, algorithm design, abstraction and pattern generalisation provides teachers with a low threshold for taking computing to their classrooms and enables them to see similarities between computational ideas and science lessons (Yadav et al., 2018). In addition, CT involves practices that are also required in science, such as "data practices, modelling and simulation practices, computational problem-solving practices, and systems thinking practices" (Weintrop et al., 2016, p.136). Hence, CT can be used in science classrooms in various ways, including single or multiple learning approaches (Ogegbo & Ramnarain, 2022). In light of the CT concepts and practices mentioned above, computational thinking should be integrated into the educational system as

a significant learning objective to ensure that students are prepared with competency for their futures (Grover & Pea, 2013).

Toward this end, the Department of Basic Education in South Africa incorporated coding and robotics into the curriculum. Furthermore, research has shown that coding and robotics expose students to computational thinking, enhancing their understanding of science (Chevalier et al., 2020). Although researchers and educators stress the importance of computational thinking in education globally (Grover & Pea, 2013), its practice seems to be limited and problematic within the South African context. Given the wide range of skills linked to computational thinking, educators attempting to implement these practices may become confused by the lack of a clearly defined subset of skills. Moreso, research has indicated that the successful integration of computational thinking and its related practices in education depends on teachers' attitudes and perceptions. Based on the above, this study explores teachers' perceptions about integrating computational thinking in South African science classrooms. More specifically, the following research question guided this study:

> What are the perceptions and intentions of teachers regarding integrating computational thinking into science teaching and learning in South Africa?

## 2. Conceptual framework

The conceptual framework of this study is based on the Technology Acceptance Model (TAM), which proposes that the perceived usefulness (PU) and perceived ease of use (PEOU) of technological tools are the essential determinants of technology use (Davis, 1989). People's predisposition to use a new concept is determined by their belief that the idea will improve their work performance. This implies that what teachers know, believe, and think about a new idea influences their acceptance of and eventual use of such innovation. The Technology Acceptance Model (see Figure 1) has grown in popularity, owing to its adaptability to different contexts and samples and its ability to explain variation in technology intention or use. As a result, several contextual variables like facilitating conditions of technology, subjective norms, interest, knowledge, and self-efficacy have been used to extend the model (Abdullah & Ward, 2016). The essential factors in the TAM are perceived ease of use, which refers to the degree to which a person believes that using technology would be free of difficulty (PEU), and perceived usefulness, which means that using technology would improve their job or task performance (PU). TAM outlines the unstructured connections between perceived usability, perceived usefulness, attitude toward using, and actual usage behaviour of system design elements. TAM has also been demonstrated as a theoretical model that aids in explaining and forecasting user behaviour when interacting with innovative technology (Scherer et al., 2019).

*Figure 1. Technology Acceptance Model (Davis, 1989).*
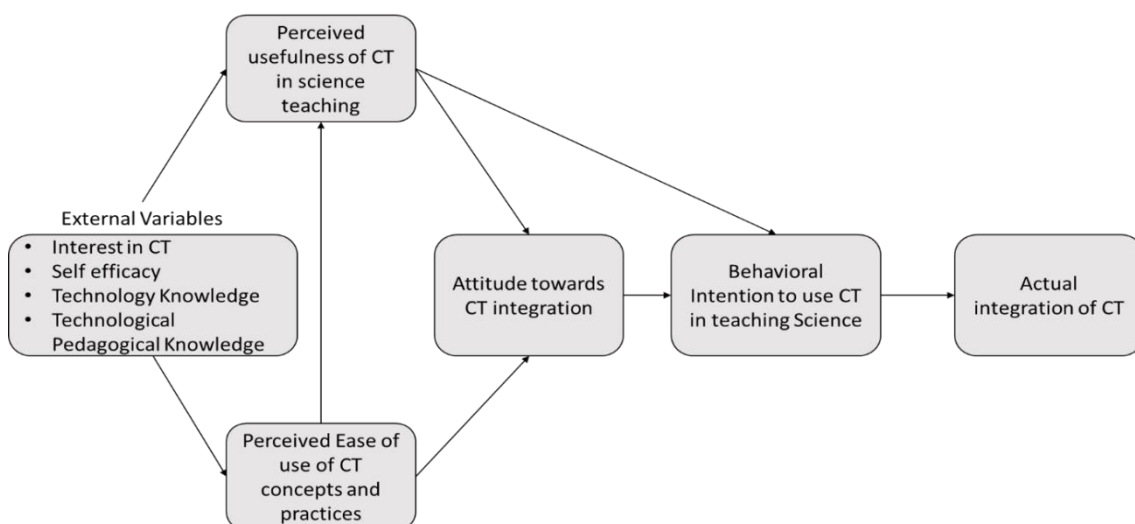


Thus, the primary constructs of TAM, which emphasises perceptions (PEOU and PU), and behavioural intentions to use CT were used in this study to determine how teachers perceive and accept the integration of CT in science instructions, as this tends to be closely related to their competence beliefs. (Scherer, Siddiq, & Tondeur, 2019). This implies that teachers may accept a model based on its ease of use and ability to improve their teaching performance.

## 3. Method

This research adopted a "convergent mixed methods" design (Creswell, & Plano Clark, 2018:41). This design involves a "one-phase project in which the researcher collects and analyses two separate databases—quantitative and qualitative—and then merges the two databases to compare or combine the results" (Creswell, & Plano Clark, 2018:41). It is regarded as a convergent design because it aims to obtain different but complementary data on the same topic, to best understand the research problem. Informal discussions and a semi-structured questionnaire (closed and open-ended questions) are used to collect data from 50 science teachers from a school district in Gauteng, South Africa. Participants were required to complete the online survey during an informal discussion following a professional development activity. The closed-ended questions contain statements to which teachers respond on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The items are grouped according to computational thinking ideas using the primary construct of TAM. In order to show the correlations between constructs, Pearson coefficients (2-tailed) were calculated. Results from the quantitative data were analysed using correlation analysis, while findings from the open-ended questionnaire and informal discussions were analysed using content analysis. Results from the quantitative and qualitative data are then integrated into a coherent whole to provide a complete understanding of the phenomenon under investigation. Fifty per cent (50%) of the teachers who completed the questionnaire are between the ages of 21 to 25 years, 38% are between the ages of 26 to 30 years, and 12% are from 31 years and above. Eighteen of the teachers were males, and thirty-two were females. It should be noted, however, that the sample size used in this study is insufficient to generalise the findings to the entire population of South African science teachers.

## 4. Findings

Mean (average) calculations were performed to identify general response trends for each scale and item. For each scale, standard deviations were calculated to determine the degree of consistency among respondents. The strength and direction of the relationship between the constructs and items were described using correlation analysis. The results of the closed-ended question analysis were combined with the results of the open-ended questions and informal discussions to form a coherent whole. Table 1 displays the statistical results from the survey (closed-ended) questions. Cronbach's alpha for each construct (scale) was greater than 0.70, indicating strong internal consistency within each scale (Pallant, 2007). The low standard deviation for each construct suggests that the participant's responses were consistent.

*Table 1. Descriptive statistics and reliability for CT scale.*

| Constructs | No of Items | Scale Mean | SD | Cronbach alpha |
|---|---|---|---|---|
| Perceived Usefulness | 4 | 3.44 | .496 | .763 |
| Perceived Ease of Use | 7 | 2.97 | .274 | .701 |
| Interest | 5 | 3.33 | .354 | .717 |
| Attitude | 9 | 4.03 | .411 | .706 |
| Self-efficacy | 6 | 2.87 | .570 | .865 |
| Behavioural Intention | 5 | 3.22 | .449 | .755 |

The findings show that teachers have a positive attitude toward incorporating CT into their science classrooms. From the perspective of the perceived usefulness of CT, teachers believe that using CT can enable students to solve problems ("Using technology and CT will help improve learners' problem-solving abilities", M= 3.42, SD = .575). They also believe that acquiring programming skills and knowledge can improve science instruction ("I expect that learning programming skills/concepts will enhance my science teaching abilities", M = 3.54, SD = .646). Teachers also talked about the affordances of CT in the open-ended question and informal discussions, as evidenced by the following excerpts, which refer to the benefits of CT for learners.

> *Computational thinking in science education provides learners with a more authentic image of science as it is practised today; it also increases access to powerful modes of thought and marketable skills for various careers.*
> *Using computational thinking in the classroom can give students ownership of their work while providing them with the skills they need to be digital citizens.*
> *Science teachers can use CT to plan lessons that promote deep learning. The teacher can use CT to create complex problems that require students to think deeply when solving them.*

> *This is a valuable skill to have when confronted with complex and messy situations or scientific problems; you can then piece together the puzzles and patterns to understand the connectivity between elements in such situations.*

The survey result shows that teachers had a strong positive response to the perceived ease of use of CT. Teachers believe that incorporating computational thinking into their classroom practices will not overburden them. This was evident in their response to statements ("integrating modelling and simulations in the science curriculum will not increase the teacher's workload" M = 3.32, SD = .551; "integrating problem-solving practices with the use of technology in the science curriculum will not increase teachers workload" M= 3.44, SD =.501; "integrating data practices in the science curriculum will not increase the teacher's workload" M= 3.64, 4.85, and "integrating system thinking practices in the curriculum will not increase teacher's workload" M = 3.16, SD = .738). However, it was discovered that the majority of teachers (about 68%) believe that integrating CT into the curriculum will affect how they prepare for their lessons ("Integrating CT in the curriculum will not affect the time spent on the preparation and process of science teaching" M= 2.34, SD = 1.042). This was expressed quite aptly by a teacher during the informal discussion:

> *The Department of Education prioritises curriculum completion, and incorporating computational thinking takes significant time. This could result in fewer hours spent on lesson planning and delivery.*
> *This might be time-consuming, and teachers would then have less time to finish the syllabus.*

The positive perception of teachers towards the integration of CT into science lessons is underlined by their interest in CT with a strong correlation with PEOU (r = .416, p < 0.05) and PU (r = -.702, p < 0.05). Teachers' interest in CT was revealed in their responses to item statements like "I am willing to learn new ideas/instrument/methods/technologies required for integrating CT into science instructions" (M = 3.70, SD = .463). Despite teachers' interest in embedding CT in science instructions, they perceived themselves as less competent in using relevant technology and advanced programs/devices to create activities that support CT integration. This was evident in the following statements ("I can create real and virtual artefacts using a variety of software on a range of digital devices" M= 2.34, SD =1.136; "I can plan and create associated programs that can be used to teach science" M= 1.88, SD =1.081; "I take time to create science activities that involve the selection and modification of advance technology applications in solving problems" M = 2.12, SD = 1.023). The responses of teachers to open-ended questions also revealed their inability to incorporate CT concepts using appropriate technology:

> *It is rather unfortunate that I don't have the technological strategy or approach that can be used to assist and scaffold some of the virtual activities using these CT concepts.*
> *Because this is an unfamiliar field for some of us teachers, we may be hesitant to use these new tools and materials.*

Furthermore, results show that teachers have a positive attitude toward using CT, as evidenced by their strong positive response to the statement, "I like the idea of using CT concepts and practices in the teaching and learning of science." M = 3.14, SD = .808. Moreover, the findings show that teachers' perceptions of the use of CT were consistent with their attitude toward CT, which strongly correlated with perceived ease of use (r = .471, p = 0.000) and perceived usefulness (r = .446, p = 0.001). On the construct 'Behavioural Intention', teachers responded to item statements indicating their intention to incorporate computational thinking into science instructions. Their responses to the statements such as "I plan to use existing lesson plans that take advantage of CT tools and approaches in my classroom" M = 3.06, SD = .740; and "Computational thinking will be incorporated in my science classroom by allowing students to solve problem" with M =3.24, SD= .591 demonstrated their willingness and readiness to use CT. This is also emphasised in responses to another statement "I plan to be involved in the process of learning and teaching science by integrating CT concepts in my classroom, M = 3.18, SD = .596). The correlation analysis showed that teachers' behavioural intention towards the integration of CT into science instruction significantly correlated with interest in CT (r = 0.539, p = 0.000), perceived ease of use of CT (r = 0.599, p = 0.000), perceived usefulness of CT (r = 0.543, p = 0.000) and attitude towards integrating CT (r = 0.312, p = 0.001). However, there was no statistically significant relationship between behavioural intention towards integrating CT and teachers' self-efficacy in CT.

## 5. Discussion and conclusion

The findings of this study reveal that teachers have positive perceptions of computational thinking in terms of perceived ease of use and perceived usefulness of CT, which significantly impacts their

behavioural intention in incorporating CT into their science lessons. Moreso, the sampled teachers were found to have a positive attitude toward incorporating CT into their science classrooms. The attitudes recorded were generally positive and strongly correlated with their behavioural intentions, with only a small percentage of participants expressing reservations or resistance. This implies that teachers appear to be familiar with the CT concept and recognize its importance in education while also stating their intention to incorporate it into their teaching and attend relevant training. These findings support the view that the perceived ease of use and perceived usefulness of technology can influence the adoption of a specific behaviour (Fessakis & Prantsoudi, 2019). However, findings show that teachers' intentions to integrate CT were more influenced by their interest in CT than their self-efficacy. As a result of their low CT self-efficacy, teachers demonstrated positive intentions to attend CT-related training. Research indicates that high CT self-efficacy could help with problem-solving, algorithmic thinking, designing systems, and understanding human behaviour (Fessakis & Prantsoudi, 2019). This finding can be beneficial in effectively organising and delivering practical training programs. Such programs should boost teachers' confidence in using CT concepts and practices to teach science. Providing teachers with the competencies and materials required for integrating computational thinking concepts helps improve their self-efficacy and attitude towards using CT (Yadav et al., 2018). These findings also call for teacher education programs to introduce preservice teachers to the knowledge of CT and provide them with learning experiences that can foster teachers' interest, understanding and efficacy in using CT to teach science content.

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# "SOIL" IN BASIC EDUCATION IN SÃO PAULO, BRAZIL: STRATEGIES FOR SKILL DEVELOPMENT AND CONSTRUCTION OF GEOETHICAL VALUES

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## Abstract

The study of the soil in formal education, through the planting of vegetables at school and in the community, involves, in general, the implementation of a school garden. The rational use of soil has taught in Basic Education in Brazil, in accordance with the National Common Curricular Base (BNCC), from the 2nd year of elementary school. However, for the development of specific skills that involve the interaction between reflective teaching, sustainability, problem solving, among other themes, there are few school projects that promote interdisciplinary strategies for such purposes. In carrying out this pedagogical action, it was necessary to develop methodologies that would integrate the student into the knowledge construction process, from the perspective of environmental education and geoethics. The project involves directly basic education students, 1st and 5th years of Elementary School level I, and 6th and 9th years of Elementary School level II, and indirectly with participation of high school students, as monitors, in activities in the garden and vegetable garden of School Prof. Francisco de Paula Conceição Junior, a state public school of São Paulo, Brazil. Based on the Sustainable Development Objective - SDG 15, of the 2030 Agenda, the project developed behavioral changes in students, based on the rational use of land, while developing a teaching methodology in which the student was the protagonist in the learning process. The construction of learning spaces, such as the school's vegetable garden and garden, and the soil laboratory, were strategies in the Interventions adopted in the form of practical, theoretical, and concluding classes.

*Keywords: Hybrid teaching, environ-mental education, agroecology, geoethics.*

## 1. Introduction

The rational use of soil has taught in Basic Education in Brazil, in accordance with the National Common Curricular Base (BNCC), from the 2nd year of elementary school. However, for the development of specific skills that involve the interaction between reflective teaching, sustainability, problem solving, among other themes, there are few school projects that promote interdisciplinary strategies for such purposes. In carrying out this pedagogical action, it was necessary to develop methodologies that would integrate the student into the knowledge construction process, from the perspective of environmental education and geoethics.

The project involves directly basic education students, 1st and 5th years of Elementary School level I, and 6th and 9th years of Elementary School level II, and indirectly with participation of high school students, as monitors, in activities in the garden and vegetable garden of School Prof. Francisco de Paula Conceição Junior, a state public school of São Paulo, Brazil.

Based on the Sustainable Development Objective - SDG 15, of the 2030 Agenda, the project developed behavioral changes in students, based on the rational use of land, while developing a teaching methodology in which the student was the protagonist in the learning process. The construction of learning spaces, such as the school's vegetable garden and garden, and the soil laboratory, were strategies in the Interventions adopted in the form of practical, theoretical, and concluding classes.

Built by the students and the teacher in charge, the garden and garden spaces corroborated the development of practical learning within the scope of sustainable development, such as recycling (maintenance of the compost bin for the production of fertilizers from waste produced at school); inclusion of the community in the project (use of sawdust and wood ash donated by traders around the school to correct the soil together with fertilizer); maintenance and planting of garden and garden spaces; implantation/use of the soil laboratory for the application of geoscientific knowledge; holding at school

about soil/planting; conducting thematic theoretical classes, conversation circles for decision-making, among others. In addition to the soil theme, the inclusion of other themes such as water resources, air quality/pollution, types and production of energy were approached, so that the student could discuss geoethics, in the use of resources of the Earth system, and man as a geological agent.

The development of activities allowed the transversality with other curricular components, the inclusion of local environmental problems, since the proposal is based on the construction of knowledge committed to the conservation, preservation, and rational use of resources, regarding geoethics.

The spaces built during the project have become pedagogical instruments for the promotion of environmental, social, cultural, scientific, and intellectual knowledge.

## 2. Strategies

Soil, as a natural resource, is extremely important for human life and other living beings. For terrestrial ecosystems, it is a source of various products and inputs, from feeding terrestrial life, including humans, to the production of medicines, which configures it as a notable divider between social strata. Such a statement imposes intrinsic attention related to the exploration, degradation, use and pollution of the soil, requiring action and responsibility from all.

According to Vicente et al. (2020), "among the different contents related to the area of Natural Sciences in the BNCC curriculum, the approach to soils in textbooks is basically restricted to two moments of Basic School: 3rd and 6th years". In High School, the approach to soil is centred in the 1st year at basic school, and in the Geography textbooks that are distributed in the 2018/2020 by the National Textbook Program (PNLD) "that from a total of 40% to 70% of the total content is destined to these themes, and, in the study on soils, the approach is carried out mostly in a very succinct way and, in some cases, non-existent, as will be detailed later" (Souza et al. 2021).

The strategy initially started with a diagnostic evaluation, using a questionnaire based on environmental indicators on the "soil"; later we held practical and theoretical classes. For the development of this study, qualitative research was adopted as a methodological reference, dealing with the contribution of interventions to promote learning aimed at the target audience (Thiollent, 2011). Therefore, we believe that the conversation circles will provide substantial conditions to rescue and promote intended skills and the resumption of projects at school based on the work developed with students (Martins, 2004).

Thus, the soil theme presents a diversity of approaches that can be directed to ecosystemic, geosystemic and anthropic aspects. In this perspective, it is necessary to promote "the strengthening of pedological studies, seeking to awaken the feeling of sustainability, awareness and, above all, integration of the other elements of nature [...] especially with regard to the soil component" (Ramos & Montino, 2018 p. 76).

For the student to build values and attitudes in relation to the environment that surrounds him, higher order cognitive skills of systemic thinking will be required, the development of which requires the implementation of a holistic approach to the earth system, emphasizing the study of the cyclical pattern of the transformation of matter and energy between the subsystems (Vasconcelos & Orion, 2021 p.5).

The teacher, by also assuming the role of an educator in environmental training, as an intellectual and transforming actor in the context of training for citizenship, involves in this protagonism "taking on active responsibilities by raising serious questions about what they teach" (Giroux, 1997 p. 161).

## 3. Objectives

This study proposes to develop a program of classes on soil education, with the 2 curriculum references: the National Common Curricular Base (BNCC) and the São Paulo Teaching Curriculum. The target public Students involved in the program: 195 students, aged 8 to 10 years, from the 3rd and 4th years of elementary school at São Paulo public school. The project proposal considered that some themes, when treated in an interdisciplinary way, corroborate for the understanding of local and global problems, such as pollution and soil degradation.

## 4. Methods

The strategy initially started with a diagnostic evaluation, using a questionnaire based on environmental indicators on the "soil"; later we held practical and theoretical classes. The 120 students answered a questionnaire with four questions to analyze knowledge about the soil: question 1 - What is "soil?; question 2 - Are there different types of soils?; question 3 - What do we use the soil for?; question 4 - What is the importance of soil for life?

The initial diagnosis allowed the teacher to verify whether the students participating in the project had appropriated the contents in previous school years, as defined by the BNCC and the São Paulo Teaching Curriculum. The action-research, as the conduction method adopted by the teacher/researcher, provided

dialogic research, in which interdisciplinarity characterized the interventions, with the project as a transverse generator theme in all disciplines involved.

Applied jointly to action-research, we adopted the conversation wheel as an interventional methodology in the classes. Conducting conversation circles during classes allowed students to expose their ideas, discuss content not yet learned, developing individual and collective protagonism.

The protagonism of the students participating in the project occurred from their speeches, recorded by the researcher/teacher, considering the demands of the interventions defined for each class. The conversation circles allowed developing the construction of autonomy, discourse, critical-reflective thinking, linguistic expressions, and family involvement during the project's implementation period. As Freire (1983) points out:

> *It is not to say that one is uncompromisingly dialogical; is to experience the dialogue. Being dialogical is not invading, not manipulating, not organizing. To be dialogical is to commit oneself to the constant transformation of reality. This is the reason why, since dialogue is the content of the way of being proper to human existence, it is excluded from any relationship in which some men are transformed into "beings for others" by men who are false "beings for themselves".* Freire (1983, p. 43).

In the intervention process in the form of classes, the student is an inseparable part in the construction of knowledge. According to Freire (1996 p. 47), *... teaching is not transferring knowledge, but creating the possibility for its own production or construction... Thus, the interactions proposed during the study aimed at developing environmental awareness, student autonomy and protagonism.*

## 5. Discussion

The initial diagnosis is summarized in Table 1. The diagnostic evaluation showed us the lack of knowledge of the students about the soil and the pedogenetic processes, and, mainly, they associated the knowledge about the soil only with the use and anthropic interventions.

The large number of "I don't know" answers indicated the need to assess whether the students actually "did not know" how to respond due to lack of specific knowledge, or whether the students were unable to associate previously learned knowledge with everyday questions.

In this way, we adopted a 3-step class program: Diagnostic evaluation to assess gaps in learning about soils; Practical and theoretical interventions (classes); Concluding evaluation, a post-intervention evaluation to analyze the knowledge learned and the skills and competences developed. This stage lasted for 2 months.

*Table 1. Summarized answers related to the questionnaire applied.*

| What is "soil"? | Don't know (n) | Partially know (n) | Know (n) |
|---|---|---|---|
| | 84 | Is it the ground we walk on, the earth, or is it used to plant (33) | 3 |
| **Are there different types of soils?** | **YES (n)** | **Don't know (n)** | **NO (n)** |
| | 76 | 13 | 31 |
| **What do we use the soil for?** | **Partially know (n)** | | **Don't know** |
| | 40 (to plant); 5 (to walk on) | | 75 |
| **What is the importance of soil for life?** | **Don't know (n)** | **Recognize the importance of soil on some aspect (n)** | |
| | 87 | - To plant (13)<br>- For breathing, planting, and living beings (6)<br>- Clean (de-pollute) the air (8)<br>- To Walk on (4)<br>- To provide food (1)<br>- Several things (1) | |

We emphasize an important stage, the replicability of the project with other teachers at the school. An intervention as a training teacher of the 3º e 4º about soil curriculum component was the strategy adopted for replicating and disseminated the methodologies.

*Figure 1. Classes as interventions.*
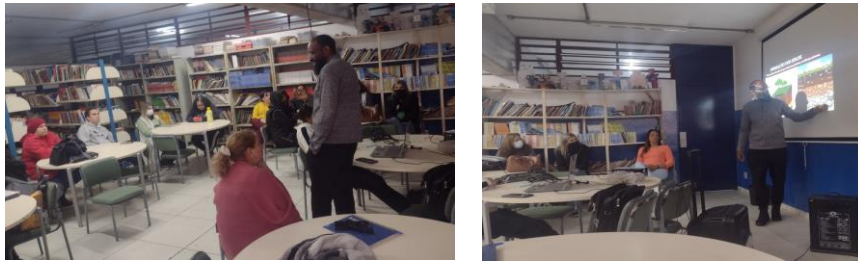


The classes (as interventions) with the students are developed by the science teacher from the 3rd and 4th years of elementary school 1. As activity monitors, students from the 6th and 7th years of elementary school 2 participate together.

Three types of classes were held with interventions: thematic theoretical classes, field classes and laboratory classes. The theoretical classes with students on soil content: pedogenetic processes, rock cycle and source rock, soil profile, environmental impacts due to human intervention (slides, erosion, etc.), preservation of life, multiple uses. several doubts of the students were observed.

*Figure 2. Thematic theoretical classes.*



The field class's objective to investigate the soil around the school, as an activity of the teacher and student as researchers, learning to differentiate types of soil and their functions.

*Figure 3. Field classes.*



The laboratory classes are based on experiments and samples collected in field classes, when we discuss the evolution of the soil profile from the parent rock to the surface, samples of different types of soil were presented, reflection on the concept of '"soil as a finite natural resource", and why preservation is necessary.

*Figure 4. Laboratory classes.*

The interventions made possible both the development of learning and skills related to the soil theme, as well as the development of students' understanding of geoethics and geoethical behaviour from the perspective adopted in the classroom. We observed that some of the concepts questioned in the initial diagnosis were applied by the students in the interventions, which in fact demonstrated that many of the "I don't know" answers could be associated with the student's lack of understanding in correlating the knowledge acquired with everyday life. This finding became more evident when we applied the concluding evaluation as an individual assessment. The option at this stage was to adopt drawings and free texts so that students could express their knowledge. In this way, the protagonism and autonomy, initially intended, would be maintained at this stage.

## 6. Conclusions

The results are indicative that although the curricular bases indicate the contents to be developed in the classroom, such as the ground approach, skills and abilities are not consolidated in the students' education, since they are unable to establish a correlation between the knowledge they have learned and everyday life.

The importance of teaching the soil including SDGs from 2030 Agenda-ONU is a possibility when we organize a diversified class program. Therefore, the strategies adopted show us that it is possible to develop skills on preservation and rational use of soil, also of other natural resources.

By promoting reflection on the use and occupation of the soil, and the need for preservation, as it is a finite resource, geoethics emerged as a transversal theme in the construction of values and in the development of non-cognitive skills, in the formation of citizens as part of nature, in a systemic relationship.

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# COULD I BE MORE SATISFIED?
# THE RELATIONSHIP BETWEEN ONLINE LEARNING ACTIVITIES, SATISFACTION, AND AGREEABLENESS PERSONALITY TYPE

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## Abstract

The ubiquity of online courses in learning programs indicates a significant trend in higher education. This trend has increased even further due to COVID-19 restrictions and social distancing requirements. As Techno-Pedagogical Learning Solutions (TPLS) are constantly being developed and improved, it is quite easy to adapt diverse learning paths for learners, based on their characteristics. Personality affects learners' preferences and thus their satisfaction with the learning process. This study examined the relationship between learners' personality traits (using Costa & McCrae's Big-Five model, which is the most widely accepted psychological model) and their satisfaction with various online learning activities. Questionnaires were used to measure personality traits and satisfaction of 123 university students enrolled in an innovative online academic course. In this paper, we focus on one of the five traits proposed by the Big Five model, the Agreeableness trait. This trait was found to be the most common trait in earlier studies, as well as in the current study. Moreover, Agreeableness was also found to be the most significant and important factor in students' adopting online learning. Significant correlations were found between learners who tend to Agreeableness and their satisfaction with the tested TPLS. In addition, three conceptual activity groups of TPLS were defined toward exploring learners' satisfaction. Following data processing, correlations were found between Agreeableness and the "Communication" and "Media" groups. These findings clearly indicate that personality plays a significant role in online learners' satisfaction, with emphasis on the Agreeableness trait. Therefore, when selecting learning activities for an online course, this trait should be considered. The current study seeks to suggest personalized online learning paths with activities that agreeable learners find satisfying. This proposed personalization has the potential to increase learners' satisfaction with online courses and therefore benefit the entire field of online learning design. The few previous studies that addressed these relationships did not test them empirically, hence, we seek to bridge this gap between theory and practice. The use of personality-based personalization can enable online learning to be adapted to a wide range of learners, thus increasing their satisfaction with the learning process, regardless of whether or not they like online learning.

*Keywords: Agreeableness trait, online learning activities, personality traits, personalization, satisfaction with online learning.*

## 1. Introduction

Online learning involves interactions using digital technology (Greenhow et al., 2022). This type of learning is increasing over the years and constitute a significant component of higher education (Tlili et al., 2016), particularly with fully online courses (Cohen & Baruth, 2017). This growth trend has increased especially due to social distancing requirements prompted by the COVID-19 pandemic (Baruth et al., 2021). Online platforms offer a wide range of technological tools and a variety of pedagogical activities. In this study, we examined students' satisfaction with 12 online learning activities, which we refer to as Techno-Pedagogical Learning Solutions (TPLS): Online Lessons, Discussion Groups, Assignments, Textual Content, Tests, Games, Peer Review Assignment, Surveys & Polls, Video, Graphics, Audio, and Questions. Satisfied learners tend to be more committed, motivated, and cooperative (Dziuban et al., 2015), hence, focusing on each activity enables creating learning paths with the most satisfying TPLS for each learner.

Personality has been found to affect learner satisfaction (Bolliger & Erichsen, 2013). In this study, personality types were observed according to Costa & McCrae's Big Five model (1985), which defines five traits in the human personality. This study focuses on the Agreeableness trait, as it was found to be the most common trait and the most important predictor of students' adoption of online learning. Self-report questionnaires were administered to examine significant correlations between personality

traits and satisfaction level with each of the tested TPLS. In addition, to find a conceptual connection of satisfaction level with each online activity, groups of activities were defined, and three more scores were calculated to explore satisfaction with the TPLS. The three groups were Communication, Media, and Literacy.

The study aims to propose personalized online learning paths for agreeable learners based on their most satisfying activities, which could increase satisfaction and benefit the entire field of online learning design. The study seeks to bridge the gap between theory and practice as few previous studies have empirically tested these connections.

## 2. Literature review

Learners differ from each other in many aspects, personality being one of these. Therefore, it is necessary to adjust learning activities to personality type (Omheni et al., 2017). Moreover, learners with differing personality types likely require differing learning activities (Bachari et al., 2012), they will perform differently, and will handle challenges and pressure during online learning differently (Divjak et al., 2019). Personality is often measured according to Costa & McCrae's Big Five model (1985), considered the most recognized modern psychological model (Baruth & Cohen, 2022), and widely accepted and applied (Bhagat et al., 2019). The Big Five model characterizes people by emphasizing distinguishing traits, taking into account the complexity of human personality. (Al-Ismail et al., 2017). The Big Five traits are: Extraversion (a high degree of sociability and assertiveness), Neuroticism (emotional stability, level of anxiety and impulse control), Agreeableness (helpful to others, cooperative, sympathetic), Conscientiousness, (being organized, disciplined, achievement-oriented), and Openness (strong intellectual curiosity and a preference for variety and novelty) and Agreeableness (being helpful to others, cooperative and sympathetic) (Chen et al., 2016). This study focuses on the Agreeableness trait, as it was found to be common and participants scored high on it (Abouzeid et al., 2021), as was observed in the current study as well. Additionally, it was lately found that Agreeableness is the most significant and important indicator of students' adoption of online teaching modes (Mustafa et al., 2022), and affects satisfaction levels with online learning (Baruth & Cohen, 2022).

Online learning has rapidly grown and influenced all educational systems (Siddiquei & Khalid, 2018), leading to a constant rise in accredited online courses (Soffer & Nachmias, 2018). These courses use various technological tools to advance learning and include a variety of pedagogical activities, referred to as Techno-Pedagogical Learning Solutions (TPLS). In this study, we examined students' satisfaction with 12 online learning activities, which we refer as Techno-Pedagogical Learning Solutions (TPLS).

Personality affects learning outcomes (Tlili et al., 2019), including satisfaction with online learning (Bolliger & Erichsen, 2013) which is important for measuring effectiveness (Kim, 2018). Therefore, customizing courses to match learners' personality and learning style can improve satisfaction (Denphaisarn, 2014).

## 3. The research

In this research, we measured students' personality traits and satisfaction with the online course, aiming to understand learners' preferences and suggest personalized learning paths. The study sought to find correlations between Agreeableness and satisfaction with various learning activities (TPLS), as well as with the course in general.

## 4. Methodology

123 students at an accredited university completed an anonymous questionnaire to identify their personality traits using the BFI (Big Five Inventory) (John & Srivastava, 1999), which includes 44 statements answered on a 1-5 ordinal scale. All TPLS were integrated into the online course sessions, aligned with the content and required no prior preparation. Neuroticism ($\alpha = 0.81$); Extraversion ($\alpha = 0.8$); Openness to Experience ($\alpha = 0.76$); Conscientiousness ($\alpha = 0.73$); Agreeableness ($\alpha = 0.68$); (Etzion & Laski, 1998). Although all five traits were measured, the study focused on examining results for Agreeableness. Participants rated their satisfaction with the tested online learning activities on an ordinal scale from 1 to 5 using a questionnaire specifically developed for this study. A high level of reliability was found for the questionnaire ($\alpha = 0.84$). Students' personality data in this study was found to be normally distributed based on skewness and kurtosis tests. Spearman's correlation analyses were performed between personality traits and satisfaction with each of the tested TPLS and with the general satisfaction score. Furthermore, as aforementioned, groups of activities with common denominators were defined in data processing. Three scores were calculated to explore satisfaction with TPLS:

Communication, Media, and Literacy. Spearman's correlation analysis was performed to identify connections between learners' personalities and satisfaction with each TPLS activity group (see Figure 1).

*Figure. 1. Conceptual groups' division.*



## 5. Results

### 5.1. Agreeableness and satisfaction with the tested TPLS: descriptive statistics

As aforementioned, students' Agreeableness was measured using the Big Five Personality model, which measures five human personality traits. Therefore, all five traits were measured, but in this study, data analysis focused on Agreeableness only. Personality traits' means show that Conscientiousness and Agreeableness have the highest scores. Agreeableness characterized students with a high score and the widest range of scores and differences within the group (Mean = 3.989, SD = 0.529). The highest score found for this trait was 5.00, and the lowest was 2.667. Agreeableness was normally distributed, with skewness of -0.491 (SD = 0.21) and kurtosis of -0.278 (SD = 0.43). As for traits' frequency, the majority tended toward Agreeableness (58.53%). Students' satisfaction with the examined TPLS and with the online course in general was measured, as well as their satisfaction with each of the conceptual groups of learning activities. Graphics and Video had the highest average scores, and hence can be defined as the most satisfying learning activities (Mean = 4.366; SD = 0.899; Mean = 4.317; SD = 0.899 respectively). Discussion groups were found to be the least satisfying activity, with a low average of 2.78. (SD = 1.163), the only activity with an average score lower than 3. Regarding the entire online course, general satisfaction level was high (Mean = 4.203, SD = 0.757). As for the three conceptual learning activities, satisfaction level was moderate-to-high: the Media group had the highest average score (Mean = 4.234, SD = 0.761), the Literacy group had an average score of 3.77 (SD = 0.781), and the Communication group had the lowest average, with a score of 3.134 (SD = 0.963).

### 5.2. Correlations between Agreeableness and satisfaction with TPLS and with the online course in general

Spearman's analysis was performed to examine the correlation between Agreeableness and satisfaction with each of the 12 TPLS, and with the online course in general. Several significant correlations were found: Moderate and significant correlations were found between Agreeableness and satisfaction with discussion groups ($r = 0.221$, $p < 0.05$), games ($r = 0.277$, $p < 0.01$), Surveys & Polls ($r = 0.2$, $p < 0.05$), video ($r = 0.204$, $p < 0.05$), graphics ($r = 0.249$, $p < 0.05$), and audio ($r = 0.274$, $p < 0.05$).

### 5.3. Correlations between Agreeableness and satisfaction with the conceptual groups of online learning activities

Alongside the examination of the correlation between Agreeableness and satisfaction with each TPLS, a Spearman's analysis was also performed to examine satisfaction with the three conceptual groups of the 12 learning activities. Several significant correlations were found, with varying degrees of strength: A low correlation was found between Agreeableness and satisfaction with Communication ($r = 0.199$, $p < 0.05$). As for satisfaction with Media, a stronger and moderate link was found with those who tend to Agreeableness ($r = 0.327$, $p < 0.001$). No significant correlations were found between Agreeableness and satisfaction with Literacy.

## 6. Discussion and conclusions

The current study examined the connections between satisfaction with online learning activities and the Agreeableness personality trait. Moderate correlations were found with five of the tested learning activities. It appears that students score high on Agreeableness may find discussion groups to be a satisfying learning activity. This relationship corroborates our previous findings of a high correlation between Agreeableness and media offerings such as video, pictures, and audio materials (Baruth & Cohen, 2022). These findings are quite consistent, although with a lower correlation. It was found that Agreeableness was positively correlated to active, sensing, and visual learning styles (Siddiquei

& Khalid, 2018), which can in turn be related to satisfaction with visual and sensory offerings such as video, audio, and graphics. Furthermore, the correlations between these and an active learning style, may also explain the correlations found between Agreeableness and satisfaction with games and discussion groups. The moderate correlation that was found for satisfaction with online games corroborates previous research that explored the relationship between personality traits (all five of them) and motivation to play online games. As for satisfaction with audio activities, earlier research found that Agreeable types prefer mobile learning materials (such as podcasts) to be delivered only when they are alone (Al-Ismail et al., 2017), an interesting finding that should be examined further in the future. Finally, the correlation between Agreeableness and satisfaction with surveys and polls also corroborates earlier findings (Baruth & Cohen, 2022), however, note that this learning activity has hardly been studied thus far. These findings are consistent with the idea that surveys may expand online interaction, and as Agreeable types tend to be cooperative (Chesser et al., 2020), their satisfaction with polls concurs with this finding (Bruso et al., 2020). Few correlations were found between our conceptual groups of activities, which were defined to examine satisfaction with combinations of several TPLS altogether, and Agreeableness. A moderate correlation was found with Media. Firstly, this is not a surprising result, as correlations were also found with each of this group's activities (games, video, audio, and graphics). Secondly, this finding may have a strong influence on online course design, so that online courses can be offered with several learning paths, and a "media path" will likely prove satisfying for Agreeable students, which constitute a significant portion of the population (Afzaal et al., 2019). Furthermore, Media has been suggested as a suitable learning activity for "Feeling" types, which are analogous to the Agreeableness trait in the MBTI® personality model (Bachari et al., 2012). Low correlation between Communication activities and Agreeableness was also found. The findings confirm Agreeableness classification as a pro-social and cooperative type (Bhagat et al., 2019), as this conceptual group includes social activities. The Communication activities, which can likely suit Agreeable students, should be considered as a learning solution for other personality types as well, such as Extroverts, who exhibit a high degree of sociability (Chen et al., 2016), yet this needs to be examined empirically too.

It appears that an online learning path featuring the studied satisfying learning activities, may increase Agreeable students' satisfaction with the online course. In conclusion, our results indicate that personality plays a significant role in learners' satisfaction with some of the tested TPLS. For example, an online course that includes discussion groups, games, video, graphics, audio, and surveys should be offered for learners who tends toward Agreeableness. Hence, offering a personality-based personalized learning path is perhaps an important and necessary action that should be considered when designing online courses. These are interim findings of a wider study that has not yet been completed and is expected to include a larger study sample. Hence, these findings require further examination, as their correlation level is not strong and unambiguous. Hopefully, a larger sample will yield stronger correlations.

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# TEACHERS' PERCEPTION OF DIGITAL GAME-BASED LEARNING IN EARLY CHILDHOOD EDUCATION IN RURAL SCHOOLS IN GHANA

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## Abstract

Digital game-based learning (DGBL) is increasingly being used as a teaching methodology to engage learners in the learning processes. The limited usage of digital game-based learning (DGBL) in rural education in Ghana has motivated this study. This study investigates the use of DGBL in early childhood education (ECE). Specifically, the study sought to examine rural teachers' perspectives of DGBL. The study adopted a quantitative data-gathering method. Questionnaires were administered to sixty-five (65) early childhood rural teachers and 62 responses were received. The analysis revealed that most rural teachers who do not employ DGBL in ECE classrooms do not have the prerequisite knowledge, and view DGBL as a distractive technique that hinders students learning. The consequences of these findings from the viewpoints of ECE rural teachers suggest that the government must support rural teachers in using DGBL through professional development programmes.

*Keywords: Digital game-based learning, computer devices, early childhood education, rural education, digital games.*

## 1. Introduction

Recently, there has been growing interest in Digital game-based learning (DGBL) in early childhood development (ECD). Studies indicate that DGBL has the potential to increase engagement and learning. However, it is still unclear how rural ECE educators perceive its use in the classroom. DGBL is an approach to teaching using games via digital technologies such as video game consoles, tablets, iPads, Chromebooks, or smartphones (Sánchez-Mena et al., 2019). DGBL can ideally be adapted to offer realistic scenarios, teach sophisticated reasoning abilities, assist in diverse learning methods, and promote cooperation and ingenuity (Roodt & Ryklief, 2019). DGBL can include play and offer replicated environments for learning and assessment, according to Rüth et al.(2022). DGBL provides for social growth while also encouraging players to practice critical thinking and problem-solving techniques (Yang & Lu, 2021). DGBL offers continuous, real-time feedback ( Kaimara et al., 2022), chances to participate (Chen & Wolf, 2021), and motivation to learn new things (Hartt et al., 2020).

Although there have been numerous studies on the educational and motivating benefits of DGBL, there are still no instances of teaching with DGBL in Ghana's rural ECE. DGBL for learning in particular and technology integration, in general, may be hindered by unfavorable teacher attitudes and the low competence of rural teachers to assist young learners in using this approach (Yang & Lu, 2021). Hence this paper concentrated on teachers' perspectives, notably on Ghana's rural ECD teachers' attitudes, and factors that influence their intention to utilize DGBL.

To this end, the paper explores ECD teachers' perspectives of DGBL in rural schools in Ghana to better understand the influence that DGBL could have on ECD. We purposefully did not define the term DGBL for the instructors since we were curious about what they would consider a game to be and what games were being used in the classroom. Our investigation was framed by the following research query: What are teachers' perceptions of digital game-based learning regarding student engagement, learning motivation, and cognitive learning outcomes?

In the following sections, we first provide a brief overview of the related literature, followed by the research methodology. We then focus on the results and discussion thereof. We conclude by discussing implications for practice for teachers in rural schools in early childhood development (ECD).

## 2. Literature review

### 2.1. Effects of DGBL

Claims concerning the consequences of using DGBL in formal learning environments can often be divided into two categories: cognitive learning consequences and motivational learning consequences.

Learning factual knowledge, cognitive skills, and meta-cognitive skills are only a few examples of different cognitive learning outcomes (Chen & Wolf, 2021). In this investigation, we focused on two motivational facets: 1) Teachers who might have used DGBL (for teaching), and 2) teachers who are motivated to teach and have a positive attitude regarding its application in classroom settings. When Yang and Lu (2021) conducted a meta-analysis of 39 studies comparing teachers using serious games (games where the entertaining quality is used for a serious purpose, like education or health) with traditional teaching methods, they discovered that serious games were more effective in terms of teaching knowledge and cognitive abilities. These results are consistent with those of the study by Kaimara et al., (2022). Additionally, the results of the study by Rüth et al., (2022) demonstrate that playing games had favorable benefits on student engagement, but the results supporting the effects on motivation to learn were unclear.

Several authors (for example, Bado, 2022) propose soft skills or communicative skills as potential results of engaging in DGBL in addition to teaching and learning with DGBL. For example, Chen and Wolf, (2021) claim that learners not only understand the subject matter, but they also gain general abilities, like teamwork or introspective skills when they use DGBL to learn. Furthermore, according to Yang and Chen (2020), students who build games gain knowledge about game design as well as practical design skills and "reached a level of introspection that went above traditional learning and thinking" (p.12). Hartt et al., (2020) further emphasized that learning benefits go beyond the abilities and comprehension of game design. They showed that pupils enhanced their digital literacy and participation in the design process while developing scientific microgames (short games). According to Görgen et al., (2020) students who master games feel compelled to make their playing aesthetically pleasing, entertaining, and accurate. The learners also learned how to challenge and explain their expertise (Chen & Wolf, 2021). Yang and Lu, (2021) discovered that students playing DGBL were more motivated and employed higher-level cognitive processes than students who do not play.

## 2.2. Perceptions and experiences of teachers for teaching with DGBL

The perspectives and experiences of teachers with game-based learning may have a significant impact on whether the usage of DGBL truly results in positive learning and motivating effects. Several studies (for example, Kaimara et al., 2021; Yang & Lu, 2021) have investigated educators' perceptions of using DGBL in the classroom. Three common aspects were noted in these studies: 1) The value of utilizing DGBL in the classroom, 2) the challenges of using DGBL in the classroom, and 3) the acceptance of using DGBL in the classroom by instructors. We concentrated on the first component in the current study because it is potentially a prerequisite for the other two, as this paper is part of a larger PhD study.

The main justification given by teachers for adopting digital games in the classroom is to increase student motivation (Kaimara et al., 2022). Teachers also indicated that the development of students' cognitive abilities and knowledge as reasons for utilizing (or desiring to utilize) DGBL in their classroom settings ( Görgen et al., 2020: Rüth et al., 2022). The intentions of teachers to employ DGBL is most directly impacted by their attitudes toward learning opportunities (Rüth et al., 2022). However, most of the participants in these studies were either teachers who do not currently teach with DGBL or teachers who do so just when necessary for a specific study project.

## 3. Method

A quantitative approach was used to gather data quickly to obtain teachers' awareness and levels of competence in the use of digital technologies.

Sixty-two (62) teachers, who represented 10 rural schools in Ghana's Greater Accra Region, were selected to participate in the study. These teachers taught either kindergarten (grades one and two) or ECD phase. Because these teachers' impressions of the usage of digital games in their teaching practice are based on their personal experience, we purposefully chose rural schoolteachers who might use or not use DGBL in the classroom.

A questionnaire was administered to teachers in the 10 schools to obtain their opinions on integrating DGBL in their lessons. The questionnaire was made up of open-ended questions that covered a wide range of topics related to using games in the classroom, including the games used, the educational objectives that were covered, the activities that the students and teacher engaged in, the perceived outcomes, and the teachers' overall views on teaching with DGBL.

SPSS version 28 was used to analyse the data, which were collected as measurable percentages and numbers. Descriptive analyses were performed to answer the research questions.

## 4. Findings

Since there were typically no variations based on the type of education, we discuss the results for all forms of rural ECD education collectively. This section presents descriptive and reliability analyses of the study's variables. It is clear from table 1 that most of the teachers have been teaching for more than five years. Hence, their teaching experience qualifies them to be participants in the study.

*Table 1. Profile of participants.*

| Gender | Frequency | Age | Frequency | Years of teaching experience | Frequency |
|--------|-----------|-----|-----------|------------------------------|-----------|
| Female | 33 | 18 -25 | 13 | 4 | 6 |
| Male | 29 | 26-30 | 21 | 5 | 9 |
| | | 31-35 | 15 | 6 | 18 |
| | | 36-40 | 6 | 7 | 17 |
| | | 41-45 | 4 | 8 | 12 |
| | | 46 and above | 1 | | |

*Table 2. Perception of the use of technology in education.*

| Items of descriptions-Perceptions | Disagree/ Strongly disagree | Neutral | Agree/ Strongly Agree | % disagree/ strongly disagree | Mean | Std Deviation |
|---|---|---|---|---|---|---|
| Technology is important in education | 35 | 12 | 15 | 65.5 | 2.56 | 1.210 |
| The technology could be used to enhance teaching and learning | 36 | 6 | 20 | 58.0 | 2.53 | 1.352 |
| Technology has a role in the classroom | 35 | 12 | 15 | 56.4 | 2.50 | 1.264 |
| Technology can be used as a tool in assisting young learners to learn math and English literacy | 32 | 15 | 15 | 51.6 | 2.53 | 1.264 |
| **Cronbach's Alpha** | | | | | | **.770** |

The four items of measurement for the perceptions of the use of technology in education yielded a measure of consistency: Cronbach alpha of 0.770, which is an acceptable measure of reliability (Mishra et al., 2019). From table 2, it can be seen that 65.5% of the respondents disagreed with the fact that technology is important in education today, while only 6.5 strongly agreed with the statement. Also, worth noting is the low percentage (6.5%) of the respondents indicated they strongly agreed that technology has a role in the classroom. Interestingly, only 8.1% of respondents also agreed that technology might be utilized to help young students acquire math and English literacy.

*Table 3. Perception of the value of DGBL in the classroom settings.*

| Items of descriptions-Perceptions | Disagree/ Strongly disagree | Neutral | Agree/ Strongly Agree | % disagree/ Strongly disagree | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| use DGBL as a tool in my classroom to motivate young learners | 65 | 12 | 12 | 61.2 | 2.50 | 1.170 |
| DGBL can improve the learning skills of young learners in the classroom | 40 | 13 | 10 | 62.9 | 2.52 | 1.302 |
| DGBL can help improve the cognitive skills of young learners | 44 | 10 | 8 | 71.0 | 2.35 | 1.332 |
| DGBL can motivate young learners in learning complex topics | 45 | 8 | 10 | 72.6 | 2.10 | 1.211 |
| DGBL can create fun for young learners while learning | 43 | 8 | 11 | 69.3 | 2.18 | 1.261 |
| DGBL has a role to play in rural ECD community schools | 46 | 8 | 8 | 74.2 | 2.16 | 1.296 |
| DGBL can be used to supplement the traditional mode of teaching and learning | 44 | 11 | 7 | 70.9 | 2.40 | 1.247 |
| Cronbach's Alpha | | | | | | .896 |

Table 3 shows an overview of the frequencies of levels of agreement for the items of measurement. The seven items of measurement for the perception of DGBL in the classroom produced a Cronbach alpha of 0.896 which is an acceptable measure of reliability (Mishra et al., 2019).

From table 3, we can see that 62.1% of the respondents disagreed with the statement that they use DGBL as a tool in the classroom to motivate young learners, while 6.5% of the respondents strongly agreed to the statement that they use DGBL as a tool in the classroom to motivate young learners. Worth noting is the high percentage (71%) of respondents that disagreed that they could use DGBL to help students improve their cognitive skills. Finally, 74.2% of the respondents disagreed that DGBL has a role to play in rural ECD community schools. Majority disagreeing to the fact that DGBL could play role in ECD is not a good sign for rural education in Ghana.

## 5. Discussion

Noteworthy viewpoints from teachers on the application of DGBL in Ghana's rural ECD were explored. In addition to orchestrating and integrating the DGBL, as previous research on DGBL in education has shown, the teacher's role is crucial for the implementation of DGBL in ECD. This study demonstrates that teachers' viewpoints and decisions about whether to utilize games in the classroom are crucial. The similarities between public and private rural ECD schools served to emphasize the significance of the teacher's involvement in the application of DGBL. However, and this is crucial to note, the importance of DGBL and the role of the instructor are not just tied to the usage of DGBL in the classroom. Rather, it alludes to the broader use of technological resources. The findings showed that teachers made connections between DGBL, general DGBL technologies, and the digitalization of education. More precisely, the few educators that support the usage of DGBL agreed to the fact that the importance of educating students on how to function in a technologically advanced world and the utilization of electronic content like DGBL to facilitate this is crucial. Most of the teachers who had reservations about using DGBL also showed mistrust of technology in general and a reluctance to employ technological tools in ECD education. It has become clear that teachers' viewpoints are important not only when discussing DGBL but also while discussing the overall utilization of technology in the rural educational setting. Appreciation and even prioritizing the importance of teachers is necessary when it comes to the multiple efforts being made by education policy to advance technology and introduce a new pedagogy of digital technologies in classrooms. Teachers' voices should be given prominence and work to improve professional learning. Future learning and teaching methods in the educational system will indeed be altered by DGBL. The findings also revealed the unimaginativeness of teachers in integrating DGBL with young learners. DGBL is not thought to help accomplish learning objectives by rural teachers, according to the selection criteria.

The findings are consistent with other studies from developed nations and urban schools in Ghana regarding the obstacles to using DGBL, which show a lack of time, technological equipment, training, and information. Also, parents' views on DGBL, as well as the encouragement and assistance from colleagues, appear to have an impact on whether and how much teachers will use DGBL in their classes. This suggests that teachers' views may be crucial, but they must be in line with those of the other ECD stakeholders. The Greater Accra region of Ghana was the study's focus, therefore its interest in technological innovation in education may differ from the interests of other parts of the nation concerning DGBL.

Discourse about using traditional play to learn in formal education has been supplanted by discussions about teaching with technology and digital tools. DGBL might be viewed from this angle as just another teaching tool or digital tool that was previously less well-liked but is now becoming more well-liked because of new development in schools in Ghana. However, the justifications for using DGBL in schools are like those for using traditional play in the classroom, and it can be predicted that instructors' attitudes would not alter greatly. The discourse around the many technology trends that develop over time in formal educational settings, as well as instructors' attitudes and use of them, need to be compared in further research. This study recommends that teachers are given training on emerging technologies to be abreast with using technology in their classroom. The government should set up computer laboratories in rural schools to assist in the use of DGBL by teachers in classroom settings.

## 6. Implications and conclusion

The study set out to determine ECD teachers' attitudes and practices towards using DGBL. The findings show that most teachers do not support the idea of using DGBL and have no or little knowledge of the benefits of DGBL. A possible interpretation of this finding is that ECD rural teachers do not have the requisite skills and competencies to integrate DGBL in the rural classroom in Ghana. The findings of this study are subject to at least limitations. First, the results are based solely on rural ECD teachers' perceptions of using DGBL in rural ECD classrooms in Ghana. Hence, a possible bias exists, as in all anonymous surveys, the respondents may not give accurate information. The results must, therefore,

be interpreted with caution. Second, the self-recruitment of the sample may have resulted in less representativeness and thus less generalisability of the results. Still, the size of the sample and their diversity in demographic characteristics (age, gender, districts ECD settings) are satisfactory for the study, and therefore the results of the study are assumed to give a realistic indication of Ghanaian ECD teachers' perceptions of the value of DGBL in the classroom settings.

To ensure rural ECD teachers' use of DGBL in the classroom settings, training, and seminars are to be organized regularly for the teachers on emerging technologies in education today. It is also important for the government through the MoE to provide teacher professional development programmes that support with not only technological tools, also the pedagogical aspect of DGBL in the classroom.

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# ORDINARY DIFFERENTIAL EQUATIONS IN A MATHEMATICAL MODELING CONTEXT

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## Abstract

Many of the problems involving motion, growth rate, electricity, physical, biological phenomena, or that in the context of rate of variation are modeled with Ordinary Differential Equations (ODE). This content provides several relationships between Mathematics and other Sciences, offering opportunities for contextualization and creation of an environment conducive to learning. Researches indicates that the approach given in the teaching of ODE has a strictly algebraic approach, where students learn the methods of resolution without focusing on the behavior of the solution obtained, without performing a qualitative analysis of the problem that generated these equations. This paper aimed to present and analyze a teaching and learning experience that took place during the first classes of Applied Differential Equations in a Mathematics Teaching Degree course using the GeoGebra software as a pedagogical resource. The classes took place in the computer lab of the State University of Goiás, in the city of Goiás, with the participation of 10 students, and included activities designed from the perspective of Mathematical Modeling as a teaching strategy. The theoretical framework was based on reflections on Raymond Duval's Theory of Registers of Semiotic Representation, which considers that learning occurs when the individual performs articulations between the different representation registers of the same mathematical object. As a result, we found that mathematical modeling and GeoGebra provided a favorable environment for teaching and learning, as they allow the integration of theory and practice. The sequence of activities, prepared in a context in which the students experience, contributed to the students' involvement in their development.

*Keywords: Ordinary Differential Equations, Mathematical Modeling, degree course in Mathematics, GeoGebra, teaching and learning.*

## 1. Introduction

Many of the problems involving motion, growth rate, electricity, physical and biological phenomena, or those involving any variation rate are modeled with Ordinary Differential Equations. Therefore, this content provides various relationships between Mathematics and other Sciences, offering opportunities for contextualization and creation of an environment conducive to learning.

This research on the use of mathematical modeling as a teaching and learning strategy for Differential Equations (DE) in a Mathematics Teaching degree program, was motivated by research such as Dullius, Veit and Araujo (2013), Alvarenga, Dorr and Vieira (2016) and Rosa, Alvarenga and Santos (2018), which indicate that the approach adopted in teaching this subject focuses strictly on algebra and allows students to learn resolution methods without focusing on the behavior for the solution obtained, i.e., without performing a qualitative analysis of the problem that generates these equations, and with difficulties in perceiving the existing connection between the DE and the real modeled system and interpreting its terms.

Therefore, this research aimed to investigate the potential of a sequence of activities, developed from a mathematical modeling perspective, with the support of the GeoGebra software and based on the Theory of Registers of Semiotic Representation of Duval (1993), in the DE teaching and learning process, more specifically, in the qualitative analysis of DE solutions.

Using a mathematical modeling is necessary, as it allows for interaction between the "real world" and mathematics, as stressed by Bassanezi:

> Mathematical Modeling is a dynamic process used to obtain and validate mathematical models. It is a form of abstraction and generalization for the purpose of forecasting trends. Modeling essentially consists of the art of transforming real situations into mathematical problems whose solutions must be interpreted in usual language. (Bassanezi, 2022, p. 24, translation by the authors).

Dullius's et al. (2013) research provides evidence that mathematical modeling can facilitate learning, as teaching activities in a modeling environment bring about various mathematical and non-mathematical concepts, which favors learning.

Mathematical modeling, according to Bassanezi (2022), must follow a sequence of steps: Experimentation: step where data is obtained, whether qualitative or numerical; Abstraction: procedure that leads to the formulation of mathematical models, wherein the selection of variables, problematization, formulation of hypotheses and simplification are established; Resolution: linked to the degree of complexity used in the formulation, may be analytical or numerical, and can only be made possible through computational methods; Validation: the process of accepting or rejecting the model; Modification: if the model is not accepted, the problem data must be reviewed to then the necessary adjustments must be made in order to redo the steps until a better approximation of reality is obtained.

To support this teaching methodology, the use of Information and Communications Technologies (ICT) was considered, as it is in the development of classes that "[...] one realizes that ICT allows that activities be performed that would have been impossible with the use of paper and pencil only; it allows the organization of pedagogical situations with greater potential for learning" (Marin, 2008, p. 138, translation by the authors).

For this research, the GeoGebra Software was used, as it has many potentialities, such as its dynamism, its development aimed at teaching and learning Mathematics in its various teaching levels (from elementary school to university), it is free and easily accessible on the internet, and available in several languages, thus favoring its use. Also, GeoGebra has the didactic benefit of simultaneously presenting several representations of the same object.

The theoretical framework that guided the development of the teaching practice of this paper was Raymond Duval's Theory of Registers of Semiotic Representation. This theory clarifies the importance of using semiotic registers for mathematical learning due to the characteristics of mathematical objects that are abstract and need to be represented.

Semiotic representations

> are the product of using signs that belong to a representation system and have their own restrictions of meaning and functioning. (Duval, 1993, p. 39, translation by the authors).

According to Duval (1993), learning occurs only when the student manages to articulate naturally between the various registers of representations referring to the mathematical object.

There are three cognitive activities that characterize semiotic representation registers. The first one is the formation of an identifiable representation that can be determined through a comprehensible sentence, a drawing, a figure, a formula, among others. The second one is the treatment of a representation, which is the transformation thereof into the register itself, e.g., algebraically solving the DE. When the representation of a mathematical object is transformed into another representation, the conversion takes place, such as a graphical representation obtained from a given function. Therefore, the treatment takes place within the same register and the conversion takes place between different registers.

This research was developed using a qualitative paradigm, highlighting the present interpretative/subjective process, understanding that people act based on their beliefs, perceptions, feelings, and values, with behaviors full of meaning and senses that are not immediately assimilated, but unveiled (Alves-Mazzotti, & Gewandsznajder, 1998). Santos Filho and Gamboa (2009) mention that the focus of qualitative research is the individual experience of situations, the process of construction of meanings, common sense, the "how". Qualitative researchers originate from phenomena that interest them.

In addition, seeking to achieve the desired objectives, field research was carried out, which is considered a "[...] type of investigation in which data is collected directly in the place where the problem or phenomenon occurs" (Fiorentini and Lorenzato, 2012, p. 106, translation by the authors). In this case, it was the university, where "the researcher plays the role of observer and explorer, directly collecting data in the place (field) where the phenomena have occurred or appeared," as pointed out by Barros and Lehfeld (2005, p.75, translation by the authors).

## 2. Research development

This research was conducted with the participation of 10 students of the Mathematics Teaching Degree at the State University of Goiás, in the city of Goiás, Brazil. Classes took place in the computer lab, made available by the institution. The computers used by the students had the GeoGebra software previously installed. The researcher played the role of teacher/researcher for 12 days with the authorization of the head teacher of the class and the course coordinator. The meetings lasted 3 hours each, and took place on Tuesday evenings in September, October, November and December 2022. It should be highlighted that the students were in the 6th period of the course, and that the first four periods were carried out remotely due to the COVID-19 pandemic.

The students had already been informed that during the first classes there would be a teacher/researcher teaching the discipline of Applied Differential Equations, and that the course syllabus would not be negatively affected.

At the first meeting, the course plan was presented and the respective topics on DE were informed, i.e., definition, importance, where to use, how they emerged, terminology, types, examples, classification,

field of direction, solutions, qualitative analysis of solutions, some methods of solving and initial value problems. The students were invited to answer the questionnaire "Getting to know the research participant" containing questions about mathematics in high school, the motivation for choosing the course, derivation, and integration, GeoGebra and DE, in addition to the authorization for participation in the research. As most students did not know GeoGebra, they were asked to access the software and perform some activities for their familiarization. As pedagogical support, a projector was used with which the activities were presented. Figure 1 illustrates the students during their first class.

*Figure 1. Solving Preliminary Activities in GeoGebra. Source: Research Data.*



After reviewing the questionnaire, we found a gap in the students' knowledge of derivation and integration, knowledge which is of paramount importance for the teaching of DE. Therefore, in the following classes, we conducted activities on the necessary content, considering a proposal by Almeida (2017), who presents a material for teaching calculus containing applets produced in GeoGebra. For the analysis of the activities, students were asked to work in groups, favoring interaction, the development of strategies for resolution and the discussion of solutions. These activities consisted of situations present in the daily life of the participating students, i.e., civil construction activities, commerce, and rural production activities. These activities were developed using mathematical modeling steps, where data were provided by the problems (Experimentation), models were formulated (Abstraction), Resolved (Resolution), solutions were Discussed, i.e., the resolution was socialized (Validation). Some students realized that their models were not in line with reality and, therefore, made the necessary adjustments, including or excluding parameters (Modification), as shown in Figure 2.

*Figure 2. Discussing Derivation and Integration activities. Source: Research Data.*
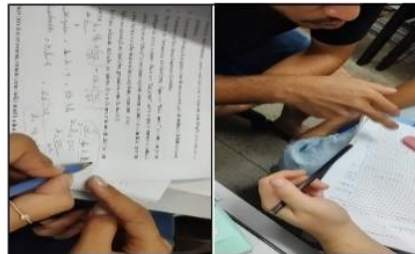


In one of the activities, they were requested to build a cylindrical tank that could capture 1000 liters of rainwater with dimensions that minimized the cost. During the solution socialization, which everyone used GeoGebra to better understand the result, one of the students, who works in civil construction, said that such a solution was impossible. From this observation, they started a discussion to find which the formulation problem was, and then they perfected the model. In this activity, the students used the three cognitive activities that characterize registers of semiotic representation: the formation of an identifiable representation, they formulated the problem; the treatment, they solved it algebraically; and the conversion, they used the software to build the graphical representation of the problem and then confirm whether the geometrically obtained solution was appropriate.

After the derivation and integration activities were performed, the study on DE began. In the first classes, the field of directions was built on squared paper, and then using SlopeField command in GeoGebra to compare the resolutions and check the facilities provided by the software, as shown in Figure 3.

*Figure 3. Building the field of directions. Source: Research Data.*
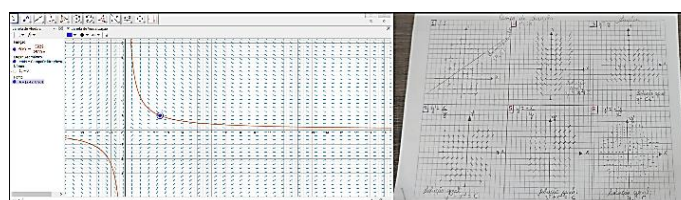
The first DE contextualized activities were classic problems, used in textbooks and which already provide all the data in the statement. The modeling steps were fulfilled as the students recognized the data, formulated the problem, solved it using the field of directions that was built in GeoGebra, and validated the model. In all DE resolution activities, using some methods, students compared the analytical solution with the geometric solution obtained from the software. Before solving it analytically, they already predicted the results through the geometric resolution offered by GeoGebra, as seen in Figure 4.

*Figure 4. Solving DE geometrically and analytically. Source: Research Data.*
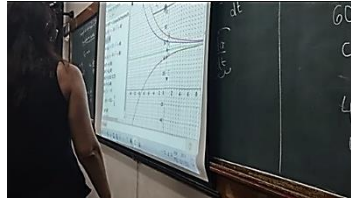


As a final activity, students were asked to choose a topic so that a problem and its resolution could be proposed from it. After several meetings and research, they chose to work with the topic of the radioactive decay of Cesium-137, a radioactive accident that occurred in Goiânia in 1987, a city close to the city where they study, and which was reported internationally. For this, the problem data were obtained from the internet. Students researched the half-life of Cesium-137, which is approximately 30.2 years, and the starting amount of Cesium-137, which is approximately 19.2 grams, to model the problem. Their goal was to discover the current amount of Cesium-137 that still exists in the city of Goiânia. These discussions on the subject are in line with what Bassanezi (2022) proposes about modeling:

> Efficient mathematical modeling allows one to make predictions, make decisions, explain and understand; finally, participate in the real world with the ability to influence its changes. We stress once again that the applicability of a model depends substantially on the context in which it is developed – a model can be "good" for a biologist, but not for the mathematician, and vice versa. (Bassanezi, 2022, p. 31, translation by the authors).

Each group formulated the problem as they pleased, and then shared their proposals. They solved it analytically and graphically and then validated it, whereupon they compared their results and decided on the model that best represented the problem, as shown in Figure 5.

*Figure 5. Deduction of the formula and resolution of the DE that represents the Cesium-137 problem. Source: Research Data.*
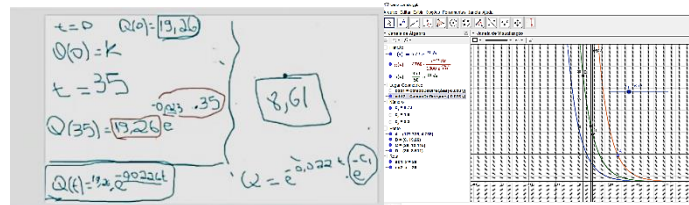


Considering the table with the data representing the amount of cesium-137 over the years, the FitImplicit and FitExp commands in GeoGebra were also used to compare the graphs with those previously obtained through commands SlopeField and SolveODE to observe the similarity between both. Figure 6 presents this new construction and the contribution for the comparison of results, representing the conversion of the semiotic registry according to Duval (1993).

*Figure 6. Using the FitImplicit and FitExp commands in GeoGebra. Source: Research Data.*
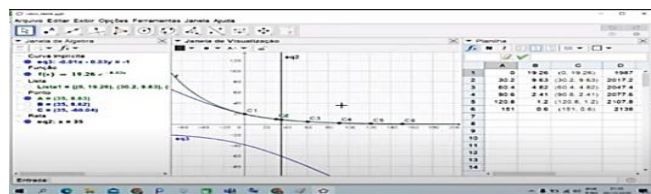


Table 1 presents the formulations and results of the algebraic and geometric resolutions obtained through the various commands used. The *x* representing how many years have passed since the radioactive accident and *y* representing the current amount of Cesium-137 that still exists in the city of Goiânia, representing the treatment of the semiotic registry according to Duval (1993).

*Table 1. Formulations and results. Source: Research Data.*

| FitImplicit | $-0.01x - 0.03y = -1$ | $x = 35\ y = 8.62$ |
|---|---|---|
| FitExp | $f(x) = 19.26e^{-0.002x}$ | $x = 35\ y = 8.63$ |
| SolveODE = Algebraic formulation | $h(x) = \dfrac{963}{50} e^{-23\frac{x}{1000}}$ | $x = 35\ y = 8.611$ |

## 3. Final remarks

This paper aimed to present and analyze a teaching and learning experience that took place during the first classes of Applied Differential Equations from the perspective of mathematical modeling and based on the Theory of Registers of Semiotic Representation.

Through the theoretical constructs considered, an environment conducive to teaching and learning, to be developed during DE classes, was provided. It is worth mentioning the difficulties presented by the students in relation to the basic contents of mathematics and, also the difficulties of some of them faced with the use of computers. GeoGebra could be used on cell phones, but few did so on their respective devices.

GeoGebra provided agility, practicality, and another resource to represent the problem, in the case of cesium-137, making it possible to compare the results.

The proposed activities provided a favorable environment for the use of mathematical modeling which students followed its steps. When reviewing content or when developing activities in the context of DE, the three cognitive activities took place according to Duval's theory (1993) used: formation of an identifiable representation, treatment, and conversion.

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# VIRTUAL REALITY IN SPEECH SOUND DISORDERS THERAPY

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## Abstract

Virtual Reality is considered to be a new way in which therapists can ensure the generalization of the acquired skills. In speech and language therapy field the use of virtual reality is commonly related with communication disorders. In our research virtual reality is supposed to improve the pronunciation skills by creating a more realistic perception of the referees denoted through the words used for training articulatory skills. In order to be able to ensure this virtual reality implementation Octoplay Application was used during our training pilot program. This application is designed to train articulatory skills and it has enclosed a module to create virtual reality and to build pronunciation skills in more realistic environments. In our research we try to identify in which way the use of virtual reality improves pronunciation skills of children with speech sound disorders. Three case studies are presented in this study and the impact of using Octoplay Application in speech and language therapy is highlighted. The students participated in 30 minutes' speech and language therapy session/week for two months. Results underlined that VR helps children remained focused in the training activities, improves their motivation to be involved in training activities aiming improving their articulatory abilities, facilitates enlarging children`s vocabulary by enhancing semantic access. In conclusion, VR can be exploited in speech and language therapy field in order to help children improve their pronunciation skills. We also consider that new applications and softs in with VR models included are needed in order to help speech and language therapy process.

*Keywords: Speech sound disorders, Octoplay application, virtual reality, speech therapy, pronunciation skills.*

## 1. Introduction – virtual reality in speech sound disorders therapy

In recent years technological solutions have played an increasingly important role in the education field, in the health sector or in therapeutic settings. There have been significant developments both in research and practice in relation to augmented virtual reality (VR) or immersive learning as technologies have emerged as potentially beneficial intervention for learning and therapeutic outcomes (Bryant, Brunner, & Hemsley, 2020). VR technology can be separated into two different approaches: non-immersive virtual reality and immersive VR.

Non-immersive virtual reality refers to a type of VR in which a person interacts with a virtual environment, usually through a gadget. In this form of VR, the person controls some characters or activities but the virtual environment is not directly interacting. For example, all basic forms of gaming devices such as PlayStation, Xbox, Computer etc. are examples of a non-immersive virtual reality experience.

Immersive learning or immersive VR consists in the use of augmented, simulated or purely artificial environments in which their users can learn through an almost complete immersion in the context they have to study or in the current or future work environment without being *in facto* present in working conditions that may present risks or perceived treats. For example: certain workplaces need simulators or social context for autistic people or people with stuttering.

There are multiple ways in which immersive learning can be approached (Sultan, 2023):

- Virtual reality: it consists of an artificial environment, brought to reality through different vision devices, thus allowing the user to be completely immersed in the environment that he wants to experience. Because the working methods in building virtual realities have developed in recent years, the user can even interact with the objects in the virtual environment or move in it. This possibility brings huge benefits in the context of real-life threatening situation or in perceived risky situation (ex. mental health sector).

- Augmented reality: brings virtual elements to life with the help of virtual augmentation lenses. Through them, the user can see the component parts of a machine before using it or can receive written information related to objects in the environment that surrounds him by looking through pairs of special glasses or through the phone screen.
- Video learning: it is done through an immersive video capture, in which the user can only look around (this can be done with the help of specialized Oculus Rift devices) or just through the laptop or phone screen.

Concerning the potential benefits of immersive learning in clinical training and education there are few items that can be listed: (1) Students or patients could spend more time in developmental context in the or they can prepare for it through virtual reality, including real-life situation; (2) There are already several video-type programs that present a three-dimensional view of real life (eg. Eva Park, Second Life etc.) which is useful for different life context situations; (3) Programs like VR could bring many benefits in the clinical therapeutic sessions, could help patients/ students in their orientation towards their possibilities, helping them to better understand the atmosphere in every-day life situation.

Many new programs and technologies are made available to the speech therapist and to the patients or students but sometimes they do not bring enough information or are not efficient enough to bring real benefits to a patient/student. Although they could bring theoretical information, sometime the practical field is not explored enough in the therapy sessions, and this can slow down or even prevent the transfer of knowledge in real-life. In this case, to learn effectively, a patient/student must learn to: organize his time, know how to apply all the information retrieved from therapeutic session, to know how to learn logically, having the information well organized in memory, not just to be a string of ideas or numbers without meaning for the true context of the studied context. And in all this situation VR could be the solution that provides the transfer context.

Previous research indicates positive results in connection with VR and speech pathology. Mostly communicative and fluency disorders, aphasia and autism were the clinical diagnosis that were addressed by VR (Cheng & Ye 2010). Therapists used Eva Park and Second Life to provide the therapy setting for the speech language intervention sessions (Marshall et al., 2016; Stendal, Balandin, Molka-Danielsen, 2011). Gains were in the field of practicing communicative skills and improvements in communicative activities of daily living for aphasia patients and in the "theory of mind" and recognition. Also, another research (deLeyer-Tiarks et al., 2022) that used the Virtual Reality Self-Modeling (VRSM), a new self-modeling intervention that combine together video self-modeling (VSM) and virtual reality (VR confirm that "after receiving VRSM as an intervention for stuttering, participants demonstrated clinically meaningful reductions in their stuttering severity".

VR and Immersive learning are modern and useful tools in the context of practical work, but its limitation to the visual and tactile field offer only a real and efficient alternative for the massive accumulation of information that life requires, not a substitute. Virtual reality, together with other new learning techniques, can lead to an elevation of the patient/student skills and abilities, towards the goal of forming better minds for a new knowledge and navigation through vast information on which a student/patient must know and apply. The VR and/or Immersive learning should be considered as a potential simulation tool for learning process of students, particularly in low- and middle-income countries (LMICs), where clinical training platforms or learning experience are limited and where simulation combined with teletraining or telesupervision can be used to increase access to training (Nagdee et al, 2022). Also, the user's perceived quality of experience (QoE) should be target when choosing new multimedia experiences as a key to the success intervention. Keighrey, Flynn, Murray, & Murray, (2021) proves that higher levels of QoE for users is obtained by the means of the augmented reality and tablet platforms.

## 2. Octoplay application

Octoplay (https://www.octoplay.io) is an interactive application through which both professionals and parents can help children train their phonetical and phonological abilities. This application has two sections, one dedicated to training Romanian phonemes (isolated phonemes from Romanian language -almost all consonants, p, b, m, n d, t, c, g, f, v, s, z, ș, ț, ț, h r. l except č and ğ, syllables – direct, CV- type and indirect, VC-type syllables), words -monosyllabic, disyllabic, three-syllabic and multi-syllabic words containing those 18 consonants trained in the first level of the application) and one dedicated to training verbal memory. These two sections are entitled Sounds Island (Insula Sunetelor) and Memorable cards (Cartonașe memorabile). The interface of the application is very friendly, the section dedicated to sounds is organized as a game, with a marine topic and the other section has very friendly and nice images based on which children can train their working and verbal memory (Vasiloiu, 2021).

The sounds training is based on demonstration and imitation techniques. This means that the selected sound/syllable/words is pronounced as example and after that the screen turns into a mirror and

the child can try his own pronunciations. For each sound/syllable and word that are three times repetitions, this offering the application the status of a therapeutic tool. The fact that the pronunciation model is given by a real person, this helps children build more accurate pronunciation abilities and, in the same time, get more involved in the task.

The original part of the application is ensured by the fact that the consolidation of the sound in syllables and words is developed starting from the idea of the speech and language therapy disk. This is an original concept put into practice in Romanian Speech and language therapy field starting with 2016, by Bodea Hațegan. In the application the speech and langue therapy disk is represented on a sailor`s wheel, having in mind the marine topic. This wheel can be rotated or a certain syllable to train can be selected by pointing on the wheel or on the list of syllables.

*Figure 1. Example of speech and language therapy for R sound, the list of syllables and words available on Octoplay.*
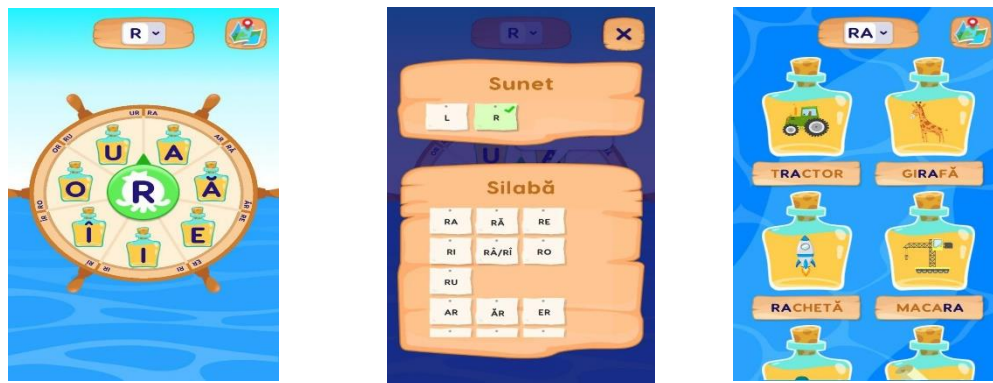


For each syllable there are six corresponding words to train, 2 words for the syllable in initial position in the word, 2 words for the syllable in middle position in the word and 2 words for the syllable in the final position in the word. This selection ensures training specific phonetic-phonological abilities in Romanian language for each consonant sound enclosed in the application.

The VR possibility to use the Sound Island from the application is a very new and interesting way that can be implemented during the therapeutic sessions. This possibility does not imply special equipment or special adjustments, with the exception of regular VR glasses.

Octoplay can be downloaded for free, it has both a variant for Android and iOS systems.

## 3. Design

### 3.1. Objectives
This study focuses on: (1) how VR can improve children`s involvement in the tasks during speech and language therapy sessions, (2) what are the benefits of using VR in speech therapy session for children with special needs.

### 3.2. Participants
Three primary school-aged children, all of them are enrolled in three different special schools. The participants were selected based on the following criteria: a) the diagnosis of TSA; b) age; c) the interest in using technologies in speech therapy sessions.

*Case study 1* - D. N. Is a 7.3 years old boy diagnosed with TSA when he was 2.8 years old and has a comorbid diagnosis of attention deficit hyperactivity disorder (ADHD) and a profound hearing loss in his left ear. He is diagnosed with severe autism. He is non-verbal and he uses gestures to communicate and some sounds to express his needs. According to Communication Matrix profile he is at level III, Unconventional Communication, he uses unconventional gestures with the intention of change behavior of the caregiver.

*Case study 2*- L. I. Is a 7.10 years old boy diagnosed with TSA. He has limited communication skills; he can articulate sounds and name some objects and actions only when the adult offers a verbal model and a motivation system is used. According to Communication Matrix profile he is at level V, concrete symbols the child uses concrete symbols (gestures and images) to indicate objects and actions.

*Case study 3* - S. C. Is a 8.5 years old girl diagnosed with TSA at age 3.5. She is an auditory learner, she likes singing and dancing, but her expressive language and thinking skills are limited, she used single words and rarely 2-3 words to communicate. S.C. has a comorbid diagnosis of sensory processing disorder. She reached level VI in Communication Matrix profile.
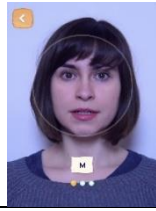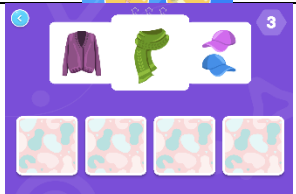
*Table 1. The demographics of the participants.*

| Participants | Age | Gender | Area |
|---|---|---|---|
| D. N. | 7.3 | M | Urban |
| L. I. | 7.10 | M | Urban |
| S. C. | 8.5 | F | Urban |

### 3.3. Procedure

The students participated in 30 minutes' speech and language therapy session/week for two months. The participants sat at the table, and they experienced VR on an iPAD 5. At the beginning of the session a visual schedule was presented to the subjects to prepare them for the session.

*Table 2. Objectives and sample tasks.*

| Participants | Objectives set using Octoplay platform | Sample tasks using Octoplay |
|---|---|---|
| D. N. | To imitate single sounds; To imitate monosilabic words with sounds he can articulate (CV;VC;VV, CVC). |  |
| L. I. | To identify objects; To imitate bisilabic and trisilabic words; To name objects. |  |
| S. C. | To name objects; To answer questions about the objects presented in the pictures. |  |

### 3.4. Results

The results are presented in table 3.

*Table 3. Objectives and sample tasks.*

| Participants | Objectives set using Octoplay platform | Results |
|---|---|---|
| D. N. | To imitate single sounds; To imitate monosilabic words with sounds he can articulate (CV;VC;VV, CVC). | Started to imitate 2 new sounds "B" and "M". Started to imitate new words (ex: "sheep", "chicken", "poppy" / "oi", "pui", "mac"). |
| L. I. | To identify objects; To imitate bisilabic and trisilabic words; To name objects. | Can indicate and name new fruit: "gooseberries", "pomegranate", "quince" /"agrișe", "rodie", "gutuie" |
| S. C. | To name objects; To answer questions about the objects presented in the pictures. | Can name new objects: "hood", "cowl", "helmet", "tassel"/ „gluga", „cojoc", „opincă", „năframă" and answers correctly 4/5 questions about this objects. |

The increased time the children spent on Octoplay platform is presented in table 4.

*Table 4. Time used to practice articulation skills.*

| Initials | Time session using VR in the first session | Time session using VR in the last session |
|----------|--------------------------------------------|-------------------------------------------|
| D. N. | 2.5 | 7.3 |
| L. I. | 5.2 | 12.7 |
| S. C. | 6.5 | 13.8 |

The results of this study indicate that all three children demonstrate improving of their articulation skills and expressive language skills at different levels. All children demonstrate interest in the VR technology and the time they spend practicing different language skills is increasing.

## 4. Conclusions

The use of Octoplay platform in speech therapy demonstrates to have a great impact on children with TSA. Results underlined that VR helps children remained focused in the training activities, improves their motivation to be involved in training activities aiming improving their articulatory abilities and expressive language skills, facilitates enlarging children`s vocabulary by enhancing semantic access. In conclusion, VR can be exploited in speech and language therapy field in order to help children improve their pronunciation/articulation skills. VR has a great potential in the future speech and language therapy. New VR platforms and technologies must be created in mixt teams (speech and language therapists and specialists in IT) in order to respond to the client's needs followed by studies are recommended.

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# TEACH INDUSTRIAL DESIGN STUDENTS
# HOW TO MAKE PHYSICAL PRODUCTS

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## Abstract

Companies mention a lot of difficulty in finding industrial design professionals capable of knowing how to carry out the complete process of designing physical products, which naturally implies physical prototyping and not just the creation of virtual 3D models. Currently, there are many higher education courses in industrial design that do not value or promote in their curricula the skills to make physical models or prototypes, in many cases, students and professors are satisfied with a graphic image of a digital 3D model as result, which is a huge mistake for who is teaching and learning to make three-dimensional and physical objects. This fact is due to the disinvestment of design schools in workshops equipped with manual and digital manufacturing tool, the need for large investments in equipment also implies associated costs of maintenance and technical support. In this context, schools choose to invest in computers and CAD software which, although are fundamental equipment in carrying out an industrial design project and an important step in the prototyping process itself.
How can we improve the teaching process in industrial design project so that students can idealize, develop, and prototype physical products with high quality standards?
The Industrial Design Project 2 class wants that students develop an inspirational connection with the best international references in industrial design. Interior lighting is one of the areas where we can find companies with a design driven identity. In this scenario, students are challenged to design a table lamp for indoor spaces for one of these brands, using a technical kit consisting of an LED strip, simulating a collaboration between designer, producer, and editor. To carry out this project and to find answers to the question posed, a method consisting of four phases was applied: project preparation; research and definition of the theme; concept development; and final model. Each of these phases is made up of tasks that, when carried out, provide outputs that allow the project to advance to the next phase. The results obtained were prototypes of high aesthetic, technical and functional quality and with low-cost materialization values easily supported by the students. Yes, it is possible to idealize, design and prototype high quality physical products, providing students with personal and professional fulfilment and increasing their technical and research skills, as well as the ability to know how to relate digital and analogue tools.

*Keywords: Industrial design education, process and outcome, physical prototyping.*

## 1. Introduction

The division of labour associated with the development of industrialization in the 18th century gives us a first insight into the professional practices we associate with design. Design, in this context, is the activity whose practitioners design physical artifacts that are used by humans to mediate our physical relationships with the world (Cline, 2019). Industrial design is a professional activity of creating and developing concepts and specifications that optimize the function and appearance of products and systems for the benefit of users and the industry (Industrial Designers Society of America, 2010). Industrial designers design the products we use in our daily lives with a concern to make them easier to use, more efficient, cheaper to produce and better looking (Unver, 2006). The practice of industrial design has undergone a lot of changes since the appearance of computer-aided design (Sener & Wormald, 2001), moving from an initial phase of 2D design to later giving way to a wide range of 3D computer design and currently a huge variety of digital manufacturing processes. These transformations derived from digital tools affected the activity of industrial design (Oxman, 2006), as well as the teaching of industrial design itself. It is expected that education in industrial design will prepare students for the complexities of professional practice (Garner, 2005), the application of digital tools in teaching this activity was and continues to be a very important pedagogical practice for preparing students. However, many schools,

with the introduction of these digital tools, abandoned the inclusion, in their curricula, of tools and analogue techniques and, above all, the practice of classes in a workshop environment, where spaces equipped with machines and tools that simulate the industrial environment are used for the materialization of physical products are abandoned in favour of 3D modelling software that limits industrial design to virtual images of physical products and conditions the learning of design students who will be responsible for the design of physical products and who in many cases will finish their courses without any have done. This fact is due to the disinvestment of design schools in workshops equipped with manual and digital manufacturing tool, the need for large investments in equipment also implies associated costs of maintenance and technical support. In this context, schools choose to invest in computers and CAD software which, although are fundamental equipment in carrying out an industrial design project and an important step in the prototyping process itself. Nothing is as convincing as a working prototype. Also, students learn the most from their failures so encourage them to prototype rapidly and fail as fast as possible to learn as fast as possible (Chow, 2022). In this context, the following question was asked: How can we improve the teaching process in industrial design project so that students can idealize, develop, and prototype physical products with high quality standards?

## 2. Methods and objectives

A working method consisting of four operational phases was outlined, in figure 1 we can see a summary version with the main phases of the project and the main iterations. The first phase consists of preparing the project where working groups of two students are formed, then each group must do brief research on some of the international lighting brands with a design driven policy. This initial research helps each group to have aesthetic and functional arguments about each brand to be able to choose one of these brands, for which they will design the luminaire, thus simulating a real case. The next phase, research and definition of the theme, focused on research on the brand chosen in the previous phase, research on the brand's products, history, philosophy, actors, such as designers and architects, location, among other relevant information that would help to get to know the brand better. This research aims to help each group to define a project theme. This theme must fit in with the objectives and philosophy of the brand and at the same time help the groups to stipulate a project path to follow. After the project theme is defined, the next phase consists of concept development, where formal and functional exploration drawings are drawn up with the aim of transforming the abstraction of the theme into a product idea. These drawings generate several hypotheses of concepts for the luminaires, and after a selection of the most promising concept, three-dimensional models of cardboard in full scale are elaborated. These models have the objective of defining and validating dimensions, proportions, shapes, functional and formal details, they are the first input for the three-dimensionality of the product. The next phase consists of the elaboration of the final model, where 3D digital models are created using parametric modelling software and which will serve to validate the model of the lamp in detail and from which all the parts that make it up are taken, these parts will be produced through rapid prototyping and digital fabrication techniques and subsequently assembled into a functional prototype.

*Figure 1. Model of the pedagogical method used in the process.*
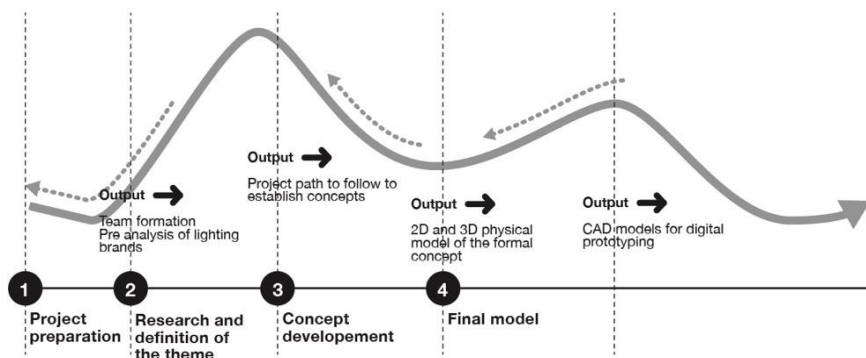


## 3. Description, discussion and results

This chapter intends to describe the application of the design process referring to all phases, always accompanied by opinions of improvement of the process that were detected by the players during their accomplishment. The project is carried out in the class of Industrial Design Project 2, in the second year of the bachelor's degree in industrial design at the Design School from the Polytechnic Institute of

Cávado and Ave, located in the city of Barcelos in the northern region of Portugal. Students are challenged to design an interior lighting product (table, wall or suspended) for international light brands and using a technical kit consisting of an LED strip, a switch, and respective cables, simulating a collaboration between designer, producer, and editor. The project is carried out in a team and the experience of use, constructive and functional details, as well as a careful choice of materials are valued. The classes take place in a studio format with a very strong incentive in the experimental component, and one of the main objectives of the project is the realization of formal and functional prototypes entirely built by the students and using digital prototyping techniques and tools.

The Industrial Design Project 2 class takes place during the first semester and intends for students to develop an inspirational connection with the best international references in industrial design. Interior and exterior lighting is one of the areas where you can find several companies with a design driven identity, especially in Italy, Germany, and the United Kingdom. These companies, in addition to having a very well-defined design culture and philosophy, collaborate with several contemporary designers in the design and development of their products, these companies have partners that allow them to design the best products with a concern for the smallest functional, emotional, and communicational detail.

The project begins with a preparation phase that consists of the formation of working groups made up of two students. The group work has two main objectives: pedagogical and financial. From a pedagogical point of view, it is intended to enrich the work itself, increase confidence among students, encourage mutual help and teamwork, preparing students to integrate work teams in their professional future. In the case of the financial component, it allows the cost associated with carrying out the work to be divided by two, lowering the costs inherent to the project with materials and prototyping. The preparation phase also involves prior research into some of the leading lighting product brands, with the aim of each group finding an inspirational link with one of these brands, whether in the products they develop and sell, or in their philosophy and mission. and in the way they communicate their values. This research also allows each group to get to know some of these brands, increasing the levels of design culture of each student.

The next phase consists of choosing one of the reference brands to be the brand for which each group will design the luminaire. After this choice, each group carried out more detailed research on the history, concept, mission and vision, the different types of products and markets to which they are intended, competitive advantage of the brand and products in relation to their competitors, designers who collaborate with the brand and the most emblematic projects carried out by the brand. The research results are later compiled in a short descriptive text, which will be accompanied by images that illustrate the text. Based on the research, each group proceeds to define a project theme, a theme that traces the main lines of the project path and that marks formal and structural elements, possible details, colours and textures, cultural influences, materials, trends and lifestyle, target audience and possible use environment. The theme is also summarized in a short text that forms the narrative and the concept of the project, which is also accompanied by images that illustrate it and that serve as inspiration for the transformation into lamp shapes. The result of these two steps is translated into two mood boards (Figure 2) that are posted on the classroom wall so that all groups can interact with suggestions and at the same time contribute to a healthy competition environment and promote the stimulation of everyone in regarding the project.

At this stage, the students showed a lot of interest and motivation in transforming the research into a visual format where the mixture of text and images make up the mood boards. When executing the mood boards, they demonstrated care in the layout of the same so that there was a harmonious connection between the two, showing care in the presentation.

*Figure 2. Example of research and project theme definition mood board.*

After executing the mood boards with the research on the brand and the concept of the project, the next phase consisted of the concept development, where the objective is to execute manual drawings of formal and functional exploration. Each group had to design several hypotheses for luminaires according to the established theme/concept, for which representation techniques were used such as perspective, side and top drawings, cuts and detail drawing. Colours were also used to distinguish parts and components, or to differentiate materials. The first half of each class was transformed into brainstorming sessions between groups and the second half for the execution of drawings on A4-sized sheets (Figure 3) where on each sheet it was possible to visualize the general idea of each concept, such as shape, details operating and construction.

The transformation of a theme/concept that is represented on a mood board (Figure 2) and that in itself is something abstract, to be transformed into a product idea, in this case an LED lamp, was the stage where the students showed the most difficulty, either because they have difficulty with the techniques of representation and manual drawing, or because they are unable to make this transition from something that has no form, such as a theme, to a physical object that bears form and a function.

*Figure 3. Illustrative drawings of the functional and formal exploration phase.*
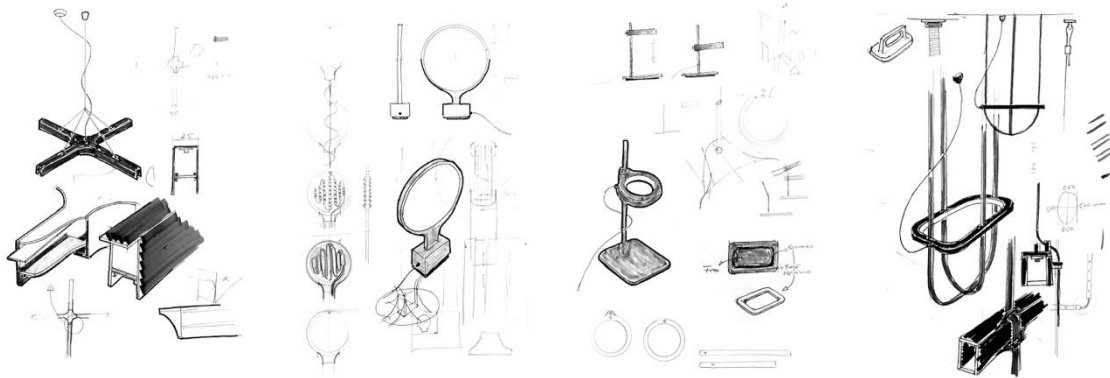


After each group had a formal two-dimensional representation of their luminaire, the next step consisted of building real-scale card models (Figure 4), this step is when the idea of the product leaves the paper, in a two-dimensional way, and finds three-dimensional reality, that is, it passes from the phase where everything is possible to the phase where the first constraints begin to appear, whether volumetric and formal, or aesthetic and functional. With the construction of these models in full scale it is possible to validate dimensions, proportions, and balance and even some functional details, such as fittings, light location, where the electric wire leaves the luminaire, light simulation, among others. In many cases problems are found and the process goes backwards to a previous stage for reformulation and correction.

*Figure 4. Some examples of low-fi cardboard models at real scale.*
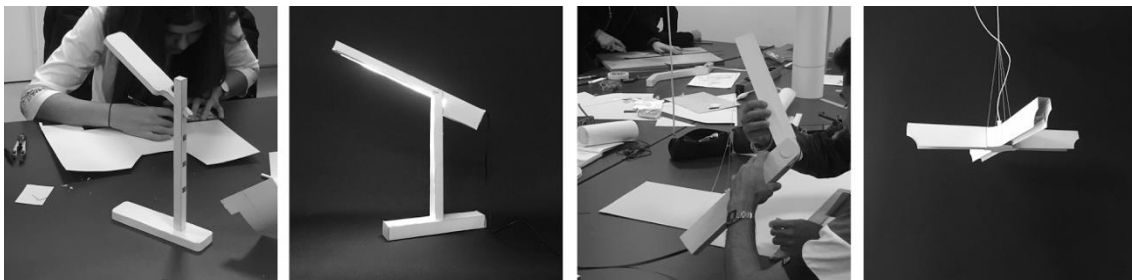


After the formal and functional validation of the cardboard models, the project moves on to its last phase called the final model, a phase of greater detail and dimensional rigor using digital 3D modelling through CAD software, in this phase all components are modelled and assembled on site, such as: the LED strip, the electrical connections, the internal channels for cables, unions of parts, articulations, diffuser, bases, etc. After the 3D modelling is finalized and validated by the teacher and the product development laboratory technician, the model is divided into parts and components. These parts are isolated in dxf or stl files for later digital fabrication, either through laser cutting, 3D printing, or CNC machining. Using these digital fabrication technologies, all the parts that make up each luminaire are produced to proceed with its assembly, in this assembly phase the students had to make the electrical connection of the LED strip, which provided them with an extra learning experience on basic principles

of electricity, soldering with tin, positive and negative poles, type of electric current, current transformers, among others. The assembly of prototypes is a meticulous task where assembly errors are avoided in order not to compromise the result and avoid having to produce new parts, which entails additional costs to the process. At the end of the assembly, a photographic session of the prototype is carried out (Figure 5) so that the students have a record of the work that is as close as possible to a professional work, which in our opinion substantially reinforces the quality of the portfolio.

*Figure 5. Some examples of final models in acrylic.*



## 4. Conclusions

The fact that a lot of importance and responsibility is given to the creation of the prototype, as if it were a final product, means that, at the time of portfolio elaboration, students show preference and greater confidence in the prototype elaborated in the discipline. The project briefing is adjusted to the laboratory conditions existing in the course, which allows the realization of the prototype within the foreseen objectives and the required quality standards. Research is carried out throughout the project and with the appearance of needs. The prototype also works as a measurable element of results between groups of students and encourages healthy competition between groups, which makes the result of higher quality. It is important when preparing a course of this kind that teachers and technicians simulate all the stages to adapt the project requirements to the real conditions of each educational institution.

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# RESEARCH PATHS AND FUTURE TRENDS OF ONLINE TEACHING QUALITY IN HIGHER EDUCATION: A BIBLIOMETRIC AND CONTENT ANALYSIS

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## Abstract

Online teaching reshapes the traditional classroom teaching by shifting instructions online, providing remote and virtual learning, and enriching and integrating electronic resources and activities into academic programs. Due to the influence of the coronavirus pandemic, online teaching has become a common distance education tool and widely used in higher education. Despite its universal adoption, the effect of online teaching has raised many questions, resulting in a variety of studies conducted for addressing the quality issue of online teaching. To systematically identify main findings, explore challenging issues and reveal research gaps and future trends in the field of online teaching quality, this study conducts a bibliometric and content analysis based on 477 articles from the Web of Science Core Collection published from 2000 to 2021.With the analysis of keyword co-occurrence and bibliographic coupling, 7 thematic clusters and main research contributions are identified. With the analysis of co-citation network, 5 theoretical clusters together with 13 widely used theories in online teaching quality research are explored. The relationships between the research themes and theoretical roots are then clarified and visualized in a social relation diagram, providing scholars with clear research paths which link the future studies and existing knowledge. The content analysis is applied to reveal gaps and key research issues for future study. The outcome of the study provides a research framework that clarifies the variety of research avenues for further developing the field of online teaching quality.

*Keywords: Online teaching quality, research path, bibliometric analysis, content analysis.*

## 1. Introduction

Catalyzed by the global impact of the coronavirus pandemic, online teaching has emerged as a common means of education. This transformation has led to a reconfiguration of the learning environment and teaching approaches. Universities have to prioritize their teaching resources to support online courses and ensure the quality of education. Meanwhile, a diverse and rapidly growing body of research has been conducted on the quality of online teaching. To gain a comprehensive understanding of the key issues and developments related to online teaching quality (OLTQ) and to identify potential avenues for future research, it is imperative to conduct a systematic and holistic review on the existing literature. To this end, this paper applies a bibliometric and content analysis to (a) investigate the current status of OLTQ research,(b) identify key issues in OLTQ and (c) discover the connections between research themes and theoretical roots and provide future studies with viable research paths.

## 2. Design and methods

Figure 1 shows the framework of the research design. Stage 1 collects the data of the quality papers in the field of OLTQ from the Web of Science Core Collection by conducting an extensive search using the keywords related to "online teaching". The collected articles are dated between 2000.1 and 2021.10. With a rigorous manual screening to remove irrelevant and repetitive articles, 477 contributions are identified. Stage 2 applies the bibliometric analysis techniques to perform science mapping on the collected articles. The VOSviewer is used in this stage for discovering and visualizing the research hotspots, themes, and theoretical roots of the OLTQ research. Stage 3 applies Ucinet to translate the relationships between research themes and theoretical roots into a social network diagram. The result provides an integrative framework for clarifying the research avenues for future study of OLTQ.

*Figure 1. Research Design.*
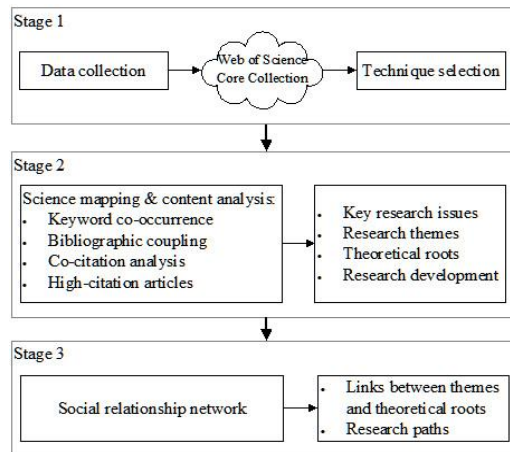


## 3. Results and analysis

### 3.1. Keyword co-occurrence analysis

In the keyword co-occurrence analysis, 41 keywords with high frequency (appeared in 5 or more articles) are identified from the OLTQ literature and mapped into four clusters according to their relevance. Table 1 shows the keywords and their occurrences in each cluster. Cluster 1 focuses on the adoption of online teaching services, exploring the acceptance factors of online teaching from the aspects of technology, continued usage intentions, and service quality. Cluster 2 emphasizes on the development of new teaching modes driven by various motivations for improving the effectiveness of online teaching. Cluster 3 focuses on the performance assessment of OLTQ with respect to criteria such as effectiveness, implementation process, and student participation. Cluster 4 focuses on the discussion of OLTQ assurance from the organizational and individual perspectives.

*Table 1. Clusters of co-keyword in the OLTQ research.*

| Cluster | Keyword (Occurrence > 5) |
|---|---|
| Cluster 1 (15 items) | Service quality (37), students (22), acceptance (12), motivation (11), continuation intention (10), information-systems success (7), technology acceptance (6), adoption (6). |
| Cluster 2 (12 items) | Blended learning (13), flipped classroom (9), framework (9), teaching mode (6), instruction (5), self-efficacy (5), strategies (5). |
| Cluster 3 (8 items) | Performance (12), engagement (7), student engagement (6), feedback (6), experience (6), perceptions (5). |
| Cluster4 (6 items) | Quality assurance (13), impact (11), learning management (6), university (6), faculty (5). |

### 3.2. Bibliographic coupling

The aim of the bibliographic coupling is to group papers based on their shared references for identifying connections between articles. In this analysis, the largest set of connected items consisting of 100 out of 477 articles is grouped into 7 clusters, which describe the intellectual core of OLTQ. In each cluster, the articles with the highest closeness centrality are analyzed to reveal the key research issues, theoretical contributions, and their connections.

Thematic cluster 1 (red) comprises 23 contributions. The main contribution focuses on exploring student interactions in online teaching environments. Based on cognitive learning theory, behaviorist learning theory, and social constructivism, the integration of innovative elements such as mobility, augmented reality, and sense of place with the development of online teaching models attaches importance to the interactions in online teaching effectiveness. However, the effect of interaction is different under fully-online and partially-online teaching modes. A fully-online mode can be synchronous, asynchronous, or partially synchronous. Students can participate in learning activities in real time using video conferencing, chat rooms, or virtual whiteboards, but the limited attendance means may negatively impact the student interactions and engagement. Exemplified by the mode of flipped classroom, where students first conduct self-learning using videos, readings, or other forms of media and then engage in classroom activities that reinforce what they have learned with their instructors, the partially-online mode allows for more interactive and collaborative learning, providing personalized and self-paced learning experience for each student (Chapman, Goodman, and Jawitz, 2016).

Thematic cluster 2 (green) comprises 23 contributions. The main contribution of this cluster focuses on the strategies or methods for monitoring and evaluating OLTQ and MOOCs are often used to illustrate and validate the proposed methods. In fact, the complexity and innovative nature of MOOCs have posed great challenges to quality evaluation. To deal with this, a two-pronged approach and a

peer-assessment approach are proposed for effective MOOCs monitoring and evaluation. The former first defines interactive entities at different levels in the MOOC system and then determines specific assessment criteria (e.g. coverage, participation rate, and grading) at each level. The latter indicates that the peer assessment allows the participants to fully utilize their experience and knowledge to engage in evaluating their peers. Other evaluation strategies are proposed from the perspective of infrastructures such as the design of online teaching platform. The assessment criteria may include accessibility, flexibility, interactivity, and usability.

Thematic cluster 3 (pink) comprises 15 contributions. The main contribution focuses on the social roles: teachers/instructors and administrators in the online teaching environment for exploring the key elements to enhance the online teaching and learning experience. It is noticed that the academic level, teaching attitude, achievement goals, professional skills, and teaching experience of instructors are positively correlated with the effectiveness of online teaching experience. Individual characteristics and performance of administrators can also affect the quality of online teaching.

Thematic cluster 4 (yellow) comprises 14 contributions. The main contribution focuses on the satisfaction and continued usage intention of online teaching systems. The development of online teaching often requires assistance of unique system design by identifying the key factors that affect the users' willingness to continue using the system. As identified by many studies, the continued usage intention may be negatively influenced by computer anxiety and high perceived financial cost and positively influenced by computer self-efficacy, compatibility and perceived information quality. Technical environmental characteristics, such as media richness, interactivity, and gamification also have a positive impact on users' behavioral intention. In particular, psychological experiences such as interpersonal factors and atmospheric cues of online teaching systems will significantly affect the continuous usage intention.

Thematic cluster 5 (purple) comprises 10 contributions. The main contribution focuses on individual performance with respect to behavior and attitude. In terms of behavior, with the flexibility in learning time and place, most online students lack of self-regulation skills. According to relevant studies, proactive help-seeking is identified as an effective method to guide students to actively participate in online learning activities (Albelbisi, 2019). In terms of attitude, this cluster emphasizes on examining the impact of learning attitude and goals on educational success. The findings show that the value-focused students often adopt a positive attitude, devote their time and effort in learning, and perform better among their peers (Paechter, Maier, and Macher, 2010).

Thematic cluster 6 (blue) comprises 8 contributions. The main contribution focuses on the impact of online teaching technologies on instructional design. OLTQ is increasingly influenced by new technologies. For example, Ellis et al. (2019) pointed out that online teaching technologies can help teachers improve their instructional design. Ellis et al. (2016) suggested that the learning principles for using online teaching technologies should be included in the instructional design. Owens (2012) emphasized that the professional skills and development of teaching and technical staff are essential for effectively integrating teaching technologies with instructional design and practice.

Thematic cluster 7 (orange) comprises 7 contributions. The main contribution focuses on the factors influence online learners' participation. Various external and internal factors are thus investigated such as environmental factors (e.g., COVID-19), personal characteristics, gender, technological ability, and social skills. Dias et al. (2020) further developed a predictive model using deep learning techniques to predict student participation in online learning in order for enhancing their motivations.

## 3.3. Co-citation analysis

The theoretical roots of the intellectual core are identified by grouping articles that share similar content into a co-citation cluster. By setting the minimum number of citations of a cited reference of 3, a network of 5 clusters is constructed, as shown in Figure 2.

*Figure 2. Bibliographic co-citation network.*
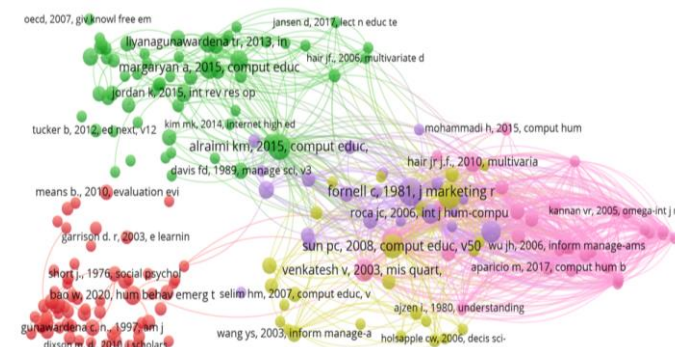
Co-citation cluster 1 (red) comprises 76 contributions. The cluster mainly based on Community of Inquiry (COI) and Self-Efficacy Theory (SET). COI indicates that a successful online teaching involves the interaction of three key elements: social presence, cognitive presence, and teaching presence. By promoting these elements, the COI model can help instructors create an effective and engaging online learning experience for their students. SET explains how people's beliefs about their own capabilities affect their motivation, behavior and learning outcomes. Cluster 2 (green) comprises 60 contributions. The cluster mainly relies on the Theory of Motivation (MT), Self-Regulated Learning (SRL), and Implicit Theory (IT). The core of this cluster is to explore various factors that motivate learners to participate in online learning activities and identify the ways to enhance motivation, engagement, and persistence, such as individual autonomy, belief in intelligence and learning ability. Cluster 3 (pink) comprises 32 contributions. The cluster mainly relies on Technology Acceptance Model (TAM), Task-Technology Fit (TTF), and Expectation-confirmation Theory (ECT). These theories are applied to study user acceptance and usage of technology in online teaching. In particular, TAM is used to predict user acceptance of technology-based teaching tools and platforms. TTF assesses whether the technology used to deliver course content and facilitate communication between students and instructors is well-suited and meet course objectives. ECT further explains why students and instructors continue to use a particular online teaching tool or platform (Bhattacherjee, 2001). Cluster 4 (yellow) comprises 23 contributions. This cluster mainly studies models for measuring the success of online teaching systems. Information Systems Success Model (D&M) and Structural Equation Modeling (SEM) are commonly applied in the cluster. Cluster 5 (purple) comprises 22 contributions. This cluster mainly relies on Self Determination Theory (SDT), Theory of Planned Behavior (TPB) and the Flow theory of social psychology. The use of the three theories provides useful frameworks for understanding the intentional behavior of using online teaching. The results can be used for the design and implementation of effective online teaching strategies.

### 3.4. Social relation analysis

With a content analysis of the articles, a quantitative matrix between the thematic and co-citation clusters is established and their relation diagram can be drawn by Ucinet. Based on the diagram, a framework with multiple research paths can be obtained, as shown in Figure 3.

*Figure 3. Research paths.*
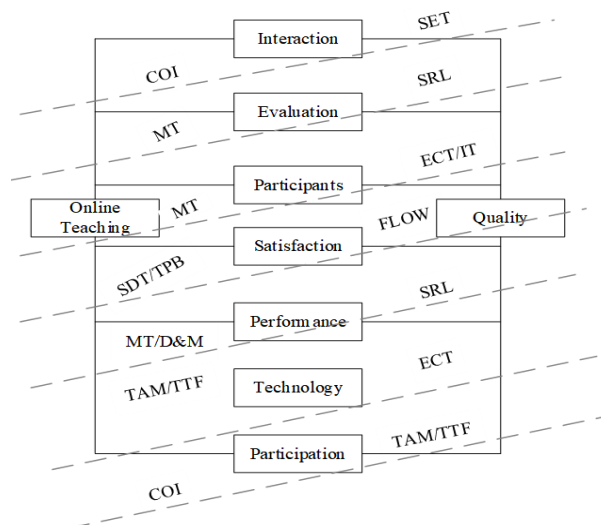


It is noted that the research of student interactions in online teaching environments is mainly based on COI and SET, indicating OLTQ is significantly affected by the interactions between instructors and students, computer self-efficacy, and learners' reflection strategies. The discussion about OLTQ evaluation is highly dependent on MT and SRL. Due to the lack of supervision in online learning, it is necessary to explore internal and external motivations that promote learners' proactive participation, investigate strategies that enhance autonomous learning. IT is often used to study the role of participants in dealing with situational changes and challenges in adoption of new technologies. It is recognized that the implicit intelligence of students, instructors, and administrators has strong influences on their adaptive behaviors. The research on online teaching satisfaction and continued usage intention apply a variety of theories such as TPB, Flow and SDT. These theories mainly investigate the influence of attitude, motivation, enjoyment and other psychological factors on the willingness to continue using the online teaching tools. In the study of individual performance in online learning, theories such as TPB, ECT and SRL are used for exploring the changes brought by attitudes, perceptions, and motivations. To understand

the impact of online teaching technologies, TAM and TTF are used to investigate the user acceptance of online teaching and sustained usage behavior over time. In the discussion of student participation, COI serves as a framework for assessing the participation rate in online teaching environments from the perspectives of technology and user perception.

## 4. Discussion

The results of this study can help scholars track contributions of the intellectual core and identify research gaps or future research issues along each path. For example, effective learner reflection strategies need to be established in a trusted environment and are subject to potential interventions caused by other network users. Future research can thus be conducted to address **RQ 1**: *Will the intimacy of peer relationship affects the students' decision-making in formulating reflection strategies*? Due to the heterogeneity of online teaching, it is necessary to differentiate synchronous and asynchronous teaching modes and investigate the impact of autonomy on OLTQ under different environments. Future research can thus investigate **RQ 2**: *What is the impact of heterogeneity in online teaching on self-regulated learning behaviors*? To further explore the influencing factors to OLTQ from the perspective of participants, future research can investigate **RQ 3**: *Will the leadership style of administrators affect the quality of online teaching*? According to the Flow theory, gamification of online teaching interface design can improve OLTQ via incorporating pleasure. Future research can further investigate the variables that affect the flow experience of the students, such as **RQ 4**: *How to make online teaching platforms more gamified*? Although the SRL theory can help explain individual behavior in online learning, little research has been done on the triggering mechanisms for such behavior. As suggested by MT, individual behavior can be largely influenced by external motivation. Future research can thus identify **RQ 5**: *What kind of organizational mechanisms (e.g. scale and gender ratio) can facilitate proactive learning*?

## 5. Conclusion

This study makes theoretical and practical contributions to the OLTQ research. By using bibliometric techniques and content analysis, the study overcomes the limitations of qualitative reviews and systematically explores the key research topics, contributions, theoretical roots, and main findings. By establishing the relationships between the research themes and theoretical roots, the study constructs a research framework with viable research paths for connecting existing knowledge and presenting mature study schemes. The framework can help reveal gaps and key questions for guiding the future research in this field. Practically, the concept of "Internet + teaching" has become an important means of education in the post-COVID-19 era. It is important for universities to ensure that students receive high-quality education in remote learning environments. The findings of this study provide a comprehensive review of the past, current and future development of OLTQ and can be used to facilitate the universities to develop strategies for improving the quality of online teaching.

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# DESIGNING RUBRICS TO ASSESS PEDAGOGICAL KNOWLEDGE OF PROSPECTIVES TEACHERS

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## Abstract

This study is encompassed within a two-year project that was commissioned by the Chilean Ministry of Education and executed by the University of Concepción. This initiative concerned the elaboration of open questions stemming from cases studies and the rubrics for them to be corrected, amongst other products. The case was conceived as an assessment resource with the purpose of linking the theoretical insights acquired by students-teachers, throughout their undergraduate training process, with their future professional development and professional learning. The open questions triggered the analysis of the outlined case and demanded from respondents the association between theory and practice through a reflective process of interpretation and re-interpretation, accessing the possible points of view that guide decisions of those who are represented. Thereby, the rubrics should provide quality assessment information on the students 'capacity to demonstrate their abilities to pose hypotheses and questions, to infer meanings and implicit information, to establish generalizations, to criticize models and strategies, to generate alternative didactics solutions. This paper reports on this stage of the project, namely, the devising of rubrics aimed at the assessment of the general pedagogical knowledge for prospective teachers. Two main methods were applied, i) Documental analysis, which had at its core the review of national standards that guide teacher training programmes. In this process, specific indicators were examined. This procedure came up with a categorization that comprised the content, the ability examined, and the theoretical difficulty level. ii) Expert panels, which congregated together higher education teachers and schoolteachers. These professionals were subdivided into three different groups for: writing, reviewing and external academics judges within an evolving process of reflection and improvement of the elaborated rubrics. The study's results state that, once determining content validity and construct validity, four interrelated notions emerged that should be the constituent elements within each rubric description level. This means, a descriptor should make reference to: the highest ability demonstrated within the answer, what actions might serve as evidence of those ability has been achieved, the core content which reflects the student's perspective or stance from which they elaborate their answer, what information from the case analysed was used to articulate their responses. This, in turn, allowed researchers to develop a writing scheme by integrating these four defined parameters. This approach was used as a theoretical frame in training assessors and in the design of all set of rubrics involved within the project.

***Keywords:*** *Rubric, pedagogical knowledge, descriptor's components.*

## 1. Introduction

The assessment of prospective teachers has been at the centre of the national debate since a number of difficulties have arisen, which are linked to standardized measures, namely, the multiple-choice tests. These sorts of tests have been used as a prime method to assess teachers' professional competence and to promote the development of higher abilities (Villarroel et al., 2015)

Within this context, a Project was developed by the Chilean Ministry of Education in order to elaborate open questions stemming from case-studies or from pedagogical situations, thus providing the opportunity to integrate theory and practice through a reflexive process of interpretation and re-interpretation. This, in an attempt to gain insights into the possible points of view, that might drive the pedagogical decisions, of who were represented within the proposed cases (Mineduc, 2019). Therefore, through the analysis of real-life situations, pedagogical reflexivity can be evidenced as student-teachers must put into practice the pedagogical knowledge acquired throughout their initial teacher training. This means that prospective teachers should make explicit in their answers their capacity to build meanings that are in accordance to what they have previously learned (Mineduc, 2019).

As open questions entail answers that are not set in advance, its incorporation within national assessment procedures also brought up a new challenge, that is to design an assessment instrument that encompasses both, the respondents' performance and provides insights about the students-teacher higher order thinking abilities, which, in turns might inform on their capacity to reflect in depth. This issue becomes highly important as feedback on the initial teaching training processes is therefore required. In accordance with the aforementioned, teacher training standards can be used as a framework for this task, which comes across to all higher educational institutions.

Consistent with this idea of getting valuable information, from students 'answers, that can be used as feedback to improve their pedagogical competences. The project comprises the elaboration of rubrics to evaluate teachers' performance. Rubrics are understood as assessment tools that set progressive levels of knowledge domains regarding an individual's attainment at a particular task (Díaz Barriga, 2005). Therefore, potential feedback might be grounded on these levels or descriptors, hence, it contributes to learning consistent with a formative approach.

Bruna et al. (2019) when commenting Allen & Tanner (2006) contribution, asserts that the rubric as an assessment instrument can be effective, not only because enables the assessor to judge a level of attainment by marking using grades or comments, against a predetermined description, but also, the rubric opens the opportunity for formative feedback to take place. By considering this idea, when devising rubrics there are certain elements that must be taken into account, namely, the attainment level descriptions - also referred to as descriptors, that explicitly detail under which criteria the work will be judged, thus outlining what it is the expected performance of the student regarding his or her task, ergo what constitutes a satisfactory or unsatisfactory answer, following the question that was answered and the analysed case.

According to Sadler (2014) it is crucial that those descriptions go further than an automatized summary of aspects to be assessed, in fact the emphasis relies on how the drafting of the descriptors explicitly shows, in an integrated manner, the aforementioned elements within the student's work. Hence it gives way to a general judgment, which focuses on providing some orientation or insight into the abilities and knowledge domains that evidence the quality of the student's answer. It is important to note that a variety of levels of attainment are carefully described in rubrics, from the highest level required, as well as middle and lower levels.

In line with the previously stated, there are certain guidelines that are followed when constructing rubrics to assess answers to open-ended questions. These aim to ensure that descriptions of the four established levels of attainment, i.e., Optimal, Satisfactory, Basic, and Unsatisfactory, are consciously and consistently reached by those who formed the case and question development teams. Brookhart & Chen (2014) regarded this collaborative aspect of constructing rubrics as highly relevant to ensure the reliability of the instrument.

## 2. Design

The study follows a qualitative stance (Cohen et al., 2011; Mason, 2022; Silverman, 2011, Berg & Lune, 2019), using the documentary review technique. At a first stage, the National Standards of the Ministry of Education were examined due to their role at guiding initial teacher training programmes. Likewise, research on the design of rubrics to assess pedagogical competencies of student-teachers were also reviewed. Then, in a second stage, a hermeneutic analysis was conducted, which involved reading, analysing and interpreting texts according to the study's aims. This phase focused on determining the elements that should comprise the rubrics' descriptors. Thereafter, within the third stage, rubrics were collaboratively drafted within an iterative process that involved the participation of teachers from diverse educational levels and settings such as university lecturers, elementary and secondary teachers, special education teachers. Finally, a fourth stage involved the validation of these instruments along with external evaluators which enabled the rubrics to be enhanced.

## 3. Objectives

The study is driven by the following general aim:
- To describe a collaborative methodological approach to design rubrics that seek the assessment of students-teachers' pedagogical knowledge.

This prime purpose is delineated through the following specific objectives:
- To identify the core notions that define quality within prospectives teachers 'responses to open questions which are meant to reflect pedagogical knowledge.
- To define the parameters that should compose the descriptors to reflect different levels of attainments in assessing professional teaching competences.
- To devise a writing scheme for rubrics descriptors that allow assessors to make sense of what is being monitored but also provide valuable information that can be retrieved for effective feedback.

## 4. Methods

As previously stated in the design section, one of the methods used was documentary analysis. The analysis was centred on the review of National Standards that drive initial teacher training programmes, and on research on rubric design. The process resulted in determining the elements that are at the core of the rubric writing methodology, as well as the skills being examined and the level of the theoretical challenge.

In addition, a panel of experts was grouped, integrated by university lecturers and classroom teachers, who then worked collaboratively. They were divided into four sub-sections or groups, those being preschool, special, primary and secondary education; with the purpose of writing and enhancing the rubrics after the review by external experts.

## 5. Results and discussion

The results of the experts' observation regarding the drafted rubrics led to four intertwined notions that should be considered as constitutive elements of the achievement description that enables judging a student's response within the four different categories outlined by the assessment tool, namely: *optimal, satisfactory, basic and unsatisfactory.*

At a first stance, the groups with the responsibility of designing rubrics agreed to establish the descriptor corresponding to the highest level required in the question, which will be referred to as the "Optimal descriptor". Its structure encompasses four essential elements:

1) *The highest cognitive ability* measured in the question. To approach this, Marzano's taxonomy (2001) was adopted, particularly within its adjustment to the pedagogical competences established in accordance with the standards for the teaching profession (Mineduc, 2022). This pedagogical alignment was the result of a collaborative and consensual re-interpretation process that serves as a framework for the elaboration of the question as well as identifying the evidence to be assessed that is contained in the students' responses.

2) *The actions* that allow evidence of attainment on the cognitive ability previously defined, which must be coherent with the instruction on what it is expected the student should do and how should he or she structure his or her response. Some examples may include: If the assessed cognitive skill is "design" (within the level of Knowledge Utilisation), then the expected attainment (descriptor) could be expressed as "*plan* a didactic sequence…", "*develop* an activity (...)", "*elaborate* an instrument to measure (…)".

3) *The reflection criteria* involved in the question that guide the key content of the response and delimit its scope. These may include aspects, dimensions, factors, variables, amongst others. The criteria provided in advance within the question give way to different forms of answers that must be contained in the drafting of the descriptor and must be comparable or rather similar in terms of quality. The drafting of this section of the descriptor, considered a variety of possible correct students' answers or ways to structure them.

4) *Examples.* This descriptor's component relates to the exercise of including reasons that stem from the evidence contained within the case, specially, when the questions are oriented towards the *Knowledge-Utilisation* level of the taxonomy. For instance, the ability to judge, as illustrated in the following question: *"Which of the two error-approach methods used by Natalia has a greater impact on student learning? Justify by providing two arguments based on evidence from the case".* In both situations, introducing examples in the descriptor seeks to guide the assessors in the conceptual framework of the adopted approach when formulating the question.

It should be noted that the holistic rubrics that were elaborated by the teams took into account only one description for each of the four outlined attainment categories, this took place gradually from the *optimal* level to *unsatisfactory*. This *descriptor* should clearly evidence the logical and cohesive interrelation of the previously defined components, thus showing the quality of the expected response from a qualitative stance, which reminds the reader that this process is not just about a checklist to be used by the assessor (Sadler, 2014). This implies that the teacher-student's answer must be addressed as a whole, and it should be compared to the described levels. Also, this allows for a detailed description on what prospect teachers should know and be able to do in order to show his or her level of attainment on a measured standard or competence, which can only be achieved through the consensus amongst rubric developers regarding which aspects are to be considered, aspects that are in turn grounded on their own experiences and teaching practices (Reddy, 2007). Baring this in mind it contributes towards the reliability and consistency of the designed instrument (Brookhart & Chen, 2014), given that it will be used in the context of national assessment of prospective teachers and not in the particular setting of those who drafted it.

In line with what has been discussed throughout this paper, it should be kept in mind that rubrics as tools or instruments are considered to be perfectible (Martínez, 2008), that is they can be improved and optimised in terms of the wording of the descriptors, modifications that are also coherent with their use in teaching practice.

In order to operationalise the drafting of the descriptors, it became crucial to acknowledge their textual nature, and as such, its main feature is being able to precise on the achievements in a specific task. This is why a writing scheme was taken into consideration. This was conceived as a sort of template that provided instructions on how to write a text in a coherent and cohesive way (Figueroa, Aillon & Fuentealba, 2014), thus articulating the four essential elements previously defined in this text, which can be distinguished through different colours in the following figure:

*Figure 1. Writing scheme that illustrates the components of an Optimal Descriptor.*
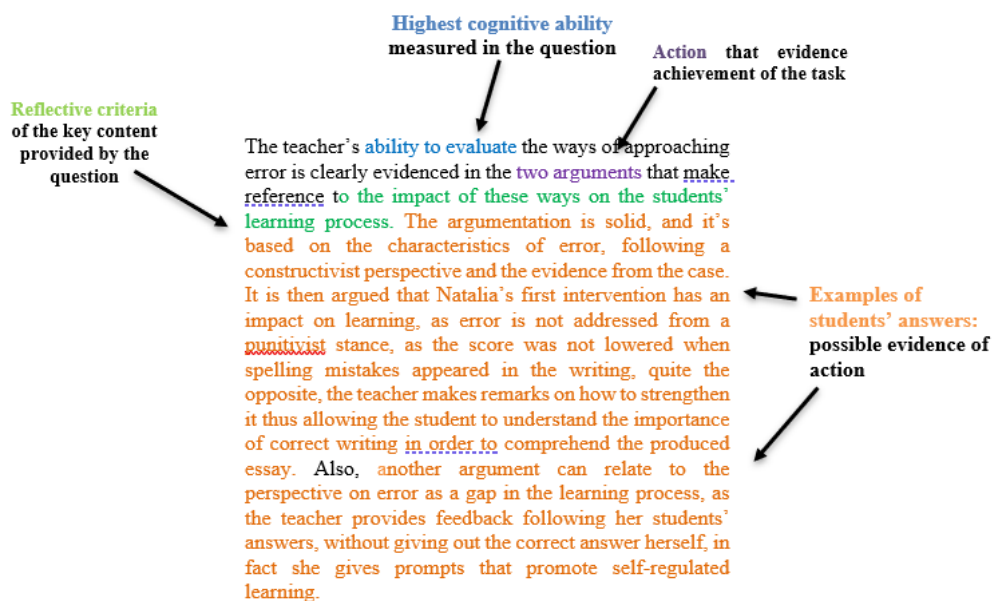


## 6. Conclusions

This project was developed following a standpoint that, on one side, enabled the definition of the components that would evidence the highest attainment level obtained in a cognitive task of high-order (i.e., designing, reflection, problem solving, etc), this was posed through a case based on real life situations that are experienced by teachers in the classroom (Martínez-Rizo & Mercado, 2015). On the other side, the project's approach also involved drafting descriptors that could incorporate such components in an articulated way where these elements were not perceived as isolated items, but rather as a complex framework that accounts students' achievement. This highest quality level descriptor then becomes a model for writing the remaining descriptors, which corresponds to the lower grading descriptors, by using a writing scheme.

In sum, rubrics as tools provided theoretical support that strengthened the development of professional competences of teacher trainers and schoolteachers. In this context, collaborative work showed to be particularly relevant considering that both actors were able to devise a deep and reflective praxis in relation to how the National Standards on teacher training are portrayed, and how they become present in the classroom teaching exercise to elaborate a descriptor that should guide assessment and monitoring of prospective teachers' process of achieving competences.

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# TECHNOSTRESS IN DISTANCE LEARNING:
# THE POSITIVE LEARN PROJECT

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## Abstract

During the recent Covid-19 pandemic, school education has massively shifted to online-only learning. One of the key lessons learned from the pandemic was that many teachers and students were unable to deal with new technologies in a healthy way, resulting in various psychological effects such as anxiety and stress.

Technostress in online education refers to the negative effects of using technology on a person's well-being, including physical and mental health, work-life balance, and overall quality of life. It is a phenomenon that affects both teachers and students. Technostress can arise from a variety of sources, such as: difficulty of adapting to new digital platforms and tools, information overload, technical problems and feelings of isolation. This can lead to decreased motivation, burnout, and negative impacts on mental and emotional well-being, and negatively impact learning outcomes and performance.

Managing this digital transformation requires developing digital readiness, resilience and capacity. There is a need for profound overhauls and changes that address wellbeing and mental health. The POSITIVE LEARN ("Distance learning positification: technostress relief and wellbeing") project starts against this background. POSITIVE LEARN aims to empower school professionals and modernise teacher education through curriculum innovation to meet the demands of the emerging online-first learning paradigm.

The focus of the present paper is twofold. The first objective is to investigate how technostress is affecting Distance Learning in schools, its causes and effects. The second objective is to present the goals of the POSITIVE LEARN project and to report on early research findings.

*Keywords: School, online education, emergency remote teaching, technostress.*

## 1. Introduction

The recent Covid-19 pandemic has had a profound impact on schooling. Widespread lockdowns have disrupted traditional school operations. According to the OECD (2021), lockdowns in the first year of the pandemic left 1.5 billion students in 188 countries unable to attend school in person. As a result, schools have massively switched to online-only learning. Overnight, teachers and students had to adapt to the use of distance learning platforms and other technology-based forms of learning delivery. This has put digital learning in the spotlight, highlighting its strengths while also revealing some key weaknesses. A specific term has been coined to describe the nature of teaching in these urgent circumstances: emergency remote teaching (Hodges et al., 2020).

One of the key lessons learned from the pandemic was that many teachers and students were unable to deal with technology in a healthy way, resulting in various psychological effects such as anxiety and stress (Pressley et al., 2021; Robinson et al., 2023).

It became clear that a new "normal" is emerging in school education. Schools are reopening to a new reality in which digital learning will continue to play an important role. Managing this digital transformation requires developing digital readiness, resilience, and capacity. There is a need for profound overhauls and changes that address wellbeing and mental health. Well-being needs to be addressed in the context of the use of technology, and as teachers play a crucial role in the educational process, it is crucial that teachers become active agents of change in implementing technological innovations.

Consequently, the effective take up of digital technologies and innovative pedagogies in education calls for a rethinking of the portfolio of digital competences of educators, namely competencies

and skills to (a) move seamlessly towards digital learning scenarios and (b) react to psychological effects such as technostress, depression, or isolation.

In the following sections we first discuss technostress in the context of Distance Education in schools, its causes, and effects. Following we present the goals of the POSITIVE LEARN project and to report on early research findings. The POSITIVE LEARN project is funded in the context of the ERASMUS+ Programme Its goal is to support school professionals and modernize teacher education through curriculum innovations to support the effective adoption of digital technologies and innovative pedagogies in online education.

## 2. Technostress

Originally, Brod defined technostress as 'a modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner'' (Brod, 1984). Since then, the term has been widely used and studied in various fields, including school education and, more recently, distance learning.

Today, technostress is often understood more broadly as "stress experienced by individuals due to their inability to cope with new computer technologies in a healthy manner" (Tarafdar et al., 2007). The effects of technostress can be very diverse, depending on the situation and the individual. Mäkikangas et al (2017) noted that stress can be physical or mental for an individual. Technostress can have different causes, strains, inhibitors, and impacts (Nisafani et al., 2020). Salo et al. (2019) analyzed it in terms of **stressors** (technostress sources) and **strains** (technostress results or consequences). Stressors can include factors such as information overload, constant interruptions, difficulty using new technology, and fear of technology obsolescence. **Strains** can include physical symptoms (such as headaches or eye strain), emotional symptoms (such as anxiety or frustration), and behavioral symptoms (such as decreased job performance or increased absenteeism). Technostress can arise from various sources, such as difficulty adapting to new digital platforms and tools, information overload, technical problems, and feelings of isolation. It can lead to decreased motivation, burnout, and negative impacts on mental and emotional well-being, and can have a negative impact on learning outcomes and performance.
In their study of the "dark side of technologies", Salanova et al. (2013) investigated two psychological experiences of technostress associated with the use of information and communication technologies (ICT), i.e., **techno-strain** (Users report feelings of anxiety, fatigue, skepticism, and beliefs about ineffectiveness associated with technology use) and **techno-addiction** (users feel bad due to excessive and compulsive use of these technologies).

Over the past few decades, much effort has been devoted to combating the various adverse effects of technology. **Positive computing** has emerged for building digital environments that can make us happier and healthier, not just more productive. It comprises concepts, processes and systems which contribute towards the quality of life and well-being of users (Pawlowski et al, 2015). **Positive psychology** has been promoted as a scientific approach to studying human thoughts, feelings, and behavior, with a focus on strengths instead of weaknesses, building the good in life instead of repairing the bad (Peterson, 2008). Similarly, **positive education is pursued** as 'education for both traditional skills and happiness'. (Seligmann et al, 2009). Efforts also include the design and development of technologies to "**support well-being and human potential**'' (Calvo and Peters, 2014).

## 3. Technostress in online education: The POSITIVE LEARN project

Technology has become an increasingly important part of classroom equipment at all levels of education. Joo et al. (2016) noted that teachers using new technology in classrooms have experienced technostress, which influenced their intentions to use technology and caused adverse effects in the active adoption of new technologies.

**Technostress in online education** refers to the negative impact of technology use on a teacher's or student's well-being, including physical and mental health, work-life balance, and overall quality of life. This can lead to decreased motivation, burnout, and negative impacts on mental and emotional well-being, and negatively impact learning outcomes and performance.

The POSITIVE LEARN project aims to address this key challenge by (a) developing teachers' competencies to ensure well-being and health; (b) providing learning scenarios and materials to mainstream wellbeing; and (c) creating a unique open exchange platform to foster skills development and collaboration across Europe. The goal is to support school professionals and modernize teacher education through curriculum innovations to support the effective adoption of digital technologies and innovative pedagogies in online education.

We believe that to support the effective adoption of digital technologies and innovative pedagogies in education, a rethinking of the digital competence portfolio of educators is required. POSITIVE LEARN will address the key emotional challenges of the Covid-19 pandemic by applying a positive computing/psychology approach beyond technological/digital solutions. The project will support innovation, resilience and change to help schools in the education system cope with the uncertainty caused by the pandemic and build support for change. We consider positive psychology/positive computing as a necessary skill to address psychological/emotional issues.

The main goal of POSITIVE LEARN is to provide teachers with tools to create positive views, emotions and atmospheres in times of crisis. To become effective promoters of resilience in education, teachers need access to relevant, quality professional development and support during the crisis to effectively implement technological innovations. The project will support and train teachers so that they can optimally use the possibilities of new technologies to develop and implement innovative teaching methods. POSITIVE LEARN thus contributes to the professional development of teachers.

The project work revolves around the "**positification**" of education, a term coined to conceptualize the transformation of (digital) education to support the development of students' potentials, and to achieve positive impacts and overcoming potential negative effects of IT, such as technostress.
Our examination of the current state of school education found that technostress can affect students and teachers in a number of ways.

Students often experience difficulty adapting to new digital platforms and tools that can hamper student learning and increase stress levels (Fuchs, 2021; Chiu & Lapeyrouse, 2021; Mu et al., 2022; Yang et al., 2022). The balance between online classes and other tasks and distractions can lead to time management issues and stress. Students can experience information overload and stress from managing and processing large amounts of digital information. Online education can limit face-to-face interaction and lead to feelings of isolation and stress. Technostress can lead to decreased motivation, burnout, and a negative impact on mental and emotional well-being. Technical issues and glitches can disrupt learning and cause stress.

Similarly, **technostress can affect teachers** in several ways (Mokh et al., 2021; Nang, et al., 2022; Siddiqui et al., 2023). Integrating technology into the classroom and using up-to-date digital tools can increase their workload and stress levels. Technical problems can lead to frustration and stress. Additionally, teachers can feel overwhelmed when transitioning to new digital tools and platforms. The balance between technology-enhanced teaching and traditional teaching methods and administrative tasks can lead to time constraints and stress. Technostress can lead to burnout, reduced job satisfaction and reduced motivation (Aktan & Toraman, 2022). Technostress can negatively impact teachers' mental and emotional well-being, leading to anxiety and depression (Estrada-Muñoz et al., 2020).

Overall, Technostress **can arise from a variety of sources,** such as difficulty adapting to new digital platforms and tools, information overload, technical problems and feelings of isolation. As new digital tools and platforms are introduced, teachers may need to learn new skills and ways of working. This can create stress, especially when the technology is complex or not user-friendly. Furthermore, with so much digital information available, identifying what is important can be difficult. This can leave teachers and students feeling overwhelmed and stressed. Technical issues such as system crashes, slow internet connections or device malfunctions can be frustrating and stressful as well. In addition, the extended use of technology in communication can lead to feelings of isolation and disconnection from others, especially when face-to-face interactions are reduced.

The main **technology stressors** (Donham et al., 2022; Aktan & Toraman, 2022) associated with the use of technology in online education include: technical difficulties (e.g. poor internet connection, hardware failure), time management and workload, difficulty in adapting to new digital platforms, lack of human interaction and social support, distractions and lack of concentration, information overload, difficulty in staying organized and motivated, feeling isolated and disconnected from classmates and trainers etc. Overall, technology stressors can be roughly divided into four main categories:

- **Technical challenges:** Difficulties with hardware, software, or internet connectivity.
- **Learning Challenges:** Adapting to new digital platforms, information overload and difficulty staying organized and motivated.
- **Social Challenges:** Lack of human interaction, social support and feelings of isolation.
- **Time Management Challenges:** Heavy workloads, difficulty balancing multiple responsibilities, and distractions.

The POSITIVE LEARN investigation of technostress situations in distance learning classrooms included dedicated focus groups and interviews with teachers and technostress experts in Greece, Germany and Finland. The study identified three core themes and relevant mitigation strategies.

- Theme I refers to "**technostress related to technology use and network connections**", such as power cuts, empty batteries, scarcity of devices, hybrid learning situations etc.

- Theme II is about "**Technostress related to Access to learning materials/educational content**", such as Digital content being either too basic and unmotivating, or very disruptive, teachers' perceived lack of control over the digital content that students watch in classroom etc.
- Theme III refers to "**Technostress related to Professional development of teachers mechanism**s", including their lack of technical skills, lack of motivation to use technology, the poor pedagogical support for teaching with technology during teacher education etc.

This implies that **the support teachers need** to better deal with technostress spans several areas, ranging from professional development opportunities to technical, peer and administrative support, and access to mental health resources (Whalen, 2020; Dennis, 2021; Daneshmand et al., 2022). Access to training and professional development programs can help teachers develop the competencies they need to effectively integrate technology into their classroom. Availability of technical support staff can help resolve technical issues and provide assistance with digital tools and platforms.Opportunities to collaborate with colleagues will allow teachers to exchange ideas, experiences and strategies for coping with technostress (learn from others' experiences and knowledge, solve problems related to technology use, receive social support). Support from school administration is needed in terms of providing adequate resources, reducing workload and recognizing the importance of managing technostress. To this end, the availability of mental health resources, training and support for teachers struggling with technostress is critical. Furthermore, teachers need a combination of **technical, pedagogical and social and emotional competencies** to better deal with technostress.

Similarly, **students are in need of technical, academic, and social and emotional support** to better manage the challenges of online learning and promote their overall well-being. Technical support involves access to reliable internet and devices, resources to troubleshoot common technical issues, as well as assistance in navigating and using online learning platforms and digital tools. Academic support includes clear instructions and expectations for online learning assignments and assessments (Rahim, 2020; Rodrigues et al., 2022), support for time management and organization of online learning tasks, as well as opportunities for interaction and feedback from teachers and peers. Social and emotional support includes access to mental health resources and counseling services, and support and opportunities for social interaction with teachers and peers.

## 4. Conclusion

While scholars like Hodges et al. (2020) draw attention on the differences between emergency remote teaching (ERT) during the COVID-19 pandemic and regular online learning, stating that ERT cannot be equated with online learning, since "well-planned online learning experiences are meaningfully different from courses offered online in response to a crisis or disaster", there are valuable lessons to be drawn.

The analysis underlying the POSITIVE LEARN project was based on the fact that the "positification" of distance learning in school education is often overlooked. The lack of awareness, capacity and professional skills of educators to design and implement positive e-learning interventions represents a significant barrier, but a comprehensive approach to teaching e-learning positivity is lacking.

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# JUMPING OUT OF THE COMFORT ZONE: PROMOTING COLLABORATIVE LEARNING THROUGH MUSIC AND MOVEMENT COURSE IN HIGHER EDUCATION

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## Abstract

This presentation investigates the benefits and challenges of a collaborative learning (CL) model implemented within a music and movement course in higher education in Macau, China. CL is an educational approach that involves groups of learners working collaboratively to solve a problem, complete a task, or create a project (Laal & Laal, 2012). This university-level music and movement course is structured to promote collaborative learning through small group creative projects and group demonstrations. In addition to the musical and pedagogical skillsets, this course aims at developing students' 21$^{st}$ century learning skills: critical thinking, communication, collaboration, and creative thinking. Research has shown that East Asian students usually tend to learn passively yet low participation is found to be only confined to classrooms as students are generally talkative outside the classroom (Tani, 2005). To engage students through active learning and experience (Dewey, 1938), a pre and post-survey were employed to obtain students' feedback on collaborative learning. Participants (n=71) were non-music major students enrolled in this music and movement course. Results revealed that the benefit of the CL encourages the 4Cs of 21$^{st}$ century skills, self-management, leadership skills, knowledge acquisition, social interaction, and so on. Yet, there are also challenges and barriers to implement this model in a classroom where passive learning is ingrained in the culture (Tani, 2005). It is to recommend collaborative learning model to be used more often as a pedagogic innovation to transform the current learning culture in the higher education in East Asia.

*Keywords: Collaborative learning, music, movement, 4Cs, pedagogic innovation.*

## 1. Introduction

Collaborative learning (CL) is recognised as an important skill set in the 21st century. Collaboration encompasses a principle of engagement as well as a personal way of life that underscores personal accountability for one's actions, while also valuing the skills and contributions of others. Whether in group settings or elsewhere, it offers a framework for treating people in a way that acknowledges and celebrates the unique talents and contributions of each individual within the group (Laal & Ghodsi, 2012).

In higher education, there is a growing fascination with how interactions with peers' impact academic engagement and learning. However, despite this enthusiasm, effectively organizing productive peer learning remains a complicated endeavor (Palincsar & Herrenkohl, 2002). Especially in Asia, students from Asian countries generally have lower levels of in-class participation (Tani, 2005; Chow & Chu, 2007; Crosthwaite et al., 2015). Teacher-centered pedagogies and lecture styles are common in Southeast Asia (Braine, 2003; Tan & Hairon, 2016; Loima & Vibulphol, 2016; Saito et al., 2008). Saito and others (2021) discussed issues in introducing collaborative learning in Southeast Asia, such as teachers' views towards the learning processes and academic experiences (p. 169). They concluded that the challenges to implement CL in Southeast Asian classrooms are students' hesitancy to ask questions due to the structure of the class and the difficulty of creating challenging and engaging tasks (Saito et al., 2021). Rao and Chan (2009) described traditional Eastern education approaches as didactic, instructional, and expository in nature. In contrast, according to Kember (2000) and Tani (2015), Asian students are only quiet in the classroom and are active in the cafeteria. Kember (2000) further stated that Asian students do not actually prefer passive learning or resist teaching innovations, using evidence from more than 90 action research projects. Zhao et al. (2015) concluded the importance of teachers' attitudes and their roles in curriculum reform in China.

As Atweh and Clarkson (2001) noted, many East Asian countries are revamping their education systems to foster more student engagement, group discussions, and teamwork in classrooms, which are typical strengths of Western education. Dello-Iacovo (2009) pointed out that ''Cross Century Quality Education Project'' curriculum reform project has been proposed for fostering students' curiosity and thirst for knowledge, encouraging their active involvement in the learning process, nurturing their sense of inquiry and investigative skills, promoting communication and collaboration, and reinforcing the connection between the curriculum and society (p. 243). With a similar goal of increasing participation and engaging students further, the objective of this study was to explore the benefits and challenges associated with the use of a collaborative learning (CL) approach in a music and movement course offered at the higher education level in Macau, China.

## 2. A revamped music & movement course

Traditionally, music and movement courses are designed for younger children to promote their musical and physical development through singing, moving, dancing, and various musical concepts. Renowned approaches such as the Orff Schulwerk method and the Dalcroze method in music education have expanded the course to college students, adults, and even elders by incorporating movement and dance to foster a strong sense of musicality and expression for learners. As a researcher and course instructor, I proposed a revamped music and movement course at a higher education institute in Macau, China. Macau is a unique region that has been influenced by both Chinese and Portuguese culture and history. Though it was handed back to China in 1999 and is now a Special Administrative Region, it still retains some of its Portuguese heritage and identity. In terms of education, traditional schools in Macau have been heavily influenced by the education systems of Hong Kong and other East Asian countries, which often prioritize rote memorization, teacher-led instruction, and a focus on academic achievement over creative thinking and student-led exploration. While there has been some pushback against these traditional teaching methods in recent years, with educators and policymakers advocating for more student-centered and innovative approaches to learning, many schools in Macau still adhere to more traditional models of education. This is in contrast to the more progressive educational approaches that are being adopted in other parts of the world.

To shift the learning styles of students, this course not only teaches musical concepts and techniques, but also focuses on transforming the teacher-centered classroom into a student-centered one. The course is open to students of all majors, including education majors, and students are divided into small groups to complete various tasks throughout the course. Drawing on the support of constructivism theory (Piaget, 1970; Vygotsky, 1978), several strategies have been implemented in this course: (a) reducing lecture time, (b) regularly incorporating student-led activities after guided instructions, (c) employing collaborative learning strategies, and (d) adding in-class small group preparation time. Reducing lecture time allowed for more time for students to engage in hands-on activities and group work. This approach was in line with the constructivism theory, which suggests that learners construct knowledge through their own experiences and interactions with others. Collaborative learning strategies were also employed to encourage students to work together in small groups to complete various tasks and assignments. This approach was in line with the constructivism theory, which suggests that learners construct knowledge through social interaction.

## 3. Methodology

This study utilized a pre- and post-study design to evaluate changes in the abilities of individual students before and after taking the Music and Movement course. A total of approximately 90 undergraduate students were invited to participate in the study and complete both pre- and post-study surveys. Ultimately, 71 students completed both surveys, and their data were used for analysis. All the participants were undergraduate students, comprising of 83% female and 17% male students with a mix of majors including education, accounting, Chinese language, Portuguese language, psychology, communication, and engineering in various years of their undergraduate studies.

Both pre- and post-study surveys contained the same questions that aimed to evaluate students' perceptions of their musical abilities and 21st century skills. The surveys were administered using Google Forms and were promoted to students during introductory and concluding lectures, as well as through email reminders and postings on the course content system. The surveys included a total of 25 questions, consisting of 11 questions on personal learning styles, 4 questions on music-related self-assessment, and 10 questions on 21st century skills. The students rated themselves using a 5-point Likert scale, with 1 indicating strong disagreement and 5 indicating strong agreement for learning styles and music-related self-assessment questions, and 1 indicating low scores and 5 indicating high scores for 21st century skills

questions such as leadership, confidence, and motivation. The data obtained from the surveys were analyzed using paired t-tests to compare students' self-ratings at the beginning and end of the course. A statistical significance level of $\alpha$ = .05 was set for the analysis. The continuous data were reported as mean ± standard deviation (SD).

## 4. Results

The results of the music-related skills of students showed a significant increase after taking the Music and Movement course. Specifically, the pre-test (M = 2.54, SD = 1.13) and post-test (M = 3.04, SD = 2.7) ratings for the question "I am comfortable at dancing and singing in front of people" indicate a significant improvement in students' comfortability in dancing and singing after a semester of the course, with t(70) = -2.82, p = .006. Additionally, for the question "I consider myself a musical person," the pre-test (M = 2.54, SD = 1.13) and post-test (M = 2.96, SD = 1.02) ratings show a significant difference with t(70) = -2.57, p = .01, allowing us to reject the null hypothesis of no difference. Regarding learning style preferences, there were no significant differences for most questions, except for the question "I have many experiences learning through group projects before," with pre-test (M = 3.58, SD = 0.87) and post-test (M = 3.96, SD = 0.75), t(-2.95), p = 0.004, indicating that the course increased their experiences learning through collaborative design.

For 21st-century skills, students ranked themselves significantly higher in public speaking skills (p < 0.005), self-management skills (p < 0.05), relationship with others (p < 0.05), leadership skills (p < 0.05), collaboration skills (p < 0.005), confidence (p < 0.005), and critical thinking skills (p < 0.05). However, for creative thinking skills, there was only a slight improvement in the mean rating, which was not statistically significant.

*Table 1. Comparison of Pre-test and Post-test Means, Standard Deviation, and p value for Students Self-Assessing Skills and Preferences.*

| Categories | Survey Questions | Pre-test Mean ± SD | Post-test Mean ± SD | *p* value |
|---|---|---|---|---|
| Music-related Self-assessment | I am comfortable at dancing and singing in front of people | 2.54 ± 1.13 | 3.04 ± 0.98 | 0.006* |
| | I consider myself a musical person | 2.54 ± 1.13 | 2.96 ± 1.02 | 0.01* |
| Learning Styles Preferences | I prefer to take a test rather than an alternative final (presentation, performance, etc.) | 2.57 ± 1.18 | 2.46 ± 1.31 | 0.56 |
| | I have many experiences learning through group projects before. | 3.58 ± 0.87 | 3.96 ± 0.75 | 0.004* |
| | I prefer to learn through doing, rather than memorizing. | 3.89 ± 0.96 | 4.04 ± 0.87 | 0.28 |
| | Getting a good grade is the most important thing as a student | 3.69 ± 0.90 | 3.60 ± 0.92 | 0.57 |
| | I prefer to sit and listen in the class. | 3.25 ± 1.09 | 3.11 ± 1.02 | 0.43 |
| 21st Century Skills Self-Assessment | Public Speaking Skills | 2.83 ± 0.81 | 3.30 ± 0.80 | 0.0008* |
| | Self-Management Skills | 3.32 ± 0.75 | 3.60 ± 0.73 | 0.03* |
| | Relationship with Others | 3.58 ± 0.73 | 3.87 ± 0.67 | 0.019* |
| | Leadership Skills | 3.14 ± 0.88 | 3.45 ± 0.81 | 0.019* |
| | Collaboration Skills | 3.46 ± 0.75 | 3.82 ± 0.72 | 0.005* |
| | Confidence | 3.05 ± 0.77 | 3.42 ± 0.71 | 0.002* |
| | Critical Thinking Skills | 3.11 ± 0.82 | 3.38 ± 0.66 | 0.019* |
| | Creative Thinking Skills | 3.28 ± 0.84 | 3.45 ± 0.81 | 0.14 |

* Data represents statistical significance at *p* value > 0.05

## 5. Discussion and conclusion

The findings suggested this collaborative Music and Movement course has enhanced the skillsets of students (n = 71), as reflected in their self-assessment. Notably, the students ranked themselves higher in terms of their ability to sing and dance in front of people, as well as their perception of themselves as musical individuals. Additionally, students reported higher rankings in various 21st century skillsets, including self-management, relationship building, leadership, confidence, and critical thinking skills after the course. Among these skills, collaboration and public speaking skills were statistically significant. Previous research has indicated that East Asian students commonly experience anxiety while speaking in

class (Cheng, 2000; Mak, 2011; Tani, 2008). However, this study demonstrated that through student-led activities and collaborative learning, students were able to improve their 21st century skills and learning, which is consistent with prior research (Johnson et al., 2000; Johnson & Johnson, 2019; Nokes-Malach et al., 2015; Panitz, 1999).

However, the main challenges were observed in the results related to the students' learning preferences. The question regarding their preference for taking the final exam, "I prefer taking a test rather than an alternative final (presentation, performance, etc.)," showed a higher standard deviation, indicating that the data was more dispersed. This suggests that some students still preferred written exams rather than presentations or performances, while others did not. This preference did not change significantly even after the course. Similarly, for the other two questions, "I prefer to learn through doing rather than memorizing" and "Getting a good grade is the most important thing as a student," there were slight shifts in the mean scores towards "doing" and less emphasis on getting good grades, but the overall shifts were not significant. Wong (2004) and Wu (2015) believe that some researchers have attributed passive learning styles to the culture-based approach to learning, which limits the understanding of the complexities of Asian students' experiences.

> From an essentialist point of view, students from Confucian heritage cultures may typically display a reluctance to speak up or give their opinion; rely heavily on memorization; lack critical thinking; respect the authority of the teacher; and expect to be spoon-fed. (Wu, 2015)

Although some students were influenced by their cultural heritage, many of them desired a more diverse and active learning experience. As a Macau native, I personally believe that the limited exposure to CL is one of the main challenges for students. Traditional teaching styles in which the teacher is the center of attention and passive learning is encouraged have wired students to learn this way. They were rewarded for being quiet and passive rather than participating actively in class. Many universities in East Asia recommend innovative pedagogies and student-centered learning, which can benefit not only Asian students but also transform their attitudes, methods, and motivations for learning. While this research has only focused on one pilot course, it is hoped that CL learning can be continuously implemented and integrated into students' learning culture by the university.

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# CULTIVATING COLLABORATIVE ONLINE INTERNATIONAL LEARNING (COIL) EXPERIENCES FOR UNDERGRADUATE HEALTH EDUCATORS IN THE CLASSROOM

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## Abstract

Collaborative Online International Learning (COIL) is a globally networked classroom that prepares students to understand the interconnectedness of the world. Previous studies have found that US students need to learn about the world, languages, and other current events compared to their counterparts. Notably, this becomes concerning for students majoring in health fields, where there is a need for culturally competent health educators to aid in improving health outcomes, providing quality care, and contributing to eliminating racial and ethnic health disparities. This study explains an undergraduate COIL experience created by two institutions within the United States and The Netherlands. The study seeks to explain the emergence of the institutional partnership, course content, digital technologies, and students' perspectives on the COIL experience. Institutional partnerships were created by two professors from the United States and The Netherlands. They created a COIL course sustained for the past five years. Students are paired with individuals from the opposite country to collaborate on prominent health issues impacting our global world. Over the past five years, topics have included lifestyle interventions, COVID-19 impacts, mental health, physical activity, and nutrition. Students came together virtually to exchange ideas using digital technologies, like Zoom, Skype, What's App, Facebook Calling, Instagram Live, and other unique platforms. Blackboard was used as the Learning Management System (LMS), where the structured tasks, assignments, and materials were outlined. The innovative COIL project aimed to understand and appreciate cultural differences, acquire digital communication skills, and build skills to attain cultural competence. A qualitative thematic analysis was used to ascertain participants' perspectives regarding the effectiveness of the COIL experience and the impacts on their student learning. Students completed online open-ended questionnaires related to their global learning experiences. Results yielded three categories and eight themes. *Category 1: Impacts on Student Learning* had three emerging themes (1) Cultural Immersion, (2) Global Problem-Solving, and (3) Diverse Perspectives. *Category 2: COIL Experiences* identified two emergent themes of (1) New Friendships and (2) Learning a New Language. *Category 3: Tools* had three emergent themes (1) Time Management, (2) Openness, and (3) Communication. COIL affords all students the experience of studying abroad without leaving the classroom and without the financial burden that prohibits many students from participating in traditional international experiences. COIL initiatives are essential for those seeking degrees in the health field because their future careers will consist of creating health initiatives and programs face-to-face and virtually.

*Keywords: Collaborative online international learning, health educators, technology, and cultural competency.*

## 1. Introduction

Collaborative Online International Learning (COIL) is a globally networked classroom that prepares students to understand the interconnectedness of the world and creating productive and responsible members of society. As the world becomes more interconnected, educational challenges to develop individuals who exhibit intercultural competence become increasingly more important (Byram, 1989; Branche, Mullennix, & Cohn, 2007; Brewer & Cunningham, 2009; Gurung, 2009; Kramsch, 1993; Liddicoat & Scarino, 2013; Stearns, 2009; Wilkinson, 2012). Previous studies have found that United States students lack knowledge about world geography, languages, history, and current events compared to their peers worldwide (Stearns, 2009). This lack of knowledge translates into students who are less prepared to function in a global society (Bender-Slack & Ceo-DiFrancesco, 2018). Notably, this becomes concerning with students majoring in health fields where there is a need for culturally competent health

educators who aid in improving health outcomes and quality of care, and contributing to eliminating racial and ethnic health disparities (Betancourt et al., 2002). Using digital technologies offers meaningful and rewarding opportunities to develop international partnerships between health educators from other countries without economic, organizational, or geographical barriers. Despite the reported advantages of COIL, few studies have been identified in the public health and health science sectors. This study aimed to explain a COIL experience for students between two higher ed institutions within the United States and The Netherlands. The study aims to explain the emergence of the institutional partnership, course content, technology usage, and students' perspectives on the effectiveness of the COIL experience and the impacts on their student learning.

## 1.1. Importance of cultural competence for college students & health educators

As the United States becomes increasingly more culturally and ethnically diverse, there is more need for culturally competent health educators with the skill sets to develop culturally appropriate health education and promotion programs. Cultural Competence is defined as a "set of congruent behaviors, attitudes, and policies that come together in a system, agency, or among professionals and enable that system, agency, or those professionals to work effectively in cross-cultural situations (Diller & Moule, 2005) – showing that the ability to be culturally competent is imperative in increasing understanding and improving relationships across cultures (Nieto & Booth, 2010). Given the current multicultural climate within the United States, health educators must be trained to achieve cultural competence and apply this concept in planning, implementing, and evaluating health education and health promotion programs (Luquis & Perez, 2003). With an increasingly diverse global workforce, employers look to colleges and universities to equip their students with skill sets that include cultural competence, cultural sensitivity, and awareness (Chang et al., 2013).

## 1.2. The COIL experience: U.S. & The Netherlands

**Emergence of Institutional Partnerships.** The study's COIL experience was created by two international professors (United States and The Netherlands) who met at a conference in New York City. The two professors discovered they had mutual interests and taught courses within the health field that could result in a well-matched collaborative international experience for both institutions. After refining the COIL project and piloting it with students, both instructors brought in two other faculty to participate and combined two Dutch health courses with two US health courses. The four professors collaborated to create and facilitate global learning experiences for their students. This study was carried out during the Spring 2020 semester, during the COVID-19 pandemic, when both U.S. and Dutch students were abruptly removed from the classroom amid the global public health crisis. Given the uncertainty for both countries at this time, students found themselves conversing with their international partners and sharing public health information regarding the pandemic, thus increasing their understanding of global issues and becoming more globally aware of one of the most historic years of their time. The professors paired each student with a student from the opposite country. They were considered buddies or partners collaborating on creating a lifestyle intervention or program regarding nutrition and physical activity. Creating a space where students could share mutual health promotion skill sets and explore diverse global health perspectives is essential in providing health students with authentic learning experiences to further their application in the field.

**Digital Technologies.** The Blackboard Learning Management System (LMS) was a tool already used by the U.S. institution. With the help of the institution's curriculum designers, the Dutch instructors and students easily migrated into the same blackboard shell as the U.S. students. This LMS hosted the structured tasks, assignments, and materials needed for students to explore their partner's countries and submit their artifacts along the way with their virtual partners. Students from the partnered institutions came together virtually to exchange ideas and analyses using different technology sources such as Zoom, Skype, What's App, Facebook Calling, Instagram Live, and other unique social media platforms.

**Course Content.** During these virtual collaborations, students were diving into deep discussions about planning a behavior change program related to nutrition and physical activity in their country. Students discussed cultural differences related to health equity issues, governmental health initiatives, and the overall demographics of their target populations to prepare them for future careers where they need to be culturally and linguistically competent. This cultural awareness aims to help students respond to individual and community preferences to help decrease health disparities. The virtual think, pair, share method utilized for many assignments to engage students with their partner and their country is a cooperative discussion strategy that works in three phases (Robertson, 2006). The first phase, "Think," is the task that provokes students' thinking, often done before partners meet virtually. The second phase of "Pair" uses their international partner to talk through critical thinking schools their perspective or response to the assignment or task. This is where partners started to experience how health educators

differ in developing health promotion interventions and programs around the globe. The last phase, known as "Share," allowed students to discuss ideas and further their reflection, which they would complete their assignment artifact that would then be submitted to the LMS and shared with all students. This critical dialogue between students helps challenge learners to identify, analyze, and relearn their understanding of the world and different cultures (Giroux, 2011). The learning outcomes associated with the COIL assignments and activities aimed to develop an understanding and appreciation of cultural differences between the U.S. and The Netherlands, acquire digital communication skills, develop cultural sensitivity to understand individuals from another culture better, and build skills to attain cultural competence.

## 2. Methodology

A qualitative descriptive methodology was used for this study. The Netherlands and the U.S. students completed online open-ended questionnaires about their global learning experiences and cultural competence levels. A thematic analysis was done to ascertain participants' perspectives regarding the COIL course, such as their enjoyment and areas for improvement moving forward. Researchers intended to gain insight into how participants viewed the COIL course design and implementation to make any refinements needed for future cohorts. The COIL course has been sustained for the past five years, reaching a total of $N= 157$ undergraduate participants from a U.S. traditional 4-year institution in New York ($n=75$) and ($n=85$) undergraduate students from The Netherlands University of Applied Science. Participants were both enrolled in health courses at their respective institutions that focused on concepts related to assessing the needs of individuals and communities to create/plan evidence-based health initiatives. Participants completed an online questionnaire before (pre) and after (post) the five-week COIL project. The Programme for International Student Assessment (PISA) and the DePaul Global Learning Experience (GLE) questionnaire were adapted as the measurement instruments for this study. Pretest and post-test questions came from The Programme for International Student Assessment (PISA), assessing students' self-efficacy and cultural competence with questions addressing comfortability with language, self-efficacy-related questions, openness and interest in different cultures, and the existence of contacts from other countries. Additionally, questions from the Global Learning Experience (GLE) questionnaire were added to the posttest questionnaire to evaluate the effectiveness of the COIL program and its impacts on students learning. The questionnaires were posted on the combined learning management system for students from both countries to complete.

## 3. Results

Results yielded three categories and eight themes. Category 1: Impacts on Student Learning had three emerging themes (1) Cultural immersion, (2) Global problem-solving, and (3) Diverse perspectives. Category 2: COIL Experiences identified two emergent themes of (1) New friendships and (2) Learning a new language. Category 3: Tools, which identified three emergent themes of (1) Time Management, (2) Openness, and (3) Communication. The first **Category 1: Impacts on Student Learning**, was used to identify students' personal narratives about the impacts on their learning. The themes that emerged from this category were cultural immersion, global problem-solving, and diverse perspectives. The *Cultural Immersion theme* emerged from students' responses about how they experienced integrating themselves into another culture through interaction with their international peers.

> "I found the COIL course interesting, but it was also challenging learning how to communicate effectively with an international student. Everyone has their own life, of course. But it's interesting to see that we both have very different cultures. Being able to discuss our different lifestyles and experiences as health educators was very helpful in my journey."

> "I enjoyed getting to know and communicate with someone from another country and learning the cultural norms of the Netherlands and the differences/similarities there are to the United States."

> "I thought it was interesting getting to speak with someone from another country about health in their country and what their degree looks like; I have never got to do this before, so it was extremely interesting. It was neat to see how our partners put together health information."

> "I talk about the COIL project all the time, and recently used it in an interview. It was definitely life-changing, it gave me a whole new perspective."

Another emergent theme from this category was known as *Global Problem-Solving,* which teaches students how to research and analyze important global health topics and think creatively about the

future. Students expressed how they collaborated and worked together with their international peers to problem-solve and create collaborative health materials.

"Learning about who my partners were and what they did. What the differences and non-differences were between us regarding mental health interventions. Like I learned so much, I never would've through just reading an article or watching media about the Netherlands. It was great to work together to create a final photo voice project because neither of us had ever done that before, so it took some critical thinking and problem-solving to understand how we would approach the collaboration with both international perspectives."

"We had to use some problem-solving and time-management in order to properly communicate. I think having everyone download the same communication application could be helpful for all students because it worked for us. We had to work together to understand how it worked so that it was easier to contact each other in the beginning. For example, I did not know how to use Zoom, but I learned because of this international project."

The last theme that emerged from Category 1 was *Diverse Perspectives*. Diverse perspectives explain how students developed the capacity to understand interrelationships regarding different health topics such as lifestyle interventions, COVID-19 impacts, mental health, physical activity, and nutrition.

"Interacting with the students from other countries on a collaborative topic and project through sharing research, photographs, and interviews gave us common grounds to relate and talk. Being able to communicate and relate to those around the world despite any struggles with cultural differences was very informative for me and my own personal growth and competence."

"I would like to share how this opportunity was a great one to meet other people and share how our environments are different from each other; these perspectives have helped me see things differently."

The second **Category 2: COIL Experiences,** was used to identify students' personal narratives about their overall enjoyment of the experience. The themes that emerged from this category were New Friendships and Learning a New Language. Students experienced how they made new friendships which often was not an expected outcome.

"Thank you for connecting me with people from another country; this wouldn't have been possible if I was not in this course. I feel like I have made new friends internationally."

"Making a new friend and talking about things that interest us both was refreshing. I did not expect to make a friend internationally when signing up for this course."

The Learning a New Language theme emerged from student narratives about using different languages.

"It was a bit hard to communicate in English, so sometimes it was a bit hard. But I thought it was a fun experience that will help me in the future!"

"It was nice to meet new people and see how schools work in the USA. It helped improve my English use, which I was not expecting."

The third **Category 3: Tools,** was used to identify students' use of communication, technology, and digital aspects of the course. The themes that emerged from this category were Time Management, Openness, and Communication. The *Time Management* theme came from students' accounts about managing time differences with partnered meetings.

"The time difference was an issue because there is a 5-hour difference. We struggled to find a common ground during the first few meetings and had to really look at our own time management to make it work with our schedules because we both had full plates."

The second theme, *Openness*, emerged from students' narratives about being vulnerable and open to experiences.

"I was able to learn how to be more open to learning and understanding other people's opinions."

"One thing that was difficult for me was learning how to work with people despite having major differences."

The third and final theme was *Communication*. Students explored how communication tools helped them with the COIL experience and how they learned different tools.

"I learned how to use new communication tools like Snapchat to contact people from the U.S. I had never used this tool before."

"I learned that communication as a tool is key in being successful with this assignment. Being able to communicate with others and relate to the world around us is important in our field.

## 4. Discussion

Students participating in COIL shared many positive narratives and experiences regarding their interactions with their international peers. Not only did students meet the course's learning outcomes, but they also found currency in many other ways, such as global competence, the opportunity to foster and sustain international friendships, and global problem-solving. Most notably, allowing students to learn more about global health through the lens of international peers provided them with first-hand knowledge regarding major public health topics. These authentic learning experiences help refine students' cultural awareness and prepare them for their health careers. Specifically, it is important for health promotion students to consistently refine their skills to become culturally competent health educators that can develop culturally appropriate programming and materials for individuals and communities globally. COIL affords all students the experience of studying abroad without leaving the comfort of their own homes and without the financial burden that prohibits many students from participating in traditional international experiences. From the results, many students mentioned how they would not have been able to participate in an experience like this if it was not structured as part of their course. Implementing COIL initiatives is essential for those seeking health promotion and education degrees because their future careers will consist of creating health initiatives and programs both face-to-face and virtually. Instructors in higher education are tasked with preparing students with the transferrable skills needed to acquire jobs where they may never meet their coworkers or supervisors face-to-face (Harris, Seo, & McKeown, 2021), making authentic learning experiences with both cultural competencies and technology essential components of our student's future and elements that are easily embedded in the core of COIL.

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# GAMIFICATION IN THE PORTUGUESE LANGUAGE SUBJECT: A REVIEW OF TWO E-LEARNING PLATFORMS

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## Abstract

The study presented in this paper is part of a master's investigation project that aims to design a gamified interface to engage young students with school literature. Recognizing the importance of reading in human development and the urgency of addressing the progressive disinterest of young people in this activity, associated with technological progression and reduced contact with books, it becomes relevant to explore the relation that the study of school literature currently has with the available learning technologies. The educational reality during the pandemic also highlighted the importance and convenience of e-learning platforms that support distance learning and self-study. These e-learning platforms often use multimedia and gamification strategies that, when well designed, demonstrate to be able to increase the quality, effectiveness, and motivation of students in learning processes. Thus, this study aims to identify and understand the current application of gamification in digital learning contexts, specifically in school literature, by analyzing gamified resources present in the Portuguese language discipline of two educational digital platforms from the two main publishing groups in Portugal: Escola Virtual, from Porto Editora, and Aula Digital, from LeYa. The methodology adopted was case-study-based research. A literature review in the fields of e-learning and gamification was made, to select the criteria for the case studies analysis. The findings indicate that the implementation of gamification in digital educational resources, particularly in the school subject under examination of 7th, 8th and 9th grade, remains limited in terms of variety, and is primarily focused on quizzes. The few remaining resources fall under the category of serious games and seem to provide a more engaging experience by incorporating multiple game elements. In future studies, it is intended to understand this resources efficiency for students and teachers through empirical research.

*Keywords: Gamification, reading, e-learning, school literature, Portuguese language.*

## 1. Introduction

In 2020, the Portuguese National Reading Plan revealed a study on reading practices of primary and secondary school students, indicating a progressive decrease in reading for pleasure throughout adolescence. The primary deduced causes are technological growth and diversification, and less exposure to books at home, which increases schools' responsibility to promote reading practices (Mata, 2020).

Reading requires focus, silence and time, contrary to the fast multimodal stimuli of digital media, which results in disinterest in time-consuming and concentration-requiring activities like deep or continuous reading.

The current study was undertaken as part of a master's degree investigation aimed at developing a gamified interface to engage teenagers with school literary work. To design a solution without compromise reading quality, it is crucial to assess existing examples and approaches. Therefore, this analysis aims to identify current gamification strategies in the Portuguese language contents of the main national e-learning platforms: Escola Virtual and Aula Digital. The primary literature review in the fields of gamification and e-learning served to define the criteria for the analysis. These case studies intend to provide valuable insights and serve as a starting point for further exploration and development.

## 2. Literature review

### 2.1. E-learning

E-learning or electronic learning, is as a form of online education through electronic devices (UnYleYa, s.d.). Educational software, like the case studies here presented, are digital tools that contain specific content from curricular subjects to facilitate learning (Estrada & Zapata, 2022).

Currently, there are many educational challenges when it comes to adapting teaching to the evolution of the digital society, among them, promoting motivation and students' engagement. Gamification is often used in e-learning as a tool to address these challenges.

## 2.2. Gamification in education

The learning process requires both cognitive and affective-motivational factors, making motivation a determining factor in education (Buckley & Doyle, 2016; Artola et al., 2021). Gamification in educational contexts emerges from the premise that incorporating game elements into serious contexts can make learning more fun and engaging (Lee & Hammer, 2011; Kapp, 2012; Li & Chu, 2020).

Gamification can be defined as the process of applying game elements in non-game contexts (Deterding et al., 2011). Although gamification and serious games share the same goal, serious games have a well-defined game space (Kapp, 2012). In this study, some strategies and features of serious games will be considered for analysis as gamification examples.

Studies have shown that gamification can stimulate interest and motivation, increase student participation, and promote new habits (Buckley & Doyle, 2016; Li et al., 2018;). However, it is not a consensual matter, and some studies also express concerns about its long-term effectiveness and potential negative effects, such as competition and social comparison (Hanus & Fox, 2015; Sanchez et al., 2020). Therefore, properly applying game elements in teaching materials is crucial to promote intrinsic motivation and improve long-term engagement and academic performance.

## 2.3. Game anatomy

To create a gamified system, it is necessary first to know the anatomy of the game, that is, what makes games fun and engaging and how to apply those elements to the context of learning and reading.

There are some proposals for structuring games. Werbach and Hunter (2012), for example, propose a hierarchical pyramid according to the level of abstraction of game elements, composed of three categories: dynamics, mechanics and components. Schell (2020), in turn, proposes a scheme, consisting of four categories – mechanics, aesthetics, history and technology – which he calls the elementary tetrad.

Regardless of the structure or categorization, there are some game elements that, when applied together and thoughtfully, facilitate learning experiences. Kapp's (2012) 12 main elements for creating engaging learning experiences serve as parameters for the analysis: 1) Abstraction of concepts and reality; 2) Goals; 3) Rules; 4) Conflict, competition, or cooperation; 5) Time; 6) Reward structures; 7) Feedback; 8) Levels; 9) Storytelling; 10) Curve of interest; 11) Aesthetics; 12) Replay or do over;

## 3. Case studies analysis

For the case studies analysis, the two most used national e-learning platforms were selected: Escola Virtual and Aula Digital, developed by the leading schoolbooks publishers: Porto Editora group and LeYa, respectively. Both offer access to their digital schoolbooks and complementary e-learning contents such as: video lessons, exercises and educational games. The analysis was focused on the contents of the Portuguese language discipline of 7th, 8th and 9th grade, a choice motivated by the observed decline in reading interest from 7th to 12th grade and the importance of addressing the issue from an early stage. Following the identification of resources incorporating gamification, a thorough examination was conducted by deconstructing them according to the 12 previously established game elements, if found.

### 3.1. Escola virtual

Escola Virtual was developed by Porto Editora Group and integrates content from pre-school to 12th grade (Escola Virtual, https://www.escolavirtual.pt/). In the analysis, only content characterized as games and quizzes was considered, since the remaining contents integrate interactivity and multimedia, but not gamification. For the curricular subject and school years under study, two types of gamified contents were found: "Quiz" (considers both normal quizzes and QuizEV) and "Escape Room".

**3.1.1. Quiz.** Escola Virtual provides different types of quizzes, all with the same game structure. These are played individually, except for QuizEV, a classroom-based tool designed to streamline lessons. The term "Quiz" derives from the "questionnaire" and consists of a game of questions to check knowledge.

*Table 1. Quizzes game elements.*

| 2 | The goal is to respond correctly to as many questions as possible. |
|---|---|
| 3 | • there is only 1 correct answer that, when selected, is immediately considered final.<br>• the player can only move on to the next question after answering the current question. |
| 4 | QuizEV can have an element of competition when played in group, at the classroom. |
| 5 | Time restriction: 12, 20, 30 or 60 sec. |
| 6 | Final score – number of correct answers compared to the total number of answers. |
| 7 | • answers generate positive or negative feedback through the color green or orange respectively, on the button and/ or background, and sometimes an animation of a smile "☺"/sad face "☹".<br>• in some cases, the feedback is followed by an explanation.<br>• when the quiz ends, final qualitative feedback is shown with the player's score and time spent. |
| 10 | The progress bar helps the player to situate in the game, visualize the end and avoid giving up. |
| 11 | Minimalist aesthetic with plain background colors and, in some cases, an image. |
| 12 | Once selected, the answer cannot be changed. |

**3.1.2 Escape Room.** The platform offers 8 "Escape Room" games where players must solve puzzles to escape a themed room within a limited time. The themes are related to textual typologies.

*Table 2. "Escape Room" game elements.*

| 1 | The game involves abstraction from reality, for example, the virtual space of the room. |
|---|---|
| 2 | Final goal: complete the final riddle with the lost items found and get the key to leave the room.<br>Intermediate goals: complete the challenges and find the lost items. |
| 3 | • the player can complete the tasks in any order and can try to solve them multiple times;<br>• the game is won when the final riddle is solved, and the player leaves the room. |
| 5 | Time restriction: 30 min. |
| 6 | There are 3 types of rewards: 1) objects - that unlock another task; 2) lost items - that are required for the final challenge and 3) key – allow to exit the room and win the game. |
| 7 | • a green/ red border around the screen indicates a correct/ incorrect answer respectively.<br>• once the game is completed, there is a final score (accuracy of the answers) and the time spent. |
| 8 | Level 1: items directly in the room that only have to be placed in the inventory.<br>Level 2: task completion to acquire an object, hint or one of the lost items.<br>Level 3: locked task that requires a previously won object to be unlocked.<br>Level 4: final riddle that requires all lost items to get the key and leave the room. |
| 9 | Each escape room has a different storytelling related to a text typology. |
| 10 | Time pressure, progressive achievement and difficulty levels help to maintain the interest curve. |
| 11 | 2D illustrations with textures, shadows and vibrant colors. Some animations and background music. |
| 12 | • tasks can be repeated until the player gets the right answer.<br>• close to the time limit, the player can be given an extra question to earn 10 min more of play time. |

## 3.2. Reflection

In the subject and school years under study, all gamified contents in Escola Virtual are quizzes. These vary on play environment, time restrictions, feedback and visuals, keeping the same structure and game play. "Escape Room" are serious games that combine multiple game elements. The complexity of its rewards, goals and multiple levels appear to contribute to a more challenging and engaging experience.

## 3.3. Aula Digital

Aula Digital is the platform developed by LeYa and contains content from 1st to 12th grade (Aula Digital, https://auladigital.leya.com/). Also in this case, only quizzes and games were considered. For the curricular subject and school years under study, four gamified contents were found: "The Wheel of Luck", "Game Messages" and "Who wants to be".

**3.3.1 Quiz.** The game structure of quizzes in Aula Digital is similar to the one already identified in Escola Virtual, maintain the game elements present. The main differences reside in: 3) having to confirm the final answer in a button after selecting the considered option; 5) not having time restrictions; 7) feedback being given by a green or red pop-up with the words "Correct!" or "Ups…" respectively, always followed by an explanation; 10) shorter quizzes with only 4 questions, deterring player discouragement.

**3.3.2 The Wheel of Luck.** "The Wheel of Luck" is a quiz-based game played individually or in group, up to 4 players.

*Table 3. "The Wheel of Luck" game elements.*

| 1 | The wheel and player pins are models of reality. |
|---|---|
| 2 | The goal is to respond correctly to 5 questions. |
| 3 | The player spins the wheel and answers a question. |
| 4 | The game involves competition if played by more than 1 player. |
| 6 | First player to correctly answer five questions, wins. |
| 7 | • feedback on correct or incorrect answers given by the selected button turning green/ red respectively and a specific sound effect. Also, if correct, 1/5 of the player's progress bar is filled.<br>• the pawn who is playing is marked by a yellow star.<br>• the colored pawn of the winning player appears with a congratulation message at the end. |
| 10 | Competition and socialization contribute to maintain the interest curve. |
| 11 | 2D illustrations with shadows and vibrant colors, as well as the sound effect of the wheel turning. |
| 12 | Players play alternately, regardless of answer accuracy. |

**3.3.3 Game Messages.** "Game Messages" consists of a digital board game related to recommended reading books.

*Table 4. "Game Messages" game elements.*

| 1 | Board games are a model of reality that simulates a trail. |
|---|---|
| 2 | Final goal: reach the final tile, first.<br>Intermediate goals: answer the questions correctly. |
| 3 | • the player rolls the dice, moves forward and answers a question. If the answer is wrong, the player goes back, if it is correct, he/she stays in the tile.<br>• Special tyles: 1) tile with "X": exempts from answering a question; 2) cloverleaf tile: move forward two extra tiles without answering a question; 3) dice tile: roll the dice again.<br>• First player to reach the end wins, although excess dice value requires returning excess tiles. |
| 4 | The game involves competition if played by more than 1 player (up to 4 players). |
| 6 | • each correct answer is rewarded by moving forward in the board.<br>• chance factor rewards for players who land on special tiles. |
| 7 | • feedback to answers given by the symbol "✓" in green or "✗" in red, the word: "Correct!" or "Incorrect" respectively and a specific sound effect.<br>• podium in the end of the game. |
| 9 | The game is based on a specific book and its narrative. |
| 10 | Competition and socialization contribute to maintain the interest curve. |
| 11 | 2D organic gameplay with colorful illustrations and shadows for a 3D effect. Players can choose their pawns' color and there are sounds effects like the dice rolling and the pawns moving. |
| 12 | Players play alternately, regardless of answer accuracy. |

**3.3.4 Who wants to be.** The game "Who wants to be" is a reproduction of the game "Who wants to be a millionaire" and takes on different themes: Who wants to be a playwright/ narrator/ poet/ editor.

*Table 5. "Who wants to be" game elements.*

| 2 | Final goal: reach the maximum prize: 1 000 000 pts.<br>Intermediate goals: answer the questions correctly. |
|---|---|
| 3 | • the game has 12 questions until reaching the total prize.<br>• the player has to answer all the questions correctly.<br>• there are 4 help options: 1) the 50:50 - leaves the player with 2 options only; 2) the cell phone - offers the correct answer given by an acquaintance; 3) the switch - allows to change the question; 4) the audience help - shows the percentage of people who would choose each option. |
| 5 | Time restriction for each question: 30 sec. |
| 6 | Each question answered correctly, is awarded by adding points. |
| 7 | Feedback on correct or incorrect answers given by the selected option button turning green/ red and respectively and a specific sound effect. |
| 8 | 3 levels: 1) from 100 to 1000 pts; 2) from 1,000 to 50,000 pts; 3) from 50 000 to 1 000 000 pts |
| 10 | The combination of challenging levels, accumulation of points, closeness to the final goal, and the pressure of not being able to miss any questions, help sustain player interest. |
| 11 | Simple, colorful aesthetics, in yellow and blue tones, with rounded corners and background music. |
| 12 | One wrong answer and the player automatically loses the game. |

## 4. Reflection

All gamified contents in the subject and school years under study in Aula Digital are quizzes and all serious games are quiz-based, that is, based on a question-answer system. "Game Messages" and "Who wants to be" are the two resources slightly more complex in terms of game elements' development.

## 5. Discussion and conclusion

This study found limited variety of gamification resources in the Portuguese language digital learning of the school years under study, mostly being quizzes. While useful, quizzes have a similar structure to tests and use few game elements to enhance student engagement. The serious games analyzed were deeply related to the learning topics, and didn't seem to rely heavily on external rewards.

Consistent to all examples, there was: a well define goal; instant and recurrent feedback reinforced by elements such as text, colors, animations, and sounds; and explicit rules, regardless of their complexity. Storytelling and aesthetics enhanced the experience but didn't seem to make it great by themselves. Like for example, in "Game Messages" and "The Wheel of Luck" despite the storyline and visuals, they end up being slightly monotonous for its limitation to quiz-like mechanics.

Overall, the resources that incorporate more complex and well-defined game elements appear to have a more engaging experience, although this has to be supported by future research. This study shows significance in providing useful information on the current state of gamification in Portuguese language e-contents for the years under study, and serves as a starting point for further research and development.

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# ABILITY GROUPING AND INCLUSIVE PRACTICE IN FOREIGN LANGUAGE TEACHING

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## Abstract

There is no doubt that inclusive education has become a global agenda, an important topic discussed at international level, and a political objective responding to the problems and challenges of the modern world, such as multiculturalism, ever growing social inequality across the world as well as within countries. Inclusive education has also become a generally accepted and closely monitored criteria for assessing the quality of educational systems around the globe. In the context of these facts, it is important to analyse in more depth the problems of segregation in education and ability grouping at the level of both the education system and the school. Researchers are trying to find an answer to the question whether ability grouping really brings benefits to all children or only to individuals. In the paper, the authors reflect on the extent to which ability grouping of children can be considered as a strategy for inclusive practice. Against the background of existing research findings, they analyse the possibilities and models of grouping children in the context of foreign language teaching in primary education. They conclude with a recommendation to strengthen differentiated teaching at the classroom level, respecting not only the level of foreign language proficiency but also other characteristics of the pupils. They also present the possibility of creating specialised programmes beyond the normal teaching time for children who are significantly ahead. At the same time, they point to the risks of creating elite classes or fixed elite groups in relation to the social and learning climate of the school and the broader concept of social inclusion. The authors' contribution responds to the trend of segregation in education in Slovakia and provides impulses for the development of inclusive school policy, culture, and practice.

*Keywords: Inclusive education, ability grouping, foreign language teaching, primary education, segregation in education.*

## 1. Introduction

The subject of our paper is ability grouping at the school level, where we can observe two types of this practice: 1) between-class grouping and 2) within-class grouping. We define ability grouping in agreement with J. A. Kulik (1992) as a practice that places learners into classrooms or small groups based on an initial assessment of their levels of readiness or ability. In the case of foreign language teaching or second language (L2) teaching, pupils are grouped based on their current level of L2 acquisition. This division is always hierarchical and encourages competitive rather than cooperative behaviour. This redistribution results in the emergence of groups that have their own attributes - high-performing learners (high-ability group, gifted children), low-performing learners (low-ability group) or group of learners who perform slightly behind the high group (middle ability group).

The creation of ability groups is most often done to achieve better academic results for pupils. The effects of this practice (not only on academic performance) are more often studied at the secondary or higher education level (see Khazaeenezhad, Barati, & Jafarzadeh, 2012; Naddafi, Vosoughi, & Kowsary, 2019; Wu, Tsai, & Chiu, 2018; Liu, 2009; Kim, 2012). The results are not consistent. However, several suggest that this practice might not produce the expected results in terms of progress in language proficiency for all groups of learners but may have a negative impact on learners' self-esteem. We also base this theoretical analysis of ability grouping in L2 learning in primary education on the results of two second-order meta-analyses that mapped 100 years of research on ability grouping on K-12 pupils' academic achievement (Steenbergen-Hu, Makel, & Olszewski-Kubilius, 2016), as well as research that highlights the experience of this practice in early years and primary education (Webb-Williams, 2021; Roberts-Holmes, & Kitto, 2019; Gripton, 2020; Hallam et al., 2003). Drawing on numerous research studies and the developmental characteristics of primary school children, we seek to answer the questions:

1. Why does ability grouping in primary education need to be carefully considered?
2. How to do between-class grouping in foreign language teaching in a way that brings it closer to the principles of inclusion?

3. How to reinforce the principles of inclusive education when applying within-class grouping?

## 2. Why ability grouping in primary education should be carefully considered

Ability grouping is a commonly used practice in schools. It is used in all subjects but more often only in selected subjects - mainly in mathematics, first language, and foreign language classes. In particular, advocates of ability grouping argue for the need to tailor learning to the different ability levels of pupils to achieve the highest possible standards in each group (Kim, 2012). Working in a homogeneous group, they argue, allows the teacher to tailor tasks and learning materials to pupils' abilities, thus creating conditions for better use of pupils' intellectual resources (Sorensen and Hallinan, 1986).

Analyses of the supporting arguments suggest that many teachers practice ability grouping to respect the principle of equity, which refers to the school's role to fulfil each pupil's individual potential and to create opportunities for them to reach their personal best. However, in the context of the philosophy of inclusive education, the value of human dignity and tolerance should also be emphasised (Vančíková, Porubský, & Kosová, 2017). Respecting the value of human dignity means removing the categories of WE and THEY and eliminating the risk of any labels that co-create the child's image of their self-worth. Tolerance refers to the need to create a safe and respectful environment in which rivalry and competition are suppressed at the expense of peer learning and cooperation. Inclusive discourse rejects words such as *above average, problematic, below average, and underachieving*. In an inclusive school, there are no able and unable pupils, talented and untalented, successful or unsuccessful. In light of these value pillars, ability grouping seems problematic, especially in primary education, where we are working with children at a sensitive age of forming relationships with themselves and the world around them. The risks of ability grouping become more tangible when we consider the close relationship between children's developmental characteristics and the laws of social comparison.

Competitive behaviour is typical of younger school-age children. School ethnographic research has shown (Doubek, 2005; Bittnerová, 2005) that primary school children in Lower Elementary use a variety of competitive social and communicative strategies through which they try to consolidate their position in the group. These strategies are not infrequently hurtful in nature. It is common to see ridicule, gossiping, boasting, bragging and name-calling in children's groups at this age. School achievement is an important aspect of competition, especially in a group of girls. Thus, school failure inevitably affects children's social life at a time when they are forming stronger social bonds through which they form an image of their social attractiveness or unattractiveness. Acceptance and rejection of group membership (which may even be like an alliance) is, for the child at this age, the answer to the question of their worth. Their formal inclusion in a group directs them towards significant objects of social comparison.

Social comparisons have long been shown to be pivotal to self-evaluations (Webb-Williams, 2021). Many children are unable to maintain their positive self-image, which has spill over effects on their school performance because self-efficacy comes into play (see Schunk et al., 2008; Usher and Pajares, 2008), which is closely related to learners' expectancy-value beliefs "understood as the anticipatory predictions and forecasts that pupils make in an attempt to anticipate their actions, emotions and outcomes in a new educational situation" (Doménech-Betoret, Abellán-Roselló, & Gómez-Artiga, 2017, p. 9).

Self-efficacy is one of the most influential independent variables on learners' performance and achievement, which is also true in foreign language learning (Raoofi, Hoon Tan, & Heng Chan, 2012; Jabbarifar, 2011). In doing so, it turns out that the personal experience of success is vital in foreign language learning and the so-called vicarious experience. "Learners should be provided with opportunities to observe their friends and classmates do tasks successfully; these opportunities help learners to foster positive beliefs about themselves" (ibid., p. 67). Meanwhile, the effectiveness of the teacher's work and the quality of classroom interactions play an essential role in stimulating learners to put effort into completing the assigned tasks (ibid.).

As Webb-Williams (2021) notes, researchers have identified that social comparisons can result in positive and negative effects depending on whether they are perceived as contrasts or assimilations (see Mussweiler et al., 2004). When a social comparison target is perceived as a contrast, one compares and focuses on the differences between oneself and the object being compared. In the case of assimilation, the comparison results in an attempt to get closer to the reference object (Webb-Williams, 2021). Contrast can cause a reduction in group identification and lower self-esteem in the low group as they compare themselves to so-called better groups (upward comparisons) (Smith et al., 1994). At the same time, these pupils lose the opportunity to compare themselves with better ones within their group and, therefore, the opportunity to learn and grow. Downward comparisons occur within them as part of assimilation. "Individuals focus on the similarities between themselves and the lower comparison target leading to increased anxiety and self-doubt" (Webb-Williams, 2021, p. 4). Increased anxiety and self-doubt may be a reason why there is a poorer learning climate, higher levels of resignation and less

progress in learning in groups (cf. Gamoran, 1992). Social comparisons are central to forming academic self-concepts, even in high-ability groups. Indeed, there are higher levels of rivalry and predation in these groups, which causes discomfort. Being ranked among the best does not necessarily enhance self-esteem and self-efficacy; on the contrary, it may cause feelings of inadequacy. Researchers of the so-called Big Fish Little Pond Effect (Marsh & Hau, 2003; Trautwein et al., 2009; Liem et al., 2013) repeatedly confirmed that "children evaluate themselves more favourably against low-ability others than comparing to higher performing others which can lead to negative feelings about their own ability" (Webb-Williams, 2021, p. 4).

## 3. How to make between-class ability grouping more inclusive

Despite the numerous research studies that point to the risks of between-class ability grouping, this practice is not infrequently used in foreign language teaching. Children arrive at school with varying levels of foreign language proficiency, depending on their language learning experiences in kindergarten but also the conditions of the family environment (bilingual families, travel, and the like), which leads school principals to decide to group pupils with the same level of language together, across classes. The pairing can also take the nature of cross-grade grouping. Even in this case, it is possible to make the practice more inclusive. Based on research and case studies, several recommendations can be made:

- *Keep educational pathways open to all.* Between-class grouping should not evolve into the practice of creating classes for gifted children or so-called levelling classes. If children are divided into ability groups as part of a foreign language lesson, they should return to their mainstream classes when the lesson is over.
- *Use between-class grouping in extracurricular after-school classes.* Pupils may not perceive ability grouping within standard classes as beneficial. A qualitative study by Y. Kim (2012) showed that in addition to uncertain outcomes, pupils feel discomfort at having to leave their class, their friends, find transfers chaotic, and their attitude towards the practice is rather negative. However, they have a positive perception of extra EFL classes. They seem to perceive grouping according to their level of foreign language proficiency in the afternoon as an opportunity rather than a threat; this is not only for lower-ability pupils but also gifted ones (Steenbergen-Hu, Makel, & Olszewski-Kubilius, 2016).
- *Reorganise groups.* The qualitative shift in ability grouping is contingent on the groups' openness. Pupils' performances may change during the year depending on various external or internal factors. Continuous monitoring of their current language skills will allow for group reorganisation, dampening feelings of unfair treatment in grouping (cf. Kim, 2012).
- *Ensure sufficient teacher rotation.* Pupils and teachers alike should not remain locked in groups. This recommendation can be built on findings confirming that teacher-centred education is more prevalent in low groups while learning is more active in other groups. One reason for this may also be the quality of the teacher. In the case of foreign language teaching, it is imperative to refrain from placing less experienced or even less linguistically skilled teachers in low-ability groups. The rule of 'best teachers to best and weakest to weakest' needs to be reconsidered.
- *Make sure your foreign language teaching curriculum is inclusive.* Any grouping of pupils according to ability only makes sense if the learning process is tailored to the needs of each group. Research confirms that the expectations of pupils, parents, and teachers are not always met in this regard, and pupils do not always see different learning practices in different groups (Kim, 2012). Each group needs a different type of learning materials and learning tasks. However, this does not mean that the expectations of pupils' learning progress should be differentiated. Low expectations from low groups can lead to the routinisation of children's expectations and limitations themselves (Roberts-Holmes, & Kitto, 2019).

## 4. How to make within-class ability grouping more inclusive

Within-class ability grouping can be seen as an inclusive practice in some circumstances. In this case, too, several recommendations can be formulated:

- *Inclusion in groupings must not be permanent.* Having children work in stable groups increases the risk of routinising ideas about the self and can lead to unwanted labelling. Experience with this practice has shown that some children have come to perceive the classroom in terms of the categories with which the groups have been labelled (Gripton, 2020). Thus, as noted above, ability grouping can negatively affect the social climate of the classroom and increase the risk of intergroup tension or favouritism or rejection of individuals. It is, therefore, crucial that groupings constantly be changing and that groupings should be subject to systematic ascertainment of the current level of development of those skills to be developed

in the classroom. Particularly in the case of foreign languages, each child may be dominant in a different area (reading, speaking and so on) or topic, thereby creating an opportunity for each child to experience a sense of achievement. Changing groups can also be done at regular intervals (e.g. every two weeks, see Hove & Phasha, 2022), thus reducing the risk of misplacing a pupil based on current problems that may not always be obvious (family situation, problems with a friend and the like).

− *Allow permeability.* Flexibility in grouping practice is also related to the design of the learning environment in each group. Therefore, it is imperative that a group that includes pupils with lower levels of knowledge or skills does not adopt a teacher-centred model that puts pupils in a passive role as task performers. Research suggests that children placed in low-ability groups are denied access "to the opportunities for self-regulation that formed part of the requirement for participation in the other groups and limited their opportunity to express understanding beyond the level ascribed to them" (Roberts-Holmes, & Kitto, 2019, p. 859).

− *Focus more on mastery learning than on pupil performance.* If within-class grouping practices are to be successful, teachers must differentiate instruction (Kulik, 1992; Kulik, 1995 as cited in Tieso, 2010). Teachers must adopt a new form of classroom management to create a learning environment sensitive to individual levels (Tieso, 2010). Managing work in diverse groups implies moving away from a textbook-dominated curriculum. Setting up a learning environment also requires well-developed diagnostic skills to help the teacher identify not only ability level but also learning style, the dominant type of intelligence, learning pace, and the like.

− *Respect factors other than children's abilities when setting up groups.* Children's experiences of ability grouping are varied. As demonstrated in C. Gripton's research (2020), some aspects of classroom life are compelling for individual children and others, on the other hand, do not even notice. For some children, relationships with friends are more critical, while others are more sensitive to the place of learning. The author, therefore, recommends that we include a wide range of factors, including friend relationships, when deciding on grouping. A prerequisite of inclusive grouping practice is not just to look at children's level of acquired knowledge or skills but to seek to understand their needs and to be sensitive to how they perceive their inclusion in the group.

− *Include the voice of the child.* The above recommendations are overarched by the principle of strengthening the child's voice in education. Children should be heard and directly involved in the power and responsibility of the decision-making process (Shier, 2001), including deciding in which group they will be placed.

## 5. Conclusion

The practice of ability grouping is not so rare in primary school foreign language teaching. Especially in countries where the principle of segregation blocks horizontal and vertical permeability in education, it is necessary to pay more attention to this phenomenon. Slovakia is one such country (Hall, et al., 2019). This paper aims to discuss the risks of this practice in primary education settings and to direct the readers' attention to strategies that can contribute to strengthening inclusive education in foreign language teaching.

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# CREATIVE THINKING OF CHILDREN WITH ADHD AND THEIR PERFORMANCE IN LANGUAGE AND MATHEMATICS

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## Abstract

The purpose of this research is to study the relationship between the creative thinking of children with ADHD and their performance in Language and Mathematics. That is, we sought to explore the creative possibilities in speech and drawing of children with ADHD and the relationship of the individual factors of their creative thinking such as fluency, flexibility, originality, the abstract form of the titles, etc. with the performance of these children in selected factors in language and mathematics such as reading proficiency, reading comprehension, calculations, solving mathematical problems, etc. The sample of our study was a total of 13 primary school children from the 5th and 6th grade (9 boys and 4 girls) attending schools in the city of Rethymno in Crete, Greece. All children had been diagnosed with ADHD. For the collection of research data, the Test Torrance of Creative Thinking (TTCT, 1998, Verbal and Figural) was used for creative thinking, the Reading Test Test-A (Panteliadou & Antoniou, 2007) for language while the Psychometric criterion of Mathematical Proficiency for children and adolescents (Barbas, Vermeoulen, Kioseoglou, & Menexes, 2008) for mathematics. The SPSS22 statistical program and the non-parametric Spearman rho test were used to analyze the collected data. According the research findings, there is a positive statistically significant relationship between the most factors of figural creative thinking of children with ADHD and their performance in mathematics. The language performance of children with ADHD seemed to have a positive statistically significant correlation only with two factors of figural scale (fluency and originality) of the TTCT. We hope that the results of our research, although based on a relatively small sample, will contribute to the understanding and study of the special characteristics of children with ADHD and their education.

*Keywords: Creativity, ADHD, school performance, creative thinking.*

## 1. Introduction

### 1.1. Creativity and creative thinking

Creativity is considered one of the most controversial concepts, although it has been the subject of research and study in several scientific domain. According to Barron and Harrington (1981), the term creativity refers to the ability of the individual to invent something innovative, activating in a specific time a specific mental function. For Anwar, Shamim and Hap (2012) creativity, is that characteristic of people related to the production of new and original ideas. However, one of the derivatives of creativity is the creative thinking. According to Kampylis and Berki (2014) all people seem to have creative thinking abilities and creative ideas, however children have the ability to think in a more creative, open and playful way and their thinking tends to diverge.

### 1.2. Relationship between creativity, school performance and ADHD

Creativity and the creative way of thinking consist of the basic skills of children, for the cultivation of which the modern school plays a pivotal role. It was found that creativity is not only related to school performance but can predict to a satisfactory level the success rates of students in learning processes (Kozbelt, Beghetto, & Runco, 2010). According to Mendelsohn (1976), creative people often show signs of distraction, which also characterizes people with Attention Deficit Hyperactivity Disorder (ADHD). Barkley's (2005) research claims that the prevalence of ADHD in the student population on a scale of 5% to 7%. However, according to Leroux and Levitt-Perlman (2000), studies on children with ADHD often focus on the problems, diagnosis, and treatment of the disorder and rarely refer to the fact that the characteristics of the disorder have an impressive resemblance to areas of creativity. As a result, in many cases giftedness overshadows ADHD and vice versa. Shaw and Brown (1991), who examined a group of

16 children with ADHD and a control group of 16 typically developing children concluded that children with ADHD used more imagination in problem solving and achieved quite higher scores than the typically developing children in a creative drawing test. In another study, Gracia, Juan, and Marta (2017), examined a group of 34 children, aged 8 to 13, diagnosed with ADHD and a group of 34 typically developing children and concluded that children with ADHD achieved higher ratings in fluency, in originality and creative strengths (story-telling, feelings expression, humour, imagination). The above finding created the need to study the tripartite ADHD, creativity and school performance.

## 2. The problem and the purpose of the study

Despite the encouraging results of the above research on the relationship between the creativity of children with ADHD and school performance, research in this domain is lacking. The evaluation of creative thinking in speech and drawing of children with ADHD, as well as the evaluation of their performance in language and mathematics were correlated in our research to study their creative skills and their connection with their academic performance.

## 3. Methods

### 3.1. Research hypotheses

The present research examined four research hypotheses based on the research tools which used and the performance of children with ADHD in tests of creative thinking, language and mathematics:

1st research hypothesis: The children with ADHD, who achieve high performance in language, will also achieve high performance in creative thinking in speech (TTCT-Verbal).

2nd research hypothesis: The children with ADHD, who achieve high performance in language, will also achieve high performance in creative thinking in drawing (TTCT- Figural).

3rd research hypothesis: The children with ADHD, who achieve high performance in mathematics, will also achieve high performance in creative thinking in speech (TTCT- Verbal).

4th research hypothesis: The children with ADHD, who achieve high performance in mathematics, will also achieve high performance in creative thinking in drawing (TTCT- Figural).

### 3.2. Participants

The sample of our study was a total of 13 primary school children (9 boys and 4 girls) attending schools in the city of Rethymno in Crete. All children had been diagnosed with ADHD.

### 3.3. Research tools

The performance of the research tools was done individually for each child and was completed in two meetings. In the first meeting, were given them the Reading Test (Test-A) (Panteliadou & Andoniou, 2007) and the Psychometric Criterion of Mathematical Proficiency for children and adolescents (Barbas, Vermeoulen, Kioseoglou, & Menexes, 2008) and in second meeting were given them the Torrance Test of Creative Thinking (Verbal and Figural) (TTCT, Torrance, 1998). More specifically, the creative thinking in speech was tested by three main factors: fluency, originality and flexibility. The creative thinking in drawing was tested by six mains factors: fluency, originality, flexibility, abstractness of titles, resistance to premature closure and creative strengths total. Performance in language was tested by four mains factors: reading decoding, reading fluency, morphology- syntax and reading comprehension. Finally, Performance in mathematics was tested by three mains factors: vocabulary, calculations and maths-problem-solving.

## 4. Research results

The analysis of the research data was carried out with the statistical package SPSS22. In order to investigate the relationship between the performances of children with ADHD, in creative thinking (verbal and figural) and in language, as well as in creative thinking (verbal and figural) and mathematics, a correlation analysis was carried out with the Spearman rho index, due to the small number of the sample. The results showed that regarding the first and third research hypotheses, there are no statistically significant relationships between the factors of creative thinking in speech and the linguistic and mathematical factors in children with ADHD. Then the results of the research that presented statistically significant correlation with individual factors of the variables under study are detailed. The results showed that there is a positive statistically significant correlation in some factors of the second and fourth research hypotheses. More specifically, regarding the second research hypothesis, positive statistically significant correlation in the language test are observed in the morphology-syntax set with the variables: fluency and

originality in the drawing scale of the TTCT-Figural (rho(11)=0.64, p=0.019<.05 and rho(11)=0.56, p=0.049<.05 respectively). Also, positive statistically significant correlation are observed in the reading comprehension set of the language test with the fluency set in the drawing scale of the TTCT-Figural (rho(11)=0.60, p=0.031<.05) (Table 1).

*Table 1. Correlations (Spearman rho) between the variables of language performance and creative thinking, through the design scale in the TTCT-Figural.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 .Total fluency_figural | - | | | | | | | | | |
| 2 .Total originality _figural | .915** | - | | | | | | | | |
| 3 .Total flexibilityς_figural | .588* | .396 | - | | | | | | | |
| 4 .Total abstractness of titles_figural | .783** | .712** | .621* | - | | | | | | |
| 5 .Total resistance to premature closure_figural | .749** | .580* | .691** | .809** | - | | | | | |
| 6 .Total creative strengths _figural | .829** | .724** | .792** | .832** | .722** | - | | | | |
| 7 .Total reading decoding._Test-A | .439 | .398 | .084 | .477 | .349 | .194 | - | | | |
| 8 .Total reading fluency_Test-A | .281 | .236 | .203 | .387 | .394 | .192 | .731** | . | | |
| 9 . Total morphology- syntax _Test-A | .637* | .555* | .178 | .427 | .432 | .255 | .653* | .515* | . | |
| 10.Total reading comprehension_Test-A | .599* | .375 | .374 | .368 | .528 | .355 | .466 | .562* | .831** | _ |

*\*\*\*p<.001 \*\* p<.01 \* p<.05*

Regarding the fourth research hypothesis, the results showed that there is a positive statistically significant correlation between two factors, the mathematic performance and the creative thinking by the drawing scale of the TTCT-Figural (rho(11)=0.79, p=0.001<.05). Also, positive statistically significant correlation are observed between the total vocabulary set with the variables: fluency, originality and abstractness of titles in the drawing scale of the TTCT-Figural (rho(11)=0.73, p=0.005<.05, rho(11)=0.68, p=0.01<.05, and rho(11)=0.56, p=0.049<.05 respectively). Furthermore, the total calculations set with the variables: fluency, originality, abstractness of titles, resistance to premature closure and creative strengths in the drawing scale of the TTCT-Figural (rho(11)=0.80, p=0.001<.05, rho(11)=0.67, p=0.011<.05, rho(11)=0.69, p=0.009<.05, rho(11)=0.72, p=0.006<.05 και rho(11)=0.64, p=0.019<.05 respectively). Finally, total of maths-problem-solving set with the variables: fluency and originality in the drawing scale of the TTCT-Figural (rho (11) =0.70, p=0.008<.05 and rho (11) = 0.80, p=0.001<.05 respectively) (Table 2).

*Table 2. Correlations (Spearman rho) between the variables of mathematics performance and creative thinking, through the design scale in the TTCT-Figural.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 . Total fluency_figural | - | | | | | | | | |
| 2 . Total originality _figural | .915** | - | | | | | | | |
| 3 . Total flexibilityς_figural | .588* | .396 | - | | | | | | |
| 4 . Total abstractness of titles_figural | .783** | .712** | .621* | - | | | | | |
| 5 . Total resistance to premature closure_figural | .749** | .580* | .691** | .809** | - | | | | |
| 6 . Total creative strengths _figural | .829** | .724** | .792** | .832** | .722** | - | | | |
| 7 . Total vocabulary_ mathematics | .727** | .683* | .150 | .556* | .402 | .486 | - | | |
| 8 . Total calculations_ mathematics | .803** | .677* | .387 | .688** | .712** | .636* | .722** | - | |
| 9 . Total maths-problem-solving_ mathematics | .699** | .798** | .278 | .438 | .364 | .396 | .597* | .599* | - |

*\*\*\*p<.001 \*\* p<.01 \* p<.05*

## 5. Discussion

The purpose of the present research is to examine the connection of the creative thinking performance of children with ADHD in speech and drawing with their performance in language and mathematics. The results research showed that there is no statistically significant correlation between the total scores of children with ADHD in their language performance and their creative thinking, which was tested through the TTCT-Figural. The above finding is confirmed by the research of Zbainou, Belogianni, and Katsampanis (2019), which studied the relationship between creativity and school performance of 5th and 6th grades children. The results showed that there is no correlation between the students' performance in the Torrance test and their performance in the language course. However, in the further processing of the correlations made to the in-dividual factors of the drawing scale, it appeared that in our research, there is a statistically significant correlation between reading comprehension and the fluency of the drawing scale examined by the TTCT. The above finding is confirmed by the research of Sur and Ates (2022), who studied the relationship between the reading and listening comprehension of texts and the creative thinking of children studying in the 5th grade. The results of their research showed there is also a significant correlation be-tween reading comprehension and fluency, which is one of the factors of creativity examined by the TTCT. According to the fourth research hypothesis, it was found that there is a positive statistically significant correlation between the two variables, mathematical performance and creative thinking through the drawing scale of the TTCT-Figural. The research of Klavir and Gorodetsky (2009) agrees with the above findings, who compared the performance of gifted and non-gifted students in mathematics with their performance in the areas of fluency, flexibility and originality. The results of the specific research showed that students with high performance and gifted abilities in mathematics presented a more readiness to engage in the creative process, a high ability to think of different mathematical ideas, which were directly related to the stimulus as well as a very good performance in processing of their ideas but also in the originality of the solutions they proposed. Although the above research refers to children with typical development, the research by Gracia, Juan, and Marta (2017) was studied the creative thinking of the 34 children with ADHD and the 34 children of typical development through the TTCT, showed that children with ADHD scored higher percentages in fluency and originality, giving more and more unusual answers as well as having higher performance compared to children with typical development in creative powers (telling stories, expressing emotions, humor, imagination). It would be useful at this point to mention that in the present research all three areas examined by the Psychometric criterion of Mathematical Proficiency (Vocabulary, Calculations and Mathematical Problem Solving) show a significant correlation with two specific areas of creative thinking, which are examined by the drawing scale of the TTCT, fluency and originality. In conclusion, we find that the academic performance of children with ADHD in language and mathematics was related in our research to creative thinking in drawing. More specifically, mathematics appears to be associated with most of the factors of the drawing scale (fluency, originality, abstractness of titles, resistance to premature closure, and the set of creative advantages), while language with the factors of fluency and originality.

## 6. Conclusions

Despite the small sample of our research and its inability to generalize, we hope to enrich the data of previous studies in an effort to understand the child with ADHD and highlight his creative potential. The study of the creative thinking of children with ADHD needs to be continued as it can radically and essentially contribute to finding new methods of approaching children diagnosed with the disorder, thus providing them with the possibility for personal development in other areas as well.

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# TECHNOLOGY INTEGRATION IN GRADE 10 LIFE SCIENCES TEACHING AND LEARNING

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## Abstract

This study explored the role of technology in grade 10 Life Sciences teaching and learning. The study adopted embedded mixed method design. The empirical investigation involved purposively selected grade 10 Life Sciences teachers and learners as participants. Quantitative data was collected through the administration of a questionnaire. Qualitative data was collected through classroom observations. The learners demonstrated significant improvement in academic performance as a result of technology integration in Life Sciences teaching and learning. This improvement underscores the need for coherent utilization of technological tools to be embraced as an effective means to enhance learner academic performance in science teaching and learning. The teachers employed various pedagogical strategies when integrating technology in Life Sciences teaching and learning. However, technology integration in Life Sciences teaching and learning posed instructional challenges to teachers. There is a crucial need to enhance teacher professional competence on technology integration in science teaching and learning. Theoretical implications for pedagogic innovation are discussed.

*Keywords:* Life Sciences, technology integration, academic performance.

## 1. Introduction

The use of information and communication technology (ICT) provides a myriad of pedagogic benefits in various instructional settings such as provision of meaningful opportunities for sharing of resources, promotion of collaborative learning and an inclination towards greater learner autonomy (Eze, Adu, & Ruramayi, 2013). According to Ciroma (2014), the use of ICT in education supports the development of 21st century skills such as collaboration, problem-solving, decision-making, critical thinking, creativity and innovation. The use of ICT cannot be confined to provision of access to computers and internet connection. In this regard, Mereku and Mereku (2015) contend that the use of ICT ought to be underpinned by pedagogically sound learning activities. Lack of knowledge to integrate ICT tools, availability of resources, affordability by learners and insufficient teacher training provisions stifle meaningful ICT integration in teaching and learning (Dhakal, 2018). In view of this key strategic imperative, this study explored the role of technology as a means to enhance learner academic performance in grade 10 Life Sciences teaching and learning.

## 2. Purpose of the study

This study explored the role of technology as a means to enhance learner academic performance in grade 10 Life Sciences teaching and learning. The empirical investigation was underpinned by the following concomitant objectives.
- To examine the effect of technology integration on the academic performance of grade 10 Life Sciences learners.
- To identify pedagogical practices adopted by teachers when integrating technology in grade 10 Life Sciences teaching and learning.

## 3. Research design and methodology

The study adopts embedded mixed method design. Embedded mixed method design enables researchers to embed qualitative research into a quantitative experiment to support the elements of experimental design (Creswell et al., 2009). In the quantitative dimension of the research,

a quasi-experimental design was used. Quasi-experimental research is characterized by the manipulation of an independent variable (Gopalan, Rosinger, & Ahn, 2020). In quasi-experimental research designs, researchers seek to develop an acceptable hypothetical, or what would have occurred in the absence of the policy or intervention, to offer a baseline from which causal impacts can be calculated better to understand the causal effect of any policy or action (Gopalan, Rosinger & Ahn, 2020). Quasi-experimental research designs use non-experimental variation as the primary independent variables as interest, replicating experimental settings where specific individuals are randomly exposed to treatment while others are not (Gopalan, Rosinger & Ahn, 2020). The rationale for using a quasi-experimental research design is that it is less expensive and requires fewer resources compared with individual randomized controlled trials or cluster-randomized trials (Harris, et al., 2006). The empirical investigation involved 52 purposively selected participants (2 teachers and 50 learners) from South African township schools. Quantitative data was collected through the administration of a Life Sciences Test. The Life Sciences Test was administered as a pre-test and a post-test with the participants. Qualitative data was collected through classroom observations. Quantitative data was analysed using descriptive statistics while qualitative data was analysed using an observation checklist. The analysis of observational data was guided by the Technology Integration Panel (TIP) proposed by Li and Dawley (2019). TIP is a research-based classroom observation tool that serves to provide information to schools and researchers about the capacity of using technology to support learner-centred learning in the classroom. The Technology Integration Panel aims to recognize the complexity of teaching and learning with technology while providing a clear guidance that can support teachers in their professional practice. Unlike many one-dimensional rubrics that conflate technology access with learning or teaching, the general design of the framework accounts for variation in a classroom along three intersecting continua: (a) pedagogy (b) learning context, and (c) access to technology and usage of technology tools.

## 4. Findings

### 4.1. Findings emanating from the administration of a Life Sciences Test

Table 1 below shows pre-test and post-test scores emanating from the administration of a Life Sciences Test.

*Table 1. Pre-test and post-test scores.*

| School A | | School B | |
|---|---|---|---|
| Pre –Test Score | Post –Test Score | Pre-Test Score | Post-Test Score |
| 60 | 70 | 72 | 92 |

The findings indicate that learner in School B demonstrated significant improvement in academic performance as a result of technology integration Life Sciences teaching and learning as compared to School A. This implies that pedagogical affordances of technology ought to be harnessed as part of pedagogic innovation to enhance learner academic performance in science teaching and learning.

### 4.2. Findings emanating from observational data

**4.2.1. Lesson observation: Teacher A.** Teacher A (Male) taught grade 10 Life Sciences at a township school and had 7 years of teaching experience. The teacher held a Bachelor of Education degree. The school was largely under-resourced. The topic of the lesson was Biodiversity. The teacher clearly outlined learning objectives pertaining to the topic under discussion. The teacher adopted a learner-centred teaching approach. Pedagogical strategies that were employed included collaborative learning, problem-based learning, observational learning and cooperative learning. While the learning tasks engaged learners in analysis, application and synthesis, the teaching provided limited opportunities for learners to build connections between knowledge. The learners were afforded opportunities to make choices in the learning process. However, the teacher appeared to be inadequately skilled as a facilitator to scaffold learning using digital resources. The physical space within the classroom was adequate. The classroom space design supported collaboration and observational learning. In addition, the learning space was flexible and adaptable. There were authentic teacher-learner and learner-learner interactions in the classroom. Technological devices used during the lesson were laptop, smart board and smart phones. As there was no computer laboratory at the school, the teacher was compelled to use his own laptop.

While the smart board was used during the lesson, not all the learners possessed smart phones which translated into a low technology-learner ratio. The teacher demonstrated inadequate level of proficiency when integrating technology in Life Sciences teaching and learning. This inadequate level of proficiency can be attributed to the teacher's inadequate technological pedagogical content knowledge.

**4.2.2. Lesson observation: Teacher B.** Teacher C (Female) taught grade 10 Life Sciences at a township school and had 9 years of teaching experience. The teacher held a Bachelor of Science degree and a Higher Education Diploma. The school was relatively well-resourced. The topic of the lesson was Biodiversity. The teacher clearly outlined learning objectives pertaining to the topic under discussion. The teacher adopted a learner-centred teaching approach. Pedagogical strategies that were employed included collaborative learning, problem-based learning, observational learning, cooperative learning, inquiry-based learning, project-based learning and self-directed learning. The learning tasks engaged learners in analysis, application and synthesis and the teaching provided meaningful opportunities for learners to build connections between knowledge. The learners were afforded opportunities to make choices in the learning process and the teacher was adequately skilled as a facilitator to scaffold learning using digital resources. The physical space within the classroom was adequate. The classroom space design supported collaboration and observational learning. In addition, the learning space was flexible and adaptable. There were authentic teacher-learner and learner-learner interactions in the classroom. Technological devices used during the lesson were laptops, smart board, tablets, smart phones, and interactive applications such as Kahoot. Access to technological devices was not a major problem as the school had a well-resourced computer laboratory. The availability of technological devices translated into a high technology-learner ratio. The teacher demonstrated a high level of proficiency when integrating technology in Life Sciences teaching and learning. This high level of proficiency can be attributed to the teacher's adequate technological pedagogical content knowledge. The teacher also demonstrated professional competence in the implementation of contemporary teaching approaches such as inquiry-based learning whose uptake is generally lower in rural and township schools within the broader South African context. Technical support was provided to the teacher when integrating technology in Life Sciences teaching and learning. The school environment was WIFI active and internet connectivity was not a major issue.

## 5. Discussion

Learner academic performance improved significantly as a result of technology integration in Life Science teaching and learning. This implies that pedagogical affordances of technology ought to be harnessed as part of pedagogic innovation to enhance learner academic performance in science teaching and learning. However, one of the teachers observed appeared to be inadequately skilled as a facilitator to scaffold learning using digital resources. Various studies have demonstrated that few teachers can effectively use ICT in the classroom (Nkula & Krauss, 2014; Padayachee, 2016). A study conducted by Tamim et al. (2015) identified prevailing misconceptions associated with the use of ICT in various educational settings. Meaningful ICT integration in the classroom is hampered by a myriad of factors. These factors include lack of time (Assan & Thomas, 2012), lack of clarity regarding the e-Education Policy (Vandeyar, 2015), lack of support both in terms of infrastructure and policy (Vandeyar, 2015), lack of skills (Msila, 2015) and more focus on the technical aspects as opposed to the pedagogical and theoretical frameworks (Tamim et al., 2015). Technology-enhanced learning has not advanced at the expected pace in South Africa (Department of Basic Education, 2015). According to Mooketsi and Chigona (2014), the slow pace of technology-enhanced learning advancement can partly be attributed to the disparity between government expectations and teachers' practices.

The other teacher was adequately skilled as a facilitator to scaffold learning using digital resources. The teacher demonstrated a high level of proficiency when integrating technology in Life Sciences teaching and learning. This high level of proficiency can be attributed to the teacher's adequate technological pedagogical content knowledge. The teacher also demonstrated professional competence in the implementation of contemporary teaching approaches such as inquiry-based learning whose uptake is generally lower in rural and township schools. Meaningful understanding of ICT integration can serve as a panacea to bridge the gap between theory and practice. Padayachee (2016) found that the development of an appropriate guideline for the professional development of teachers with respect to the pedagogical use of ICT can be an extremely difficult and complex undertaking. In recognition of this dilemma, du Plessis and Webb (2012) posit that current stipulated guidelines for the professional development of mathematics teachers provide inadequate information on how teachers and schools can practically integrate ICT in teaching and learning within the broader South African context.

## 6. Conclusion

Technology integration is promising as a means to enhance learner academic performance in science teaching and learning. However, technology integration in Life Sciences teaching and learning poses instructional challenges to teachers. There is a crucial need to enhance teacher professional competence on technology integration in science teaching and learning.

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# STORYTELLING AS AN INTERDISCIPLINARY STRATEGY IN GEOSCIENCE EDUCATION

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## Abstract

Education can change the world. It influences our reasoning and is preponderant in the development of competencies. It is recognized that school teachers have difficulty involving and motivating students to learn about different complex topics, namely in Geoscience Education. It is up to the teachers to be creative and innovative. They must be able to implement diversified strategies and resources that motivate and actively involve the students in their learning process. Studies reveal that storytelling is an effective, meaningful, enjoyable, and creative way to enhance teaching and promote learning. Thus, storytelling is a powerful education strategy that should be promoted in science teaching. Telling stories makes us human, this is how we understand the world and our experiences. Good teachers tell well-known stories. Great teachers tell their own creative stories. This study aims to verify whether storytelling enhances the curiosity, motivation, and meaningful learning of students in Geosciences. The present study used a convenient sample of students (n=18) from a K7 class (range 12-14 age) who attended a Portuguese public school. The storytelling strategy was framed in an interdisciplinary approach in discussing subjects "A Woman in Science" and "Sustainable Development" within Natural Sciences and Education for Citizenship. Playful-sensory storytelling - "A story with Science", was presented to the students resorting to an audio-visual video. The constructed narrative challenged the students' imagination in a "Journey through Time and Earth". Mary Anning, the renowned "palaeontologist fossil hunter", traced the common thread that captivated the interest and engagement of pupils, revealing her work and reflection on the sustainable development of humanity. The assessment instrument applied at the end of the intervention was a questionnaire consisting of three open-ended questions. The content analysis of the three questions showed that the storytelling contributed to meaningful learning, motivation, and curiosity of students in learning Geosciences. Through the teacher's naturalistic observation, the involvement and participation of students in discussions were active. The study allows us to conclude that storytelling is a strategy to be considered in teaching Geosciences to promote the engagement and commitment of pupils.

*Keywords: Innovation, middle school, motivational complement, palaeontology, playful-sensory activity.*

## 1. Introduction

Citizen involvement in social and political issues is now more than a concern, an urgent need of modern societies, and a particular challenge for young people facing uncertainty and adversity. New generations need to be prepared to understand emerging global problems and act on them consciously and resiliently (Ortega & Miravalles, 2021), in line with the common vision of sustainable development for humankind expressed in the United Nations Agenda 2030. Therefore, it is essential that human beings recognise that life on Earth depends on the responsible management of the Earth system. The Earth Sciences provide citizens with knowledge, the capacity to question and to intervene responsibly in important issues of their daily lives (Orion, Shankar, Greco & Berenguer, 2020). In this regard, Earth science education has a fundamental role in promoting education for sustainability (Vasconcelos & Orion, 2021). Education can change the world (Ortega & Miravalles, 2021). It influences our reasoning and is preponderant in developing competencies (Bueno, 2017). In this context, interdisciplinarity is important as it can increase the ability to understand the complex challenges that the world faces today (Eagan et al., 2002), addressing the social, environmental and economic issues essential in education for sustainability (Vasconcelos & Orion, 2021). Studies show that teachers who implement new educational resources and strategies can lead to good practices in the field of sustainability, fostering the development of students as social innovators (Ryan & Tilbury, 2013).

One of the overall challenges of today's school is to develop meaningful and engaging learning experiences that are distinct from traditional teaching (Bromberg et al., 2013). Education is a highly personalized activity (Ivie, 2021), so it is up to teachers to be creative and innovative, contributing to improving the teaching and learning processes. They must be able to implement diversified strategies and resources that motivate and actively involve the students in their meaningful learning. Studies reveal that storytelling is an effective, meaningful, enjoyable, and creative way to enhance teaching and promote learning (Wang & Zhan, 2010). According to Serrat (2008), "Storytelling is the vivid description of ideas, beliefs, personal experiences, and life lessons through stories or narratives that evoke powerful emotions and insights" (p.1). Telling stories makes us human, this is how we understand the world and our experiences. Landrum and collaborators (2019) refer that storytelling is culturally universal and probably the oldest teaching method. As a teaching strategy, it makes education more interesting and enhances students' learning (Rowcliffe, 2004) and engagement in this process (Sheafer, 2017). Moreover, it can provide enriching learning moments conducive to active student participation and the construction of memorable knowledge (Rowcliffe, 2004). Good teachers tell well-known stories, but great teachers tell their own creative stories (Ortega & Miravalles, 2021). Besides sharing knowledge and potentiating the reflection of societal issues, storytelling arouses emotions, creating an emotional connection between the audience and the theme portrayed (Fischer et al., 2022). Thus, storytelling is a powerful strategy in education to explain complex subjects, which should not be neglected but promoted in science education (Van Gils, 2005), contributing to motivating and arousing students' curiosity (Sadik, 2008), particularly for the Geosciences. Furthermore, it is considered an effective pedagogical strategy for developing language skills (Isbell et al., 2004) and stimulating children's imagination (Egan, 1986). In a technological society, the art of storytelling also resorts to the digital using multimedia tools to create and present stories (Gürsoy, 2021), integrating written, visual and sound aspects that hold the student's attention and maintain their constant interest and curiosity. Digital storytelling constitutes an innovative pedagogical approach that contributes to students' deep and meaningful learning (Smeda et al., 2014).

It should be noted that the perspective of Science/Technology/Society in the science curriculum contributes to the student's scientific literacy through the development of critical thinking skills and knowledge mobilization (Autieri et al., 2016), aiming to make students aware of and value science and technology in their daily lives. The study of this author also mentions that these competencies allow for thoughtful and responsible decision-making in solving everyday problems.

## 2. Design

Related to the commemoration of International Women's Day, celebrated on March 8, 2022, a pedagogical action was developed in K7 class attending a public school in northern Portugal, which resulted in this research. In this context, with the focus on developing the students' essential learning in the subject of Natural Sciences, an interdisciplinary intervention was carried out in articulation with the curricular component of Education for Citizenship. As a strategic action for the teaching of Geosciences, playful-sensory storytelling was used in the discussion of the themes "A Woman in Science" and "Sustainable Development". The intervention took place in a 50 min class, in each of the taught areas, for a total of 100 min. The audio-visual video's content was presented and discussed from the storytelling called "A story with Science", designed by the second author of this paper (Figure 1a). The sensory narrative challenges the student's imagination on a "Journey through Time and Earth", in an encounter starring the characters Mrs Earth, our planet, and Mary Anning (1799-1847), the renowned English "palaeontologist fossil hunter", whose life story is the main thread of the narrative that keeps the viewer's and listener's interest, motivation, and involvement constant.

*Figure 1. Original resources of the pedagogical intervention.*

In the elaborated storytelling, the character of Mary Anning was also personified in a doll, whose characterization reproduces and carries the recognized "palaeontologist fossil hunter" to the real classroom scenario. The idea was to create a motivational complement and reinforce the students' empathy with this woman (Figure 1b). In addition to generating reflection on the action of man on Earth and raising awareness of the role of women in science, the narrative also aims to put the student in front of concepts and dynamic processes of the planet, starting with the understanding of geological time, through which the whole story unfolds. The presentation took place in the Education for Citizenship class, where the discussion was guided from the perspective of recognizing the impact of human beings on ecosystems and raising awareness for changing individual behaviours, essential for sustainable development. This discussion was extended to the Natural Sciences class, now focused on aspects related to Geosciences, namely Geology and Palaeontology. Following the discussion about storytelling, each student was given a flyer about Mary Anning (Figure 1c), whose description reinforced the message conveyed and the scientific knowledge that served as a motto for the subtheme, *The Earth tells its history*, related to Palaeontology. Simultaneously, a sensorial experience of tasting chocolate bonbons shaped like ammonite (Figure 1d), alluding to the marine fossils studied by the "palaeontologist", was promoted. Figure 2 systematises the interdisciplinary approach in the intervention made, designed for 100 min.

*Figure 2. Summary to an interdisciplinary approach in Geosciences Education.*
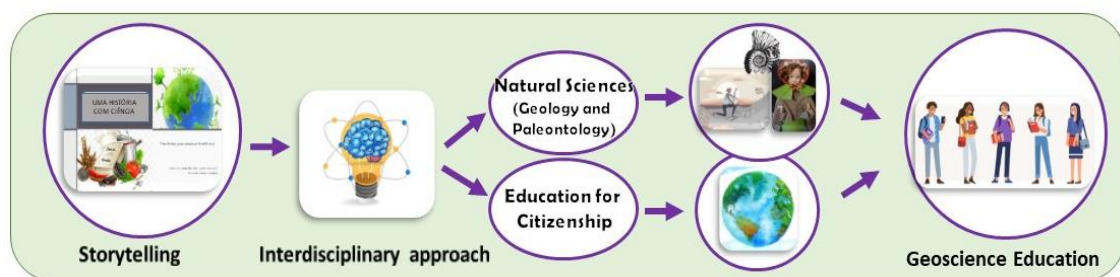


## 3. Objectives

This study that valued the interdisciplinary approach aimed to verify whether storytelling increases students' curiosity, motivation and meaningful learning in Geosciences.

## 4. Methods

The study used the technique of participant observation, being the first author of this work the teacher-researcher. As a facilitating learning agent, she had a real involvement in the research scenario, guiding the discussion after presenting the storytelling. This descriptive study used an assessment instrument applied at the end of the intervention, a non-evaluative questionnaire with three open-ended questions (one cognitive and two opinions) for the data collection, lasting approximately 10 minutes. The questions in the questionnaire were supported by the literature review and were directed to the teaching strategy used. They refer to the student's understanding of the message conveyed in the storytelling, their curiosity about the story presented, and how important the storytelling strategy is in learning Geosciences. Their reliability and validation were ensured. It should be noted that the instrument was validated by two experts in Science Education who helped in the content analysis and, after a meeting, reached a consensus. This analysis was performed using NVIVO software. After a careful content analysis, which allowed their categorization and codification, the researchers grouped them into the respective categories in Table 1.

The convenience sample consisted of 18 students from a K7 class (range 12-14 age) attending a public school in northern Portugal. Participants were informed about the study's goal, and all were volunteers, guaranteed anonymity and confidentiality in the data processing. All the data collected was subject to analysis, following the international ethical standards extended to the social sciences research.

*Table 1. Analytical categorization of questions (A, B and C) and answers related to the questionnaire applied.*

| Question categories | Answer categories | F(n)=18 |
|---|---|---|
| A. Message conveyed through the storytelling | Identifies, understands and discusses the message. | (10; 55,5%) |
| | Only identifies and understands the message. | (7; 38,9%) |
| | Doesn´t identifies the message | (1; 5,6%) |
| B. Curiosity about Women in Science | Increases curiosity. | (16; 88,9%) |
| | Doesn´t increases curiosity. | (2; 11,1%) |
| C. Importance of storytelling in motivating Geoscience learning | Relevant. | (17; 94,4%) |
| | Questionable relevance. | (1; 5,6%) |

## 5. Discussion

The results shown in table 1 reveal that a significant number of students (n=10; 55.5%) were able to identify, understand and discuss the message conveyed in the storytelling, and some students, despite identifying and understanding it, were unable to discuss it. Only 1 student (5.6%) could not identify the message of the storytelling. The data analysis is in line with Rowcliffe´s (2004) study. Regarding the character of Mary Anning portrayed in the story, it is significant the number of students (n=16; 88.9%) that demonstrated to have increased curiosity about the work of this woman. Only 2 students (11.1%) showed that they had not become curious, being enough knowledge obtained in the storytelling. The literature corroborates the results obtained in the speciality (Fischer et al., 2022). About the importance of this strategy in the motivation for learning Geosciences, the results point to its relevance in most of the students (n=17; 94.4%), being questionable in the minority (n=1; 5.6%), such as reiterated by the speciality literature (Sadik, 2008).

The content analysis of the three questions shows that storytelling contributes to meaningful learning, motivation, and curiosity of students in learning Geosciences. Through the teacher's naturalistic observation, the involvement and participation of students in discussions were active. Since it was a group of students who usually showed passivity and some lack of autonomy, the spontaneity revealed in the ability to intervene and critical thinking should be highlighted. Thus, the presented intervention proved particularly relevant for the students as an innovative strategy and significant learning (Smeda et al., 2014).

## 6. Conclusions

This research was conducted on a convenience sample, so the results are only indicative and cannot be generalised. The research results suggest that as an interdisciplinary strategy, storytelling favours and enriches the approach to scientific knowledge and increases motivation and curiosity. Therefore, an innovative teaching strategy which enhances the students´ meaningful learning. The study also allows us to conclude that storytelling is a strategy to be considered in teaching Geosciences to promote the engagement and commitment of pupils.

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# A SYSTEMATIC LITERATURE REVIEW ON MULTICULTURAL MENTORING RESEARCH FOR STUDENTS WITH MIGRANT BACKGROUNDS

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## Abstract

This study aims to systematically analyze research related to multicultural mentoring in Korea conducted for the purpose of supporting students from migrant backgrounds and present development directions based on this. For this study, basic information on multicultural mentoring research was identified, and the main topics and characteristics of the research were analyzed. As a result of reviewing the abstract and text of the journal published in the web database by January 2023, 28 documents were finally selected. The collected papers were analyzed in four categories: research trend analysis, subject-specific characteristics, effects, and activation factor analysis. The results of the study are as follows. First, research related to multicultural mentoring began in 2009 and is steadily progressing, but it is on the decline. Qualitative research is the most common, and research materials were accumulated in the order of program case analysis and quantitative research. Second, the research topic is about the experiences of participants such as mentors, mentees, and managers, and growth, change, and competency development in multicultural mentoring were dealt with. The effect of multicultural mentoring shows positive results in the improvement of mentee's achievement and confidence, and the multicultural attitude and attitude of attitude and attitude. As a limitation of multicultural mentoring, the method focused on subject learning was mentioned. Third, supervision provision for mentors, mentor education, and systematic support systems were proposed as the activation requirements for multicultural mentoring. Based on these research results, the direction for multicultural mentoring to be developed as an educational activity was presented.

***Keywords:*** *Multicultural mentoring, mentoring, research trends, systematic literature review.*

## 1. Introduction

In contrast to the decrease in the total number of students and the decrease in the number of non-multicultural students due to the decrease in the school-age population, the number of children from international marriages and foreign-born foreign families continues to increase, students with migrant backgrounds are multicultural. They have become an important member of society. Accordingly, educational interest in students with migrant backgrounds is being promoted in close connection with Korea's population management policy, and the contents and scope of education policy are also continuously expanding. The government is conducting multicultural mentoring for the purpose of supporting multicultural students' adaptation to school and stable growth. Multicultural mentoring is a program that helps multicultural students improve their basic academic skills by supporting Korean language and subject learning in the form of mentoring. It is becoming an important task to identify the causes of problems related to multicultural students' educational school life and daily life, including multicultural mentoring, and to seek systematic support measures to solve them.

The purpose of this study is to analyze studies related to multicultural mentoring through a systematic literature review method. And through this, it is to grasp the overall properties and contents of multicultural mentoring research and build a comprehensive understanding of the internal and external environment that affects multicultural mentoring. The contents of the research that this study focuses on through the method of systematic literature review are as follows.

1. what are the research trends of multicultural mentoring shown in the research target literature?
2. what are the characteristics of each Topic in multicultural mentoring Study?
3. what are the effects of multicultural mentoring activities?
4. what factors affect the activation of multicultural mentoring?

## 2. Review of previous studies

Research on multicultural mentoring has been conducted steadily since 2009. Previous studies have analyzed mentor and mentee experiences mentoring participants' multicultural awareness and multicultural sensitivity, self-esteem, and relationships with academic achievement (Kim Min-jeong, 2013; Yun Ye-rin, 2020), and mentoring program application cases (Park Dong-seong, 2021; Cho Seong-sim, 2014). In addition, studies on the effect of mentoring experience on career and career preparation activities are continuously being conducted, focusing on teachers, preservice teachers, and nursing students (Park Hye-sook & Lee Gyeong-ha, 2017; Seo Mi-ok, 2010). In this way, along with interest in students with migrant backgrounds, not a few research results on multicultural mentoring have been accumulated. However, studies from a comprehensive perspective on how previous studies have been developed and what results are being presented are lacking. In addition, many studies focus on individual cases in which multicultural mentoring is applied, so a systematic and comprehensive analysis, including quantitative and qualitative research, is required.

## 3. Methods

Systematic literature review is a research method that goes beyond the traditional method of looking at trends and trends in research, and selects, evaluates, and synthesizes relevant literature to find specific answers to research questions (Polanin, Maynard, & Dell, 2017). In this study, data were collected and reviewed for a systematic literature review between 2022.12-2023.1, and the final studies collected over February and March 2023 were analyzed.

### 3.1. Data collection

The research stage of literature analysis in this study consisted of three stages: planning, execution, and analysis, based on the stage of systematic literature analysis defined by Khan et al. (2001). First, in the planning stage, research articles were searched using research purpose setting, academic research information service (RISS) and journal citation index (KCI), and related studies were selected by combining search results. The publication period of the papers analyzed was limited to January 2023 from 2009. The process of inclusion and exclusion of literature selection is shown in [Figure 1].

*Figure 1. Literature search flow chart.*
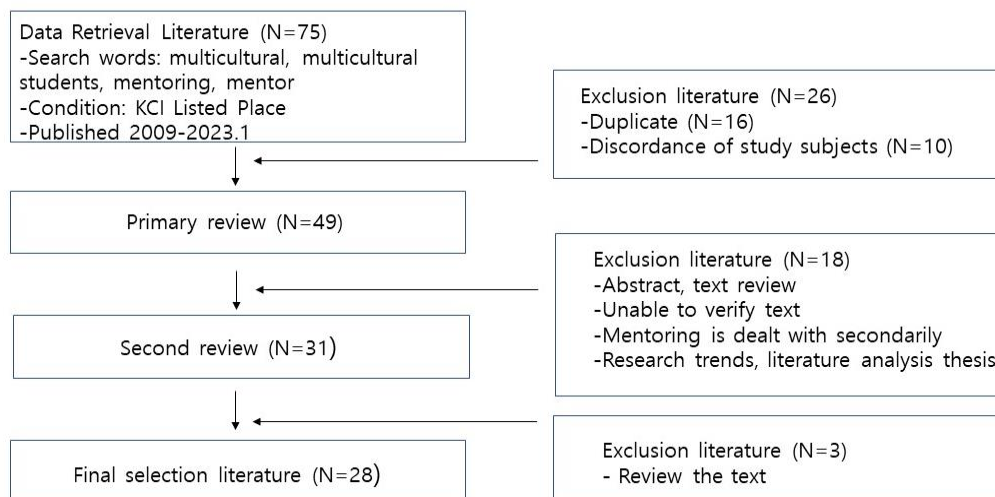


### 3.2. Data analysis

For data analysis, research trend analysis and systematic literature review were performed for the 28 finally selected articles. The analysis of research trends focused on the number of papers published by year, analysis cases, data collection and research methods, and research participant information. Next, a systematic literature review on multicultural mentoring was conducted by dividing it into characteristics, effects, and factors of multicultural mentoring according to research questions.

# 4. Results

## 4.1. Analysis of research trends

Academic papers on multicultural mentoring began to be published in 2009, and 5 papers were actively researched in 2014 and 2016, but recently the number has decreased to 1-2 papers every year. As for the specific cases of multicultural mentoring, 25 studies were conducted centering on the case of multicultural mentoring programs in universities, and the majority were conducted. In addition, 2 cases of operation by civic groups and local organizations were conducted, and mentoring conducted as part of liberal arts classes at universities There was one study about it.

## 4.2. Results of systematic literature review

**4.2.1. Topic features.** The characteristics of each subject are as follows. First, it is a study on the growth of mentors who participated in multicultural mentoring. Through participation in multicultural mentoring, mentors can positively recognize multicultural society and develop an open attitude toward cultural diversity (Woo Hee-sook, 2010). It also recognizes cultural differences and has an opportunity to reflect on one's attitudes and beliefs. In addition, negative preconceptions and stereotypes about multiculturalism are resolved, and reflective thinking can be cultivated through direct contact (Kim Young-soon et al., 2014; Kim Ki-young, 2014). Second, it is a study on the development of mentors' capabilities. In the mentoring implementation process, reorganization of the curriculum and search for various methods are linked to the personal growth of mentors (Kim Ki-young, 2014). Park Mi-sook (2017) needs to cultivate competencies at the learning, psychological, social, and cultural levels, and to this end, mentor education, time for self-reflection, and periodic counseling support for mentors were discussed. Third, it is a study on the analysis of operating cases and improvement measures of universities and institutions. As a result of the case analysis, it was found that since mentoring is affected by the characteristics of the region, it is necessary to prepare support measures in consideration of the characteristics and consumers of the region. In addition, improvement measures to prevent mentors from giving up halfway were mentioned as important. Fourth, the limitations and limitations of multicultural mentoring were addressed. It was commonly pointed out that multicultural mentoring was concentrated on subject guidance, so it could not be expanded to various activities, including cultural experiences, and was not recognized compared to subject guidance. These limitations show that it is necessary to break away from the view of understanding multicultural mentoring as a learning achievement tool and change it into practical activities that meet the needs of consumers.

**4.2.2. Effects of multicultural mentoring.** Among the five papers that studied the effects of multicultural mentoring, the most revealed is the growth of mentees and the improvement of mentor awareness. Kim Min-jung (2013) revealed that the online and offline convergence application has a positive effect on mentee achievement, confidence, and peer relationship improvement, while Yun Ye-rin and Oh Bum-ho (2020) showed remarkable improvement in English performance of mentee students who have participated for more than two years. Choi Jin-young (2011) revealed significant positive changes in terms of multicultural attitude, multicultural efficacy, and teaching ability as a study on the effectiveness of pre-service teachers' participation experiences. However, he pointed out that there is a limit to understanding multicultural education because mentoring takes place one-on-one, and suggested that it is necessary to develop and apply a multicultural teacher curriculum. There is also a study on the change in multicultural awareness of college students. Lee Su-jeong (2014) revealed that the experience of interacting with a mentee fosters a sense of responsibility and leadership in a mentor, and improves attitudes and perceptions toward a multicultural society. Taken together, it can be said that multicultural mentoring leads to mutual growth between the mentee and the mentor, and has an educational meaning that fosters values and attitudes in a multicultural society.

**4.2.3. Factors that promote multicultural mentoring.** Mentor education is also a factor in revitalization. Mentor education is suggested to enhance understanding of multicultural mentoring and strengthen the individual competencies of mentors. Lee Sung-soon (2014) suggested that multicultural education needs to be applied to mentors, mentees, mentees' parents, and teachers in charge. Park Dong-sung (2021) mentioned training mentors to have a sense of responsibility and mission as an important factor, and Lim Ji-hye and Park Bong-Su (2015) emphasized providing opportunities for communication between mentors by including cooperation and support with fellow mentors in educational elements. Finally, the support of the systematic support system includes the participation and interest of universities, schools, and parents. Kim Eun-hui and Kim Jin-sun (2022) revealed that mentors are suffering from psychological burdens when the environment for multicultural mentoring is unstable

and mentioned the close cooperation between school managers and parents. Lee Chae-yeon (2021) also sought to establish a continuous and effective mentoring system through pre-matching and follow-up management to overcome the mentoring brokerage function. It shows that the above activation factors do not consist solely of the personal relationship between the mentor and the mentee, but also include the public characteristics performed within the system of the institution to which the mentor and the mentee belong. For stable operation, it is important to support the development of mentors' personal competencies and to provide a support system suitable for multicultural mentoring sites.

## 4. Conclusion

This study looked at research trends on multicultural mentoring and analyzed it based on characteristics, effects, and activation factors using a systematic literature review method. The main research results are as follows.

First, research on multicultural mentoring began in 2009 and has been steadily receiving academic attention, but the number is decreasing. Focusing on the study of university operation cases, qualitative research on university students' experiences and program operation cases were conducted. However, richer discussions can be made if the range of subjects and application cases is expanded. Second, the subject-specific characteristics of analysis papers are as follows. As for the growth experience of mentors, the process and results of cultivating knowledge and attitudes about multicultural society through multicultural mentoring were analyzed. As for the development of mentor competency, the need to develop mentor competency was emphasized because it is linked to the success of multicultural mentoring. The papers analyzing operation cases by each institution specifically suggested the areas to be practically changed by suggesting program improvement plans. And there are only a few papers on effect analysis, which deal with changes in academic achievement of mentees and multicultural sensitivity of mentors. Third, the effect of multicultural mentoring was found to improve the mentee's academic achievement and self-confidence. In addition, it can be said that it has an educational meaning that fosters the value and attitude of a mentor in a multicultural society. Through this, systematic support and operation are needed to increase the educational effect of multicultural mentoring. Fourth, the activation factor of multicultural mentoring was presented as supervision and mentor education to develop and support mentor competencies. In addition, it was found that it was necessary to establish a systematic system and apply it to go beyond the level of subject guidance.

As analyzed in this study, there are parts that multicultural mentoring needs to be modified and supplemented by reflecting the needs of activities, participants, and fields that have various educational meanings. This study is meaningful in that it systematically analyzed domestic papers on multicultural mentoring and provided the basis for educational support and follow-up research based on this.

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# DIVEMIX: PERCEPTIONS OF MIXED REALITY IN SECONDARY EDUCATION IN SPAIN

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## Abstract

The growth and rapid development of virtual reality in the last decade has made its inclusion in classrooms of any stage of education to become a latent and patent reality. With the passing of time, virtual reality resulted in the creation of an augmented reality, which further advanced the immersive learning proposed by its predecessor. With technological growth, further advances in this technology were made, to what is known today as mixed reality, yet another step in the immersion of learning. The DIVEMIX project intends to bring to the table the transfer of the creation of materials based on this technology, to further develop the curriculum of the secondary education stage. Focusing our attention on the use of MR in the context of Biology and Geology teaching, and considering the current regulations in Spain as a frame of reference and starting point, we present the perceptions of pre-service secondary education teachers on the usability of this resource for teaching class content. The main result obtained was the lack of training and resources to be able to implement innovative actions in the classroom with MR. It was also determined that gender was not an element that determined the differences associated with the possession or not of knowledge that would allow teachers to use it in the classroom.

*Keywords: Mixed reality, teacher training, pre-service teachers, secondary education.*

## 1. Introduction

There is an imperative need to make advances in the field of education, as indicated in official documents from many countries.

Focusing on the so-called emergent technologies (Becker et al., 2018; Brown et al., 2020; Pelletier et al., 2021), and more specifically in virtual reality (from here on VR), augmented reality (from here on AR), and mixed reality (from here on MR), we corroborate that their inclusion in classrooms at different stages of education will not only be contingent upon the availability of the resources themselves, but also to the beliefs and experiences of the educators who will determine their use in the development of the curricular content (Black, et al., 2016; Bower, DeWitt & Lai, 2020; Tzima, Styliaras & Bassounas, 2019).

MR is another step in the area of emerging technology, given that it is the combination of VR and AR. Through the use of holograms in a virtual environment (Kumar et al, 2020; Magallanes et al., 2021), users, in this case students, can participate in the development of content, as shown in the study conducted by Palomo (2020). MR "refers to the superimposing of virtual objects on top of a real environment, which allows the user to interact in the real world, and at the same, with virtual images" (Encarnación de Jesús & Ayala, 2021, p. 3). Therefore, it is the blend of both realities, so that the immersion achieved is deeper. Ultimately, the perception of the user changes (Leonard & Fitzgerald, 2018).

Rosati-Peterson, Piro, Straub and O'Callaghan (2021) state that being able to interact with avatars allows students to put into practice strategies and skills that are without consequences in this scenario, beyond what is learned after making a mistake, so that the pressure of not making a mistake is lessened or almost null. Thus, the use of holograms in education environments provides students with a "hands-on" scenario that is safe (Kumar et al., 2020).

## 2. Method

The present work, under the auspices of the R+D+I Design, Implementation, and Evaluation of Mixed Reality materials for learning environments (PID2019-108933GB-I00), is framed within a quantitative study with a descriptive and correlational design, with an ex post facto method (Jorrin et al, 2021).

The starting objective was to determine the knowledge possessed by Spanish secondary school teachers about the use of Mixed Reality in this educational stage. The following working hypothesis were posited from this general objective:

1. Female secondary school teachers possess more knowledge that the male teachers about MR.
2. Geology teachers have more knowledge on the use of MR in the secondary school stage.
3. Younger teachers have more knowledge on the use of MR in the secondary school stage.

### 2.1. Procedure

The data was collected through the use of the online questionnaire during academic year 2021-2022, with the use of the Google Forms platform.

### 2.2. Instrument

The instrument, designed ad hoc, was framed within a more extensive one from the project cited above. In this sense, the intention was to study the dimension (or factors) that referred to knowledge and use of MR in secondary education environments, with this dimension (or factors) composed by two blocks. The first of these blocks encompassed the demographic variables: age, gender, subject taught, and years of professional experience. The second block was composed by 14 items that referred to the knowledge and use of MR in the secondary school stage. A Likert-type response scale was utilized, where 1 indicated complete disagreement, and 5 complete agreements.

The Cronbach's alpha test of the entire instrument provided a value of .955, which is considered very high. In order to verify if the elimination of a specific item would change the reliability of the instrument, an item-by-item discrimination was performed, which resulted in a range of alpha values between .950 and .956, thus confirming the reliability of the instrument (Ventura-León & Caycho-Rodríguez, 2017).

To verify the validity of the instrument, an Exploratory Factor Analysis was performed, which distributed the items into 1 factor, and which explained 65.367% of the variance. The extraction method utilized was unweighted least squares (ULS), with a Kaiser normalization with oblimin rotation. The values obtained for the Kaiser-Meyer-Olkin (KMO) test was .845, and for the Bartlett's sphericity test ($X^2$ (91) = 335.866 with a significance at p<0.000). Thus, considering these parameters, the factorial structure was accepted (Ferrando & Anguiano-Carrasco, 2010). The reliability test was performed again, with the same initial values obtained.

*Table 1. Exploratory factor analysis.*

| | Factors | |
|---|---|---|
| | 1 | 2 |
| I know about MR dioramas | .897 | -.070 |
| I know how to use the movement controllers for using MR | .882 | -.005 |
| I know about the holographic devices for using MR | .867 | -.225 |
| I know the safety, privacy, social, ethical, and moral implications of the use of MR technology | .866 | -.099 |
| I know MR portals | .861 | -.087 |
| I know about MR holograms | .858 | .047 |
| I know how to use immersive devices (goggles/headset) for using MR | .842 | .080 |
| I know the computer characteristics needed for using MR | .837 | -.231 |
| I know the terminology specific for the MR environment | .834 | -.021 |
| I am able to promote learning through the use of MR | .795 | .037 |
| I know the technological support necessary for the use of MR in an educational environment | .783 | .121 |
| I am familiarized with the variety of applications and programs available for creating virtual spaces in MR | .773 | .464 |
| I know about immersive devices (goggles/headsets) necessary for the use of MR | .592 | .578 |
| I know how to create virtual spaces for their use in the subject(s) I teach | .541 | -.552 |

### 2.3. Sample

The starting population was composed by Geology and Biology teachers from the province of Cordoba (Spain), for a total sample of 59 individuals. The sample was obtained through the use of a random, convenience method. Of these, 49.2% taught Geology, and 50.8% Biology.

The distribution of the participants as a function of gender showed that 42.4% were men and 55.9% women, with a mean age of 31.39 (SD = 9.780) (see figure 1).

*Figure 1. Distribution of the sample according to age.*
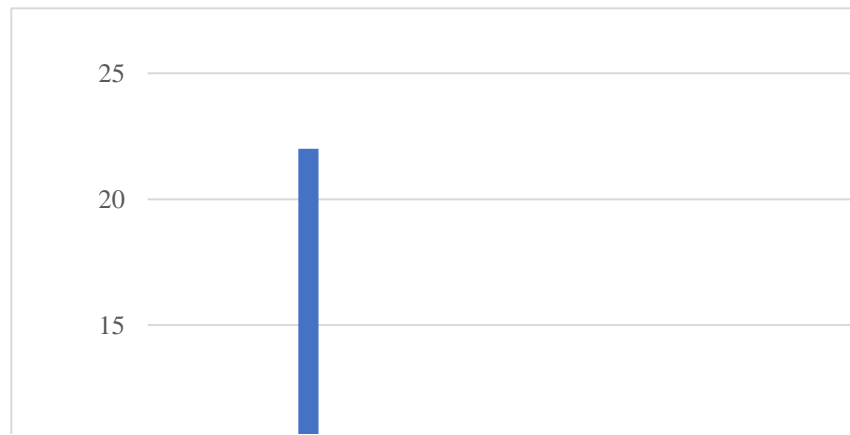


## 3. Results

An initial overview of the results showed that the Biology and Geology teachers who participated in the study had a great lack of knowledge about mixed reality and associated aspects.

*Table 2. Descriptive study.*

|  | M. | SD |
|---|---|---|
| I am familiarized with the variety of applications and programs available for creating virtual spaces in MR | 2.37 | 1.230 |
| I know the technological support necessary for the use of MR in an educational environment | 2.27 | 1.172 |
| I know how to create virtual spaces for their use in the subject(s) I teach | 2.54 | 1.317 |
| I know about immersive devices (goggles/headsets) necessary for the use of MR | 2.51 | 1.135 |
| I know about the holographic devices for using MR | 1.92 | .896 |
| I know how to use immersive devices (goggles/headset) for using MR | 2.12 | .984 |
| I know how to use the movement controllers for using MR | 1.90 | .941 |
| I know about MR portals | 1.93 | .980 |
| I know about MR dioramas | 1.83 | .968 |
| I know about MR holograms | 1.85 | .979 |
| I know the computer characteristics needed for using MR | 1.95 | 1.074 |
| I know the safety, privacy, social, ethical, and moral implications of the use of MR technology | 2.24 | 1.179 |
| I know the terminology specific for the MR environment | 2.03 | 1.159 |
| I am able to promote learning through the use of MR | 2.59 | 1.275 |

A Student's t test for independent samples was conducted to corroborate if hypothesis 1, which referred to gender, could be accepted or not. The results did not show any differences in this variable, so it was rejected.

Likewise, the same test was performed to determine if there were differences according to the subject taught. The results showed that it could be partially accepted in 8 out of the 14 items that shaped the questionnaire (see table 3).

*Table 3. Student's t-test according to the subject taught.*

|  | Subject | N | M. | SD | p. | t. |
|---|---|---|---|---|---|---|
| I know about immersive devices (goggles/headsets) necessary for the use of MR | Geology | 29 | 2.86 | 1.246 | .031 | 2.459 |
|  | Biology | 30 | 2.17 | .913 |  |  |
| I know how to use immersive devices (goggles/headset) for using MR | Geology | 29 | 2.45 | 1.088 | .022 | 2.659 |
|  | Biology | 30 | 1.80 | .761 |  |  |
| I know about MR portals | Geology | 29 | 2.31 | 1.105 | .008 | 3.126 |
|  | Biology | 30 | 1.57 | .679 |  |  |
| I know about MR dioramas | Geology | 29 | 2.28 | 1.131 | .01 | 3873 |
|  | Biology | 30 | 1.40 | .498 |  |  |
| I know about MR holograms | Geology | 29 | 2.21 | 1.114 | .020 | 2.950 |
|  | Biology | 30 | 1.50 | .682 |  |  |
| I know the computer characteristics needed for using MR | Geology | 29 | 2.45 | 1.242 | .000 | 3.922 |
|  | Biology | 30 | 1.47 | .571 |  |  |
| I know the safety, privacy, social, ethical, and moral implications of the use of MR technology | Geology | 29 | 2.79 | 1.320 | .000 | 3.991 |
|  | Biology | 30 | 1.70 | .702 |  |  |
| I know the terminology specific for the MR environment | Geology | 29 | 2.55 | 1.325 | .000 | 3.730 |
|  | Biology | 30 | 1.53 | .681 |  |  |

Lastly, and to provide an answer to the third hypothesis (The younger teachers have greater knowledge on the use of MR in the secondary school stage), an ANOVA was performed to compare the means. The results indicated the non-existence of differences between the teachers according to the variable age.

## 4. Discussion and conclusions

Making advances in knowledge in general, and in the area of education in particular, implies being in a constant process or learning and re-training on new knowledge, methodologies, and processes, etc.

The teachers who took part in the present study were mainly unaware about the basic computer characteristics needed for using MR, as well as the dioramas, holograms, and MR generator portals, just as in the work by Marín-Díaz and Sampedro-Requena (2023)

Just as in the works by Bursztyn et al. (2017) and in contrast to the work by Marín, Sampedro and Vega (2023), as of today, the variable gender did not lead to differences in the knowledge of emergent technologies, when referring to teachers who teach Biology and Geology. Also, it must be indicated that age did not result in differences in the possession of specific knowledge for the use of MR (Marín-Díaz & Sampedro-Requena, 2023)

It can be concluded that training is needed on the use of MR for Secondary Education teachers in general, and Biology and Geology in particular, for them to increase their knowledge that will allow them to include this technology as a resource in the classroom.

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# MOOCs CREATION AND MANAGEMENT METHODS: EXPLORING THE DESIGN APPROACH OF A MOOC ON EUROPEAN HISTORY AND CULTURE

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## Abstract

Since their first appearance and diffusion, MOOCs have steadily been integrated into Higher Education programs as part of either blended learning or fully distance learning courses. In this context, MOOC's pedagogical approach, development, and planning strategies have often been central to discussions among MOOC creators and researchers. Not only the setting up of a targeted educational method is needed to allow learners to reach their learning goals and make their distance learning experience valuable but also attention to the collaboration between educators and learning designers during the content creation process represents a pivotal -although sometimes contrasting- element during the MOOC's production process. Recently the KU Leuven's group of European Studies was involved in the development of three content-wise interlinked MOOCs created with the primary goal of providing students with the right tools and knowledge to enhance their expertise in different fields of European Studies. Built on the long-standing KU Leuven's experience in developing humanities-oriented MOOCs, this set of interlinked online courses represented one of the very first KU Leuven's efforts in delivering online courses that content-wise aim at supporting each other. Given the high involvement of educators, it also represents a valuable research case study due to the considerable effort in terms of design planning and coordination/management. Using as a primary example the results of the MOOC on European History, Society, and Culture, created with the support of the KU Leuven Faculty of Arts and included in the aforementioned educational framework, this paper aims at discussing the choices and challenges behind its development, on the one hand. On the other hand, by highlighting the management and learning design strategies used to support the creation of the MOOC and to ensure its pedagogical alignment within the integrated three MOOCs program, it intends to offer new perspectives in the context of content creation management and instructors/educators' coordination, highlighting the dynamics of the relationship between the learning designers and educators.

*Keywords: Massive Online Open Course (MOOC), e-teaching, teachers, learning designers, education.*

## 1. Introduction

Over the last decade and especially due to a further need and diffusion of distance education methods during the COVID-19 pandemic, Massive Online Open Courses (MOOCs) prompted contrasting debates in relation to elements such as the enhancement of learners' engagement through the application of effective pedagogical methodologies, or the impact of education technologies on Higher Education distant learning programs (Zhu et al., 2018). Nevertheless, minor attention has been given to the "behind the scene" of online courses' management and design in the academic sector, and particularly to the main characters in this field: the educators, here intended as those university academics involved with MOOC development projects, and the learning designers/technologist (White & White, 2016). Indeed, despite their significant impact on the development and design of online courses at a Higher Education level, the role of learning designers in terms of coordination, management, and planning as well as their relationship with the educators started being an object of investigation in the recent past (White & White, 2016; Liyanagunawardena et al., 2013; Veletsianos & Shepherdson, 2016).

Research conducted in the last decade has shown, in fact, how in this context a systematic, teamwork approach, rather than an individualist one, appears to have a stronger and more effective impact on the quality of distance learning products (White, White, & Borthwick, 2020; Seeto & Herrington 2006). In particular, learning designers have been indicated as *bridging, blended* figures (Keppell, 2007) between the academic community and those external departments directly related to the educational technology sector (such as hosting platforms, multimedia experts, copyright advisors, academic textbook

editors, etc.) (White, White, & Borthwick, 2020). Significant, in this context, appears to be also the content creation approach, and the role of the learning designers not only in supporting the inclusion of online courses in the academic contexts (White & White, & Borthwick, 2020) but also in guiding educators in becoming familiar with the methodologies of the content design creation, which is often made further complicated by scarcely user-friendly distant learning platforms (Weller, 2015). Furthermore, all the above-listed elements need to be also put into relation to the obstacles and complexities, in terms of management, collaboration, and co-creation, that the aforementioned *bridging* qualities of the learning technologists can entail (White, White, & Borthwick, 2020).

Zooming on aspects related to the learning designers and educators relationship, this research aims to share and discuss the design and content creation approaches and methodologies applied within the framework of the joint MOOCs development initiative carried on by three different KU Leuven faculties. Also, this investigation intends to fit into the debate revolving around management and coordination best practices in the context of Higher Education distance learning projects.

## 2. Research framework

In 2021, the group of European Studies at KU Leuven committed to the development of a joint educational project which involved three faculties: the Faculty of Arts, the Faculty of Social Sciences and the Faculty of Law. This initiative had as a main goal the development of three combined MOOCs addressed either to current or future students aspiring at joining the KU Leuven Master's program in European Studies or to learners interested in expanding their knowledge in one of the research domains explored and offered by the distant learning courses. Besides highlighting very different areas of expertise within the European Studies domain, the three MOOCs, hosted on the KULeuven's edX platform - KULeuvenX[1] - aimed at being bonded with each other and developed by applying the same educational framework and assessment methods as well as by producing an overarching, shared visual identity. Despite the extensive KU Leuven's experience in producing humanities-oriented MOOCs, this represented one of the very first sets of combined distant learning courses entirely developed on the basis of internal collaboration among the faculties.

From an organizational point of view, the MOOC implementation structure was mainly based on the continuous cooperation between the contributors, constituted in this case by academic personnel from each of the three faculties represented in the project, and three main learning designers (further supported during the development process by assistants or students). Besides ensuring pedagogical alignment and harmonization across the MOOCs, each of them was responsible for the implementation and coordination of their respective distant learning environment.

### 2.1. The case study: a MOOC on European History, Society and Culture

The MOOC on European History, Society and Culture, which is used as the main case study in the context of this research, represents one of the results of this academic project. From a conceptual point of view, this particular online course aimed at providing an in-depth analysis of European history, society and culture from a pan-European and transnational perspective. The online course is composed of seven modules (plus a final exam) which aim at using a series of iconic, transformative concepts and historical moments chosen for their relevance to help learners explore and understand European history.

*Table 1. Table of contents of the MOOC on European History, Society and Culture.*

| | |
|---|---|
| **Module 1** | Reason, Rights and Revolutions |
| **Module 2** | Ambition for European Unity |
| **Module 3** | Technocratic Unity |
| **Module 4** | Colonisation and Decolonisation |
| **Module 5** | The Avantgarde's New Man |
| **Module 6** | Social Europe |
| **Module 7** | Borders, Migration and Diversity |

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[1]https://www.edx.org/school/kuleuvenx

The MOOC was designed and developed with the contribution of a total of thirteen experts/scholars coming from different departments within the Faculty of Arts (Modernity & Society 1800-2000, Cultural History since 1750, Literary Theory and Cultural Studies, Arabic Studies), in order to reflect a diverse and interdisciplinary approach all over the course. From the very first phases of its development process, the MOOC was based on a two-folded educational approach. Firstly, the learning environment was conceived to be used in a hybrid context, suitable for different categories of students. In fact, the content produced for this MOOC is not only envisaged for a distant learning context but is also meant to be re-used and included in blended learning academic courses. Secondly, it was meant as an environment where not only emphasizes students' interaction and engagement with the content was emphasized but also educators' communication and collaboration.

## 3. Design, content co-creation strategies

In the first phases of the MOOC development process, particular attention is often given to the implementation of an effective learning and pedagogical strategy, capable of making a positive impact on learners' interaction and engagement with the content as well as on course's completion rates (Phan 2018). However, equal consideration in this context should also be given to allowing a smooth design of the learning structure, easing educators' participation in the MOOC development, which might represent a complex task, depending both on the features of the chosen MOOC platform, on the number of educators involved as well as on the complexity of the project. These factors, specifically in relation to the use of the edX platform, emerged during the implementation of the "European History, Society and Culture" MOOC, and its learning alignment with the other two MOOCs. In fact, like many other MOOC creation platforms, also edX does not guarantee real support to the educators during the content design process but only throughout the course implementation. Therefore, further assistance, in this case, should be ensured by the intervention of learner designers which, besides allowing the course to fit into the Higher Education context, need to ease the MOOC design process and shape and adapt it as much as possible to the technical functionalities of the platform.

In order to face these challenges and ensure a smooth coordination and learning design process, we decided to elaborate a strategy that could operate on two different layers. On one side, we elaborated a management approach that intended to ease the coordination between the diverse groups of educators and learning technology sectors (ICT, edX support, multimedia creators). On the other side, we worked on existing learning design methodologies and adapted them to the features and learning properties of edX learning courses.

### 3.1. Management and coordination approaches

Especially when they are used in the context of Higher Education programs or large projects, MOOCs require not only a strong educational methodology but also a solid coordination and management strategy which allows not only to facilitate the implementation of the learning environment but also to smoother the cooperation between learning designers and educators (Pollard & Kumar, 2022). The lack of a clear management approach when realizing and developing an e-learning environment might in fact lead to internal tension and frustration, a *clash of cultures* as defined by Cowie & Nichols (2010) between the academic group and the e-learning specialists.

For this reason, already in the planning phase of the MOOC's creation, particular attention was given to sketching a management plan which could allow parallel and simultaneous coordination in all the implementation phases of the three MOOCs. In this regard, the following elements were at the very basis of this management strategy:

- **Establishment of a solid pipeline structure**, which contributed to reinforcing the learning designers' position as bridging and fundamental forces not only for the translation of the learning material into suitable e-learning material but also for the communication with the technical staff.
- **Preparation of a preliminary implementation plan** with feasible deadlines and milestones.
- **Set up of collaborative environments**, dedicated to every MOOCs module, aimed at boosting interaction within small groups and at facilitating learning designers' support to the educators.

### 3.2. Re-adapting the ABC design methodology

The ABC Learning Design is based on the theory that Dianne Laurillard developed in her work "Teaching as a design science" (2012), where fundamentals of learning theories are combined together with instructional design principles in order to set up the basis of the student's knowledge creation. Afterward, in 2014 those principles were further developed and concretely applied to a series of seminars led by University College London (UCL) in order to support instructors in the design of online or offline

learning programs (Young et al, 2016). These generally consisted of live workshops, where academic teams collaborated in the creation of a sort of visual storyboard representing the future course. By assembling together a series of learning activities required to meet the module's learning outcomes and assess the students, the educators are asked to virtually recreate the content of their program or course (Young et al, 2016). This methodology spread out especially as a consequence of the COVID-19 pandemic when education institutions were necessitated to reinvent themselves and turn their -originally- live courses into digital courses (Young et al, 2016).

Although the ABC Design approach was mainly developed for traditional academic courses, we saw in it the possibility of using the same concept to support the development of edX MOOCs. The storyboard traditionally used during the ABC Design session was in fact modified and adapted to the type of structure (composed of modules, sections and units) that is present in all the edX MOOCs. By using a collaborative excel sheet, we created a set of different virtual storyboards, which mirrored the number of modules the MOOCs consisted of and which could be used to recreate through a set of learning activities, taken from the ABC design methodology (practice, acquisition, inquiry, discussion), the entire learning structure of each modules' section.

*Figure 1. Example of ABC Design virtual storyboard used for the European History, Society and Culture MOOC.*



Furthermore, the collaborative storyboard was enriched with further information indicating the exact type of activity, the type of material to be used, the completion status as well as the name of the educator who had to produce that specific activity. These learning theories were then implemented during recurring meetings where the educators were supervised in sketching their own modules. This allowed them to thoroughly structure each element of the online course on the basis of the type of content they wanted to offer. This provided all the partners involved in the MOOC production with the right tools for understanding the MOOCs' structure and for creating educational activities. Also, it contributed to boosting teamwork spirit and creating a solid basis in terms of mutual trust and respect between educators and learning designers.

In fact, the purpose of adaptation of the original ABC design approach, aimed not only at extending the use of this methodology to MOOCs but also at facilitating the application of the methodology process from an organizational point of view, especially given the high number of educators involved in the creation online courses such as the MOOC on European History, Society and Culture. The implementation of this sort of hybrid collaboration -which was further incorporated into all three MOOCs-, made up of both online and onsite meetings and discussions, contributed to easing the design process of the whole MOOC.

## 4. Conclusions

In this paper, we presented the coordination and management approaches applied to the development of three interlinked MOOCs on European Studies, produced in the context of a Higher Education project. In particular, the MOOC on European History, Society and Culture produced by one of the faculties involved in the initiative, was used as a main case study to highlight the learning design and coordination challenges the team responsible for the MOOCs development came across and the strategies that were implemented in order to facilitate the creation of the MOOC. Moreover, it aimed at bringing direct attention to the complex -and sometimes underestimated- dynamics that often occur between educators and learning designers, and that appear to have often a strong impact also on the quality of the final product.

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# CHANGES OF TEACHER-STUDENT/STUDENTS COMMUNICATION IN STUDY PROCESS: CONTEXT OF REMOTE TEACHING / LEARNING

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## Abstract

The global Covid-19 pandemic of 2020-2021 has brought about changes in all areas of our lives, including the higher education system. The global and very rapid transition to distance learning, the development and development of distance learning courses, the review of study schedules are just a small list of activities that needed to be done to manage the unusual situation and ensure the quality of studies. No less important, as it turned out later, were not only the external changes in the organization of the study process and their communication in the organization, but also the changes in the communication itself among all participants in the study process, especially among students and teachers. This is clearly confirmed by the qualitative and quantitative research conducted in our institution in 2020 and 2021, which revealed how students and teachers assessed the quality of distance learning, what challenges they faced and how they overcame/did not overcome them, what skills and competencies enabled them, in both teachers and students, not only to adapt to all changes, but also to experience success even in such a critical situation. Research has also shown what changes in communication have been relevant and have led to easier transitions and greater success at different stages of study. It also reaffirmed the importance of information in communication, in particular its quantity, accuracy, relevance to specific decisions and so on. These studies and the conclusions drawn from them and the links found would be presented at the article

*Keywords: Communication, information, communication in education, self-directed learning competencies, distance learning.*

## 1. Introduction

Communication is one of the most important activities in all processes. Education, also higher education, is not exception. Because communication in education always is purposeful, one of the most important goals here is to achieve relevant learning outcomes. On the other hand, communication in education has all the characteristics of any type of communication, e.g. own style, strategies, and tactics of communication between teachers and students or only between teachers or only between students, as well as problems, challenges and crises. The latter, according to I. Mitroff and G. Anagnos (2001), is an event that has or may have a significant impact on the entire organization, its image, reputation, and maybe even on its further development and existence. And if any crisis in the organization is also accompanied by communication problems, the crisis will be double. According to F. Frandsen and V. Johansen (2011), a double crisis is a crisis when the primary crisis is accompanied by a communication crisis, which clearly shows that the organization is unable to manage communication processes, which should not cause or complicate the primary crisis that has already arisen, but rather on the contrary, to help and contribute to the initial - primary - crisis management.

## 2. Research problem

We would like to note that communication, including internal communication, as a research topic, is one of the most popular and relevant topics in social research. Lithuanian (Šliburytė, 2004; Tamutienė, 2010; Virbalienė, 2011; Puodžiūnas, 2013) and foreign scientists (Smith, & Mounter, 2008; White et al., 2010; Attharangsun, & Ussahawanitchakit, 2010; Linke, & Zerfass, 2011) in this field studied communication in various aspects, but there is still a great lack of research, especially in Lithuania, analyzing internal communication in the educational process. That is, to what extent the general principles of internal communication are suitable for this communication, how it changes

depending on the participants in the communication process, their characteristics, such as age, level of preparation, cultural characteristics, available experience, etc. There is also a great lack of research evaluating the impact of the quality of communication processes on overall success and quality of the educational process. This field mostly deals with collaborative processes, but the latter also focus more on the psychological aspect than on communication or information management. It is like an extension of the research field, but on the other hand, the essence of the communication process disappears in that extension and it becomes very difficult to find objective variables that can ensure higher quality not only in the communication education process, but also in the education process itself. For all the reasons mentioned above, it is obvious that communication in the educational process during the Covid-19 pandemic, especially in Lithuania, is a relevant topic, because in any case, it was a crisis situation, and the communication crisis, as we have already mentioned, could have deepened it even more. In addition, this topic has not yet received much attention from researchers.

## 3. Research aim and objectives

This article aims to analyse teacher-student communication in the process of distance teaching/learning in higher education institutions under the conditions of the Covid-19 pandemic and the global quarantine caused by it. Changes in communication due to changes in the entire educational process during the pandemic and quarantine, and even the communication crisis in this context, are very relevant not only for a better understanding of the processes that took place, but also for predicting future trends in organizing the educational process, as a large number of participants in the higher education system would like to continue distance learning.

It is worth noting that when analyzing the concept of communication in the scientific literature, there is no unambiguous definition of this concept - partly because communication is analyzed in different contexts, partly because of the complexity of the communication phenomenon itself. This article will be guided by J. Keyton's (2011) concept of communication, according to which communication is a process of information transfer and mutual understanding between individuals. In other words, if there was no common understanding after exchanging information, it can be said that there was no communication or, in other words, the main goal of communication was not achieved.

Due to the Covid-19 pandemic and the resulting transition to a universal distance learning process, appropriate changes were clearly needed. They were necessary simply because distance education has greatly reduced, and sometimes (sometimes only due to technical obstacles) completely eliminated non-verbal communication, which is very significant in the process of communication. According to some authors, as much as 93 percent of information is transmitted and received through non-verbal communication (Virtual and Classroom Learning in Higher Education: a Guide to Effective Online Teaching, 2021).

It is clear that maintaining traditional teacher-student/student-teacher communication styles, strategies and tactics has been quite difficult due to all the changes that have occurred due to the Covid-19 pandemic and the transition from almost full face-to-face to distance education, and more specifically distance learning. For the reasons already mentioned, the changes in teacher-student communication after the start of the first quarantine (in the spring of 2020) can be called a communication crisis. The teachers not only tried to maintain the traditional structure, timetable and programs of all courses and subjects. Nor did they change the style of communication with students. That is why the organization of studies during the first quarantine can even be referred to as a double crisis (Frandsen, & Johansen, 2011). The main reason for this double crisis was actually not the lack of didactic competences that are so necessary for online learning or distance learning, but the lack of changes in the process of communication. This is very clearly confirmed by the analysis of the survey conducted in June 2020.

On the other hand, during the second quarantine (from November 2020 to June 2021) or even before this period, certain changes have already been made. It is interesting that most of the changes were made in the area of communication - oral and written communication, synchronous and asynchronous, communication between all participants in the educational process. Most important in this area were changes in communication between teachers and students.

The analysis of educational innovation and communication strategy and tactical transformations presented and analyzed in the article is based on the results of a survey in June, 2021. The analysis of the results not only enabled to understand what was done, but also what should be done in future distance education, especially in order to avoid communication crises or minimize their consequences for distance education and learning.

## 4. Methodology of investigation

In order to find out how the academic community of Šiaulių valstybinė kolegija overcame the challenges of organizing the educational process and the resulting changes in communication, a study was conducted. The survey was conducted in June, 2020 (i.e. after the first general quarantine) and in June, 2021 (i.e. after the second, which lasted more than 3 times longer as the first). 94 full-time and 76 full-time social science students and 38 teachers working with full-time and part-time students participated in the survey.

From this qualitative and quantitative research became clear: how students and teachers assessed the quality of distance learning, what challenges they faced, how they overcame/did not overcome them, what abilities and competencies enabled them, i.e. both teachers and students, not only to adapt to all the changes, but also to experience success even in such a critical situation.

Research has also shown which changes in communication were relevant and led to an easier transition and greater success at various stages of studies. It also confirmed once again how important information is in communication, especially its quantity, accuracy, relevance for making specific decisions, etc.

## 5. Analysis of an empirical study

First of all, it was aimed to find out how the students managed to work remotely (see Table 1).

*Table 1. Respondents' opinion about success/failure in distance learning.*

| Respondents' opinion about success/failure in distance learning | Percentages |
|---|---|
| Very successfully | 22,6 |
| Even better than in the auditorium | 32,8 |
| As well as by contact | 18,2 |
| It didn't go well in the beginning, but after that everything was fine | 19,7 |
| It didn't work out | 6,7 |

As we can see, the vast majority of students did well enough to study remotely or the problems that arose were overcome and it became easier for them to study already at the end of the semester (we are talking about the first quarantine in 2020). And only 6.7% said that they were not successful in distance learning during the entire period of study.

An analysis of the reasons for success in distance learning is presented in Figure 1.

*Figure 1. Reasons for success in distance learning.*
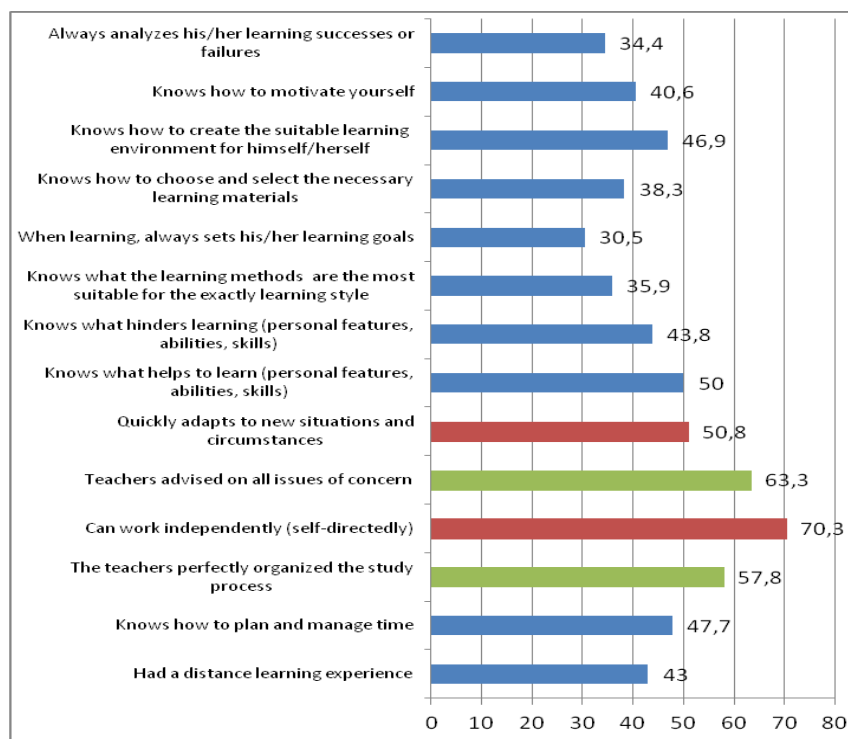
Obviously, the guarantors of success are twofold. On the one hand, it is the qualitative work of teachers, organizing the study process and helping students to solve all the problems that arise. On the other hand, the ability of students to work independently, or rather, self-directed, proved to be the most effective. Like adaptability, i.e. the ability to quickly adapt to changing environmental or life conditions, situations. In anticipation, it can be said that the latter skills are relevant not only during a pandemic or quarantine. Employers in almost all fields identify these abilities as very relevant today and even more relevant in the future.

This analysis of student experiences showed that students who had self-directed learning skills did better and, conversely, those who did not were more likely to fail or need more effort to overcome setbacks.

*Table 2. Changes in the didactic system, educational paradigm.*

| Changes in the didactic system | Percentages |
|---|---|
| Had to change the criteria for assignments' evaluation | 2,6 |
| Looked for the new ways to get feedback | 71,1 |
| Gave more active, engaging, practical implementation demanding tasks | 50,0 |
| Renewed the presentations involving more verbal information in them | 34,2 |
| More counselling before mid-term exams and final exams | 65,8 |
| More detailed description of practical assignments | 52,6 |
| Changes in the content and methodics of mid-term and final exams | 50,0 |
| Used completely different study methods than those in contact classes | 63,2 |

The biggest changes were in getting feedback. This is natural, because when working remotely, especially during the first quarantine, when students were very afraid to turn on the cameras during remote conferences, the teacher lost the opportunity to receive feedback from non-verbal language. For this reason, it was necessary to find reliable and informative methods that were mainly based on verbal communication.

Changes in communication are also related to other changes mentioned by the teachers, such as, for example, not only the quantity of consultations, but also their quality, new ways and methods of counselling, etc. As well as finding and mastering methods of organizing studies other than working in a contact manner.

Those that have not been successfully overcome are also more or less related to communication, more specifically to the quality of communication. For example, the problems related to the increased personalization of the study process, as it turned out later, actually led to the fact that the communication process between the teacher and the student was not efficient enough. Even the basic principles of organizing the communication process were not observed, such as, for example, the duration of communication, time, volume of information, etc. The same can be said about other challenges mentioned by the teachers, such as the intensity of the study process or significantly increased workload. When teachers were asked to explain these statements in detail, to provide specific examples and situations, they usually identified communication problems: too long consultation, the need to explain tasks in detail (usually in writing) to each student or write comments. Practical works to be corrected. Thus, a more detailed analysis of the situation only once again confirmed the importance of communication in the educational process and the need to change that communication in order for the process to be of high quality and with optimal time and effort.

It is obvious that all those changes, which led to the success of the study process, were actually not purely educational, but more communicative. This reaffirmed the idea of how relevant communication is in an organization, especially in a situation of change. And that effective communication creates the basis for success in overcoming challenges or in general escaping from a crisis in the organization.

## 6. Conclusions

- The analysis of the results not only made it possible to understand what was done, but also what should be done in the future in distance education in order to avoid communication crises or reduce their consequences during distance education and learning.
- The conclusions and recommendations presented here could be interesting and useful for improving future teaching and learning and not only by distance learning, and not only because of the new experience in organizing studies in the Covid-19 situation, but also because there is not enough attention paid to communication processes in education and its importance to its success.

- The study showed that students who had and had self-directed learning competencies were more likely to experience success than others. The same goes for teachers - having self-directed teaching/learning competences, they overcome various challenges more easily than others.

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# MULTICULTURAL PERSPECTIVES OF L2 LEARNING

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## Abstract

One of the significant issues in the context of migration is learning the language of the country of arrival as a vehicle for inclusion and integration. This topic has been extensively discussed in several studies, and much data has been collected on adult language erosion due to migration (Wong Fillmore, 1991) or L2 learning difficulties (Liddicoat & Taylor-Leech, 2014). It has been observed that the interaction and interdependence between L1 and L2 can be paramount in determining migrants' language choices. In addition, a rapid process of learning and acquisition of the target language could facilitate encounters with different cultures, encouraging integration and inclusion. During this process, two variables come into play that can make a difference in L2 learning: motivation to pass the B1 citizenship exam for reference documentation (according to Italian regulations) and anxiety about not being up to the task of adequately learning the language to foster full autonomy. Based on these premises, the research objectives were: - to measure the level of motivation toward learning Italian and toward Italians; - measure the level of anxiety within Italian L2 classes.

The type of research was purely quantitative, and the data matrix allowed the analysis tool (histogram) to calculate individual and cumulative frequencies for a range of cells and classes of data. The research involved the online administration of a questionnaire through google forms. Participants answered questions within the attitudinal/motivational test battery (Gardner, 1985) with a 7-point response mode on a Likert scale (strongly disagree to agree strongly).

A total of 30 migrants (15 females, 14 males, 1 non-binary) attending two Italian L2 classes in the city of Palermo (Italy) with an age range of 20-50 years participated in the online survey.

The main results show that most participants expressed a positive attitude toward learning Italian and Italians with a high degree of interest in foreign languages; a moderate level of embarrassment or anxiety within the classes emerged.

In conclusion, as teachers, trainers, and pedagogists, it would be appropriate to mitigate and facilitate this learning process by promoting a serene and non-judgmental environment to foster language learning from a perspective of active listening and intercultural empathy. Thus, try to intervene so that the acquisition of the new vocabulary is seen as a tool for autonomy in the migrants' decision-making processes and not as a building block to obtain the documents required by current regulations, and thus a mutual bond that can ensure mastery of the second language combined with personal skills.

*Keywords: Attitudes, language L2, linguistic inclusion, migrants, motivation.*

## 1. Introduction

In a classroom where, despite the different languages or dialects spoken, students have to say in the target language, as soon as their affective filters (Krashen 1988) are broken, the awkwardness disappears, and interlanguage allows effective communication. Unfortunately, this would rarely happen to parents who do not manage the L2 for several reasons: the fear of having their identity questioned and their linguistic rights neglected, belonging to less open communities, etc.

An immediate consideration to make, therefore, is that immigrants should be given the possibility of acquiring linguistic independence, or at least a reasonable level of linguistic autonomy so that they can feel more welcomed and their process of inclusion can be accelerated. If one considers the final objective, the choice between L1 or L2 is free as long as it allows for cultural exchanges and peaceful coexistence.

In an age where communication should be widely allowed, just think of satellites, GPS devices, Siri, etc. Efforts to overcome difficulties with the Italian language, understood as L2 learning are still enormous, especially in a multicultural and multi-ethnic society. If, on the one hand, migratory flows

represent a standard event, on the other, it can be seen how often public institutions and educational systems collapse in the face of a new Gambian student or a Pakistani worker who does not relate correctly to the local language. Even if migrants speak English, French, Arabic or the dialects typical of their regions, in a monolingual country, immigrants often cannot find a job or a suitable school due to their difficulty understanding or speaking the Italian language. Consequently, in our Italian school system, the immigrant student is commonly perceived as a student with special educational needs, with DSA and ADHD. For this reason, an individualized educational plan (IEP) is drafted without considering the main problem, i.e. the target language. As a result, it is possible to predict how intense the struggle to keep up with local comrades or the discomfort of marginalization with its immediate isolating effect will be. What has been said clearly shows how, in a migratory phenomenon, the main objective of inclusion is not possible, indeed, is not achieved, leaving the responsibility to the first reception centres or to voluntary organizations that manage Italian L2 courses for immigrants. Moreover, as required by law, an A2 certification in Italian is required to obtain the 5-year residence permit, which would favour privileged access to state schools, avoiding any burden for both parties, teachers and international students.

According to Ruggeri (2010), the moment of acceptance is rather delicate for the integration process and the development of relationships. Therefore, it focuses on various aspects, such as education, language and culture. Psycholinguistic research on language acquisition considers many factors present in the individual, such as intelligence, motivation, self-esteem, etc., such as linguistic input in the family (Baker, 2018) and the learning environment, such as L2 teaching (Robinson, 2002). Differences in language acquisition can be found between migrant/non-migrant students or between linguistic minority/majority students in general (Cummins, 2000). The first case is not due to ethnicity, while the second sees immigrant students exposed to the same linguistic input and taught together in the same classroom. As regards the third factor, it has been shown that a large gap between L1 and L2 does not prevent successful L2 acquisition by immigrants (Portes & Rumbaut, 2001).

As we know, the first element of inclusion and integration for migrants, part of a long and complicated process, is learning a language, in this case, L2 Italian, provided mainly by volunteers and associations who sometimes do not know precisely how to proceed. It is essential to bear in mind that it cannot be assumed that teaching an L2/LS is easy and that most of the time, this task is entrusted to untrained volunteers or retired teachers who do not know how to get started, or behave in class like if they were teaching Italian students. What needs to be done is to teach the language from a different perspective, which allows immigrants to speak Italian as quickly as possible, to give them a "linguistic survival kit" to work with daily. Unfortunately, this is rare, and as lessons can often focus on Italian grammar, in most cases, immigrant students decide to drop out. Since immigrants need to gain confidence in the target language, it should be necessary to involve all newcomers in a complete immersion trying to keep their attention and aim to build relationships based on trust. "Intelligence must be warmed up," argued Simon Weil, who taught illiterate workers for a long time. Human warmth and goodwill are the keys to facilitating the learning process, and a good teacher should think about creating the right atmosphere in the classroom. A classroom in which there is trust and cohesion, a safe environment in which the immigrant student is free to approach the language and to play with it, in which he feels like the protagonist of a great adventure on how to learn and express himself in a new way, free to make mistakes and focused on building new relationships with peers.

From a methodological point of view, the communicative method is considered the most appropriate among L2 Italian teachers, where the primary attention is paid to the spoken language and its structure linked to immediate communication, the main objective of the migrant. The aim is to make him aware of the importance of the target language in the daily routine and of the problem to overcome.

In the learning process, children are facilitated. After all, their way of approaching a language is different from that of adults, above all because they proceed by natural steps, imitating their parents or siblings orally. On the contrary, what is generally expected of migrant adolescents, young adults, or adults is that they acquire the language as quickly as possible, often without regard to their linguistic origin or, worse, their illiteracy.

According to Portes and Rumbaut (2005) there are three different outcomes of the assimilation process. First, young migrants learn the language and culture of the host group to the detriment of their own (upward assimilation). The second (assimilation downwards), identical to the first, involves their inclusion within marginal and deviant groups in the host country, and the educational role fails to improve their condition (Donati, 2009). Finally, the third result is the most advisable, understood as maintaining a solid link with the traditions and the ethnic group of origin (selective assimilation).

## 2. Objectives

It has been observed that the interaction and interdependence between L1 and L2 can be paramount in determining migrants' language choices. In addition, a rapid process of learning and acquisition of the target language could facilitate encounters with different cultures, encouraging integration and inclusion. During this process, two variables come into play that can make a difference in L2 learning: motivation to pass the B1 citizenship exam for reference documentation (according to Italian regulations) and anxiety about not being up to the task of adequately learning the language to foster full autonomy. Based on these premises, the research objectives were: - to measure the level of motivation toward learning Italian and toward Italians; - measure the level of anxiety within Italian L2 classes.

## 3. Methods

The type of research was quantitative, and the data matrix allowed the analysis tool (histogram) to calculate individual and cumulative frequencies for a range of cells and classes of data. In addition, the research involved the online administration of a questionnaire through google forms.

### 3.1. Participants

The present study analysed data from 30 migrants who participated in an online survey. The participants ranged in age from 20 to 50 years. Socio-demographic characteristics are shown in Table 1.

*Table 1. Socio-demographic characteristics of participants (N=30).*

| Variable | n (%) |
|---|---|
| **Sex** | |
| Female | 50 |
| Male | 47 |
| Non binary | 3 |
| **Nationality** | |
| Algeria | 7 |
| Bangladesh | 13 |
| Ethiopia | 3 |
| Gambia | 10 |
| Ghana | 20 |
| Lybia | 7 |
| Morocco | 13 |
| Nigeria | 23 |
| Sri Lanka | 3 |
| **Age** | |
| 20-25 | 40 |
| 25-30 | 17 |
| 30-35 | 3 |
| 35-40 | 7 |
| 40-45 | 7 |
| 45-50 | 27 |
| **Education** | |
| Primary school | 10 |
| Secondary school | 43 |
| College | 17 |
| University | 30 |
| **How many languages they speak** | |
| 1 | 30 |
| 2 | 40 |
| 3 | 23 |
| 4 | 0 |
| More than 4 languages | 7 |
| **What languages they speak** | |
| Arabic | 9 |
| English | 51 |
| French | 13 |
| German | 10 |
| Italian | 5 |
| Portuguese | 3 |
| Spanish | 9 |

### 3.2. Measures and procedures

Participants were recruited through a "snowballing" process, presenting the research project in an educational and community setting while disseminating a link to access an online questionnaire. It was explained to participants that the research involved neither risks nor benefits but only a cognitive purpose of the phenomenon. The study involved the online administration of a questionnaire using the attitudinal/motivational test battery (Gardner, 1985), using the Italian language as the focus in all items. The questionnaire was divided into two macro sections: 1) the role of attitudes and motivation 2) the intensity of motivation. The first section comprised 48 items, as the 6 subscales provided by the broad scale were used, and went to measure: Attitudes toward Italian; Interest in foreign languages; Attitudes toward Italians; Attitudes toward learning Italian; Integrative orientation; Instrumental orientation; Italian lesson anxiety. The response mode included a 7-point Likert scale (strongly disagree to strongly agree). The second section included 9 multiple-choice items.
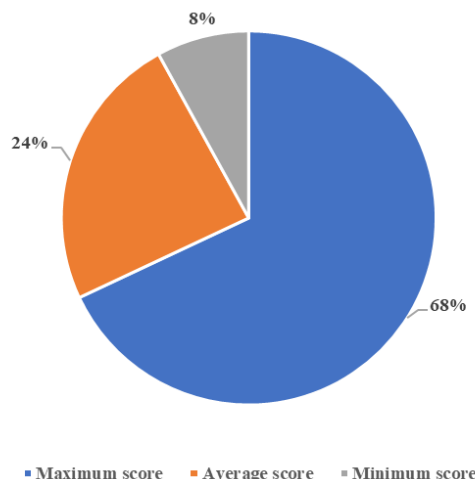
### 3.2. Results

The main results in the first category show that most of the participants expressed a positive attitude toward learning Italian (learning Italian is great or I really enjoy learning Italian - 47% strongly agree; I love learning Italian, 53% agree) recognizing that Italian is an essential part of the school curriculum (40%). Confirming our hypothesis to the statement, I hate Italian 77% of participants expressed a total degree of disagreement. Participants said a high sense of integration toward the Italian language, for example (studying Italian can be essential for me to because it will allow me to be more comfortable with Italian 60% or studying Italian can be important for me because it will allow me to meet and converse with more and varied people 70%), this could show how important it is for migrants to learn and know the Italian language not only as a vehicle to meet their own needs and demands but also to dispel clichés (migrants do not want to learn Italian) and the creation of small ghettos within which migrant communities do not open up to the culture of the country of arrival.

Feelings of anxiety and embarrassment emerged in the circumscribed moments within the classroom during Italian language learning. For example, some participants expressed a high level of anxiety when they have to voluntarily answer questions asked by the teacher (27%) or when they talk about themselves in the classroom (33%), or feel that some of their classmates speak Italian better than they do (40%).

Regarding the second category (intensity of motivation), the result was obtained by adding up all the answers of each participant to measure the degree of motivation. Precisely, the items referred to specific attitudes that the sample investigated activates in acquiring and learning the language and using other communication channels (TV, radio) to know the Italian language better. The results revealed high motivation towards learning the Italian language (Figure 1).

*Figure 1. Percentage of choice based on the score of all questions (motivation intensity scale).*



- Maximum score  - Average score  - Minimum score

### 4. Discussion

Our results confirmed all our hypotheses. The acquisition and learning processes represent two paths that are not always easy to manage for all migrants who are about to learn a foreign language. In any case, several factors drive our target audience, individual characteristics, family factors, and social factors; a common element often accompanies these: the experience of the migratory journey that

involves a clash, and thus a full awareness, between expectations and the real one, encounters in the host country, in other words, what is called cultural shock (Oberg, 1960).

The motivations of migrants are related more generally to the whole linguistic, social and political sphere that arises from the use of L2 in a concrete and satisfying way to the multiple possibilities of investment for a new life, and, finally, motivation may be directed at the desire to integrate into Italian society. The characteristics of migrants' reasons for learning Italian L2 could point not only to single needs (documents, hospital, etc.) but to cultural motivations, to motivations that form an articulated motivational, helpful structure to understand better the way of teaching Italian L2, to deepen more and more the connections between the causes present and the importance of understanding how they are related to the teaching of Italian L2. The incentives identified through the survey go beyond the immediate and unambiguous need to work, touching on the need to communicate and study within diverse emotional conditions for learning Italian L2. Learning Italian as a second language is not purely instrumental but is related to the pleasure of learning or the desire to be independent. Circumstantial factors, such as difficulty obtaining a document, can negatively affect motivation, weakening it.

## 5. Conclusion

In conclusion, as teachers, trainers, and pedagogues, it would be appropriate to mitigate and facilitate this learning process by promoting a serene and non-judgmental environment to encourage language learning in a perspective of active listening and intercultural empathy. Therefore, try to intervene so that the acquisition of the new language is seen as an instrument of autonomy in the decision-making processes of migrants and not just as a step to obtain the documents required by current legislation, and therefore a mutual bond that can guarantee mastery of the second language combined with personal skills. Thus, the figure of the teacher who can feed, with his competence and sensitivity, the interest in language learning remains central.

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# USING IMMERSIVE TECHNOLOGIES TO ENHANCE STUDENT LEARNING OUTCOMES IN CLINICAL SCIENCES EDUCATION AND TRAINING

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## Abstract

In recent years, the development of immersive technologies has progressed significantly, becoming more accessible and emerging as a fundamental change agent in how we will engage across all levels of society. These technologies are already being used in the workplace for various functions and for leisure and everyday life. They are recognized as the most disruptive technology of the next decade, with healthcare and education being amongst the most disrupted fields. Emerging research shows that Virtual Reality (VR) offers potential advantages for educational simulation and therapeutic intervention because of its ability to capture and recreate content and interactions in virtual environments. Through three-dimensional rendering of environments that incorporates visual, auditory, tactile and/or kinesthetic elements, VR presents unique opportunities to improve educational outcomes through increased engagement, enriched learning experiences and improved understanding, and increased knowledge retention. Given these potential benefits and inevitable proliferation of VR, particularly in highly experiential health-related fields with clinical components, we undertook to introduce immersive technologies into the speech-language pathology program curriculum and collect data on perceived impact on student learning. This study outlines the activities undertaken and examines aspects of integrating immersive technologies into an educational curriculum such as faculty and student attitudes on the usefulness of these technologies within a particular field, perceptions on the effectiveness of immersive technologies in increasing educational and training outcomes, availability and access to immersive technologies and software that meet defined educational needs, and adaptability of these technologies to meet specific learner and educational considerations. Ultimately, the purpose of this study is to spur discussion and exploration of the use of immersive technologies, particularly VR, across a variety of disciplines to advance student learning outcomes.

*Keywords: Innovation, technology, immersive technologies, virtual reality, clinical sciences.*

## 1. Introduction

The development of immersive technologies has progressed significantly and as they have become more accessible, they have emerged as a fundamental change agent in how we engage across all levels of society. Already in use in everyday life, for leisure, and in the workplace for various functions, they are now recognized as the most disruptive technology of the next decade, with healthcare and education being amongst the most disrupted fields. The need for effective teaching and learning pedagogies and clinical approaches in clinical sciences education calls for the use of innovative educational and clinical tools. Immersive technologies offer one such tool. Immersive technologies blur the line between the real and virtual worlds, allowing users to feel fully immersed in the experience (Suh & Prophet, 2018). It is a broad term that encompasses virtual reality (VR), augmented reality (AR), mixed reality (MR), and extended reality (XR) technology (Suh & Prophet, 2018). Immersive technologies such as VR offer potential advantages for educational simulation and therapeutic intervention because of the ability to capture and recreate real-world content and interactions in virtual environments. Three-dimensional rendering of environments that incorporates visual, auditory, tactile and/or kinesthetic elements presents unique opportunities to improve educational and clinical outcomes through increased engagement, enriched learning experiences and improved understanding, and increased knowledge retention. Research in different areas, such as health care (Kobayashi et al., 2018; Zhao et al., 2016), education (Calvert & Abadia, 2020; Frank & Kapila, 2017), and crisis management (Kwok et al., 2019; Morelot et al., 2021), shows that immersive technologies could improve learners' learning

experience and promote their cooperation and creativity in classes. Given this background, scholars from varying fields have sought to identify different ways and application domains to use immersive technologies to train health care professionals, including students. However, there is relatively little research to explain what is known and what is necessary to know about the integration of immersive technology into educational and clinical curricula (e.g., processes and supports, content areas, technical and staff capacities, barriers, performance, evaluation, and sustainability). Given the potential benefits and inevitable proliferation of immersive technologies, particularly in highly experiential health-related fields with clinical components, this study undertook to provide a framework for successful integration of immersive technologies into clinical sciences education by systematically integrating these technologies into the speech-language pathology program curriculum and collecting data on perceived impact on student learning.

## 2. Methods

The Master of Science Degree Program in Speech-Language Pathology at the university of the District of Columbia partnered with the University's Center for Advancement of Learning to pilot a program to systematically and comprehensively integrating immersive technologies into the curriculum. The Center for Advancement of Learning (CAL) works with faculty, staff, and administrators across the University's colleges, divisions, and campuses to incubate, advance, and upscale initiatives that promote effective learner-centered instruction and course design that is inclusive and innovative. The Speech-Language Pathology (SLP) Program, with its integrated academic and clinical components, presented a unique opportunity to develop a template for effectively integrating immersive technologies into a variety of programs within the University. It is deemed essential to leverage these technologies to be part of the University's learning ecosystem since immersive technologies are expected to play an important role in the future of education, enhancing STEM courses, medical simulations, arts and humanities courses, and technical education.

The SLP Program and CAL developed a plan of action for the implementation of immersive technologies into the curriculum that was focused on attaining synergistic integration, was sustainable and responsive to changing Program and student needs, enhanced student learning and clinical competency, was evidence-based, and had the support of faculty and students. The implementation plan was faculty driven, involving: 1) determination of initiative goals and objectives, 2) extensive curriculum review to determine optimal course sequence for implementation, 3) faculty training to enable implementation of immersive technologies in course activities, 4) alignment of initiative goals and objectives with Program, College and University goals and objectives, and 5) data collection and feedback through surveys and focus groups to inform the process. Central to the plan was a commitment to learning from the process and dynamic problem-solving driven by discipline-mediated processes. Program faculty and CAL personnel undertook detailed and comprehensive appraisal of available hardware and software that could support program goals and identified processes for maintaining immersive technologies assets, hardware, and software. The stages of implementation included: 1) faculty training and continued support, 2) development and launch of a learning module introducing students to the use of immersive technologies in education and clinical practice, 3) in-class experiential actives where students received hands on experience using various immersive technologies for educational and clinical application, 4) student engagement with industry innovators in the commercialization of virtual reality in clinical settings in the field of speech-language pathology, and 4) student exploration of available immersive technology resources for use in speech-language pathology and those that, though not designed for the field, offered potential use application. Students were surveyed on their attitudes on the use of immersive technologies in the curriculum, as well as their engagements around immersive technologies both before and after study implementation.

## 3. Discussion

Surveys and focus group discussions revealed positive trends regarding the effectiveness of the engagements on immersive technologies undertaken under this initiative in achieving targeted goals and objectifies, providing support for the integration of these technologies into the speech-language pathology (SLP) curriculum. Survey of student attitudes on use of immersive technologies in the SLP curriculum before and after participation in the immersive technologies in SLP learning module showed positive shift in favor of adoption of these technologies for academic and clinical use. In describing how interested students were in instructors using immersive technologies for teaching in SLP courses and clinic, student sentiment shifted from mostly "somewhat interested" to overwhelmingly "very interested". There was also a corresponding increase in the number of students who thought incorporating immersive

technologies in SLP program courses would enhance student learning. Participation in the immersive technologies in SLP learning module also resulted in bolstering of the perceived benefits of incorporating immersive technologies in SLP courses. These included allowing students to test real-world lessons in low-risk situations, allowing students to better visualize difficult or abstract concepts, motivating students to learn, and imparting important technical skills necessary in the 21$^{st}$ century workforce. The trend of higher post- vs pre-engagement numbers was not observed in the areas of encouraging creativity and offering students more personalized learning, although these areas were still identified as being benefits of using immersive technologies in instruction. This might be an artifact of the type of engagements that were presented. These survey findings provide supportive evidence for the potential benefits of integrating immersive technologies into clinical sciences program curriculum.

Additionally, the study provides a framework for successful and sustained integration of immersive technologies into a curriculum, rooted in faculty and student buy-in and participation from the earliest stages, responsiveness to faculty and student feedback, and the use of that feedback to help determine immersive technology assets selection, program processes, and the pace of integration. Features of the integration process included adoption of a dynamic process sensitive to the changing realities of available immersive technology assets, their functionality relative to program goals and objectives, and adequacy of available technical support for implementation and sustainability. The framework also recognizes and leverages the value to student learning, motivation, and engagement derived from involving students as partners in envisioning and shaping use cases for the technologies within the discipline. Because the framework is guided by and responsive to the specific needs of the academic program, it provides a template for successful integration of immersive technology in a wide variety of disciplines. A necessary component of the initiative is the need to cultivate ongoing and robust synergistic collaboration and sharing of expertise between discipline faculty and university technology services to facilitate the generation of novel ideas and dynamic approach to problem-solving that is essential for successful conceptualization and execution of the program.

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# IMPROVING STEM ACCESS WITH A COLLABORATIVE 3D/VR DESIGN LAB

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## Abstract

To evaluate a collaborative 3D/VR Lab established to improve STEM access and math skills at a Midwest US secondary school, three data sources were reviewed and analyzed. STEM access (course enrollment) improved early and consistently over five years but math achievement (STAR assessment) initially improved but did not reach the goal. The 3D/VR Lab struggled due to COVID closures.

*Keywords:* Virtual reality, connected learning, math, STEM, motivation.

## 1. Introduction

High school students struggling with STEM readiness and math scores are not uncommon in the US. However, in one small midwestern town nestled between multiple military facilities, this challenge was met with an uncommon opportunity to transcend, to change the usual narrative.

A generous multi-year grant was awarded by DoDEA as a Department of Defense Field Activity to increase STEM enrollment and math achievement through the implementation of a new 3D/VR Design Lab featuring robotics, virtual reality, and 3-D design applications. This effort initially targeted military-connected students.

The 3D/VR Design Lab was implemented over the course of five years providing a structure for increased student engagement and enrollment by providing "real world" tools and resources. Professional development, training, and community outreach including input from local business and industry were also integral elements. This article explores the project's results and lessons learned.

### 1.1. Background

The purpose of this grant was to increase military-connected student STEM enrollment and math achievement through the implementation of a hands-on Design Lab featuring Robotics, Augmented Reality, and 3-D Design applications. This lab and supporting credit frameworks were developed to provide a structure for increased student engagement and enrollment by providing "real world" tools and resources. Professional development in personalized learning and use of design tools would be an integral element of success to better prepare educators to utilize the design lab for integrated instruction.

Virtual Reality has a tremendous potential to significantly improve learning outcomes, enhance engagement and motivation, and promote active learning (Yilmaz et al., 2017). Therefore it was reasonable to think this technology might engage students of military families to develop not only engagement through increased course enrollment but also academic achievement in math as measured by the STAR Math Renaissance assessment. STEM research suggests that academic achievement scores may increase because of exposure to STEM courses (Gilmer, 2007). Exposure to STEM via a Design Lab has the potential to positively impact student perceptions and dispositions (Bagiati et al., 2010). Design Labs provide entry points for STEM engagement increasing the probability of STEM course enrollment (Easley et al., 2017).

### 1.2. Implementation

Due to district financial constraints, there was a limited ability to provide STEM experiences for immersion in traditional content areas, limiting access to those who enroll in specific formal STEM programming. However, expanding the design opportunity to all learners would give choices and an exposure that would encourage students to enroll in STEM specific programming. When students experience Design Software, 3D Printers, Augmented and Virtual Reality they may become more likely to enroll in formal STEM courses to further explore possibilities. The intent was to increase student math

achievement by experiencing relevant, hands-on application thus increasing capacity to be college and career ready in a world increasingly seeking creative designers.

The availability of these tools and resources would additionally allow for an after-school extra-curricular club whereby students could utilize the design lab for personalized projects. Additionally, the Design Lab would serve as an excellent entry point for students to engage in STEM activities thus increasing the probability that they will enroll in a STEM course (Easley et al., 2017). The Design Lab would also support areas of need in professional learning by providing a hands-on resource as well as monthly integration professional development opportunities which was unavailable to educators.

### 1.3. Goals/research questions:

Five-year project goals/strategies to be completed by 2023 were identified as follows:

*RQ1: Increase the number of target students enrolled in formal STEM courses to 20% from a baseline of 5%.*
- *Create a structure for a STEM Extra Curricular Advisory utilizing STEM Experts.*
- *Design Lab Development*
- *Plan and deliver professional development to encourage educators to utilize the lab for instruction*

*RQ2: Increase the average Math assessment for targeted students to 70% from a baseline of 61%.*
- *Establish Design Lab Coach*
- *Provide professional development and tools for math integration*
- *Recruit target students to utilize the lab*

*RQ3: Create a robust* 3D/VR Design Lab *to support community learning and industry collaboration.*
- *Develop, staff and equip the Design Lab with a design coach who would support content teachers*
- *Provide Math integration opportunities in the Design Lab*
- *Recruit military-connected students for after school Design Lab extra-curricular activities*

## 2. Methods

This effort was simultaneously a project funded by a grant and a research study to understand the academic significance of a well-funded and thoughtfully managed 3D/VR Design Lab.

### 2.1. As a five-year project, annual reports were prepared relative to the project goals/research questions and contained in five comprehensive reports

Assessments concerning STEM course enrollment and math achievements were relatively straightforward whereas the evaluation of the design lab itself was more nuanced and developmental over time. In addition to the reports, progress of the Design Lab was informed by various other sources gathered over the course of five years, such as observations, student/parent feedback, industry interaction and consultant interaction.

### 2.2. Evaluation Measures:
- STEM Course enrollment data was collected from school counselor records and reported annually.
- Math achievement data was collected from the STAR Assessment school and reported annually.
- For assessment of a robust 3D/VR Design Lab triangulation of grant reports, observations and user feedback was compiled and analyzed. In addition to the annual reports, a qualitative informal formative evaluation was undertaken, leading to observations and assessments relating to the following: community involvement (parent, business partners, military installations) and student experience: design lab projects, consultant days, focus group observations.

The lab plus supporting infrastructure was implemented over the course of several years providing a structure for increased student engagement and enrollment by providing "real world" tools and resources. Professional development and training in the use of technology and design tools were also implemented as integral elements.

## 3. Results / assessments

Results for each of the three research questions are summarized below. Please note that even though the data was collected over the period of five years and was impacted by the Covid epidemic leading to long delays and overall impacting the various measures especially math scores. The negative impact on math scores due to Covid and remote learning is well documented.

### 3.1. STEM Course enrollment: Increase military-connected students' enrollment in STEM courses to 20% by 2023

One of the initial strategies to increase STEM Course enrollment involved individual conferences with school counselors and military-connected students. Counselors shared information such as academic and career planning, shortage areas, and individual interest inventories. Parent nights were held to build support and an understanding of the importance of STEM preparation. Counselors were intentional in encouraging students who may not have planned to enter a STEM field to experience courses that they may not have originally considered. Parent and student information sessions provided relevant information of the importance of STEM foundation to a variety of careers so that students might consider adding courses to their academic plan regardless of their anticipated career track. As a result, the goal was met in the second year of the grant and continued to grow throughout the five-year progression. See graph 1 below.

*Graph 1.*

**FIVE YEAR STEM COURSE % and MATH AVERAGES**
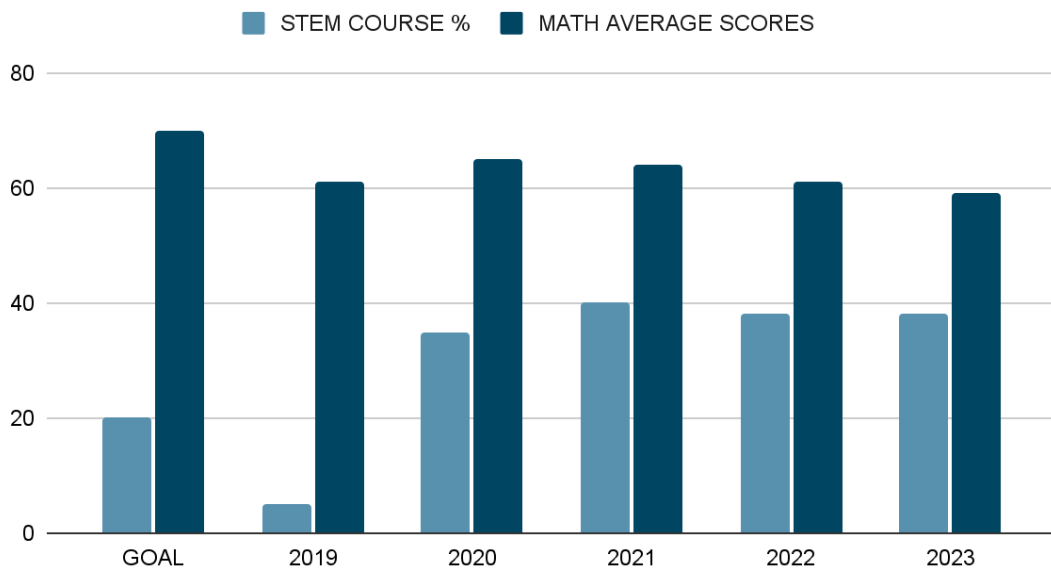


Note: Math achievement slipped significantly in the US during the COVID shutdown. (Bailey et al, 2021)

### 3.2. For MATH achievement

The Math Achievement goal was rigorous at the onset as the district hoped to increase the average percentile rank on the Math STAR assessment for military-connected 9-11th grade students to 70% from a baseline of 61%. One of the greatest challenges initially was the lack of relevant math-specific software applications for the VR Headsets. As the team re-grouped for professional development and further investigation of relevant math-specific software in the fall of 2020, they were met with the COVID-19 Pandemic early in 2020 sending all students to virtual learning for the remaining of the year and strict protocols for the following year. Because the design lab was a physical space, students were not able to access the lab and fully utilize the equipment until the fall of 2022. Additionally, math educators turned their focus to creating online content for virtual learning thus not allowing for a significant focus on AR/VR/3D math applications utilizing the Design Lab tools. Of note, however, was the growth in STAR scores in 2023 from the dips experienced during COVID-19. Because math is a scaffolded subject, the district anticipates that more time will be needed to address learning loss. See graph above.

### 3.3. Establishment of robust collaborative 3D/VR Design Lab (See table 1)

The Design Lab Coach, CTE Coordinator, and the building principal reached out to all the military connected students enrolled at Tomah High School. They presented the various aspects of the DoDEA STEM grant project to attract students to work with the Design Lab Coach on individual projects to further expose students to Virtual Reality (VR), Augmented Reality (AR) and 3D modeling, and to show how those are being integrated in STEM and math courses. Many students signed up to work with the Design Lab Coach to work on individual STEM projects throughout the school year. In addition, several student/parent/teacher/industry workshops held to connect the Design Lab to the wider learning community and nurture its own community of practice.

*Table 1. 3D/VR Design Lab Development Timeline*

| Year/ Strategy | Design Lab/ Equipment | Personnel/Prof Development | Target/ Community/ Industry |
|---|---|---|---|
| 2018- 2019 | Space Identified 12 HoloLens | Lab Coach Search Consultant Learning Day | Industry outreach  planning |
| 2019 - 2020 | Initial Build 3D Printers COVID | Site visits COVID | Industry/parent outreach COVID |
| 2020 - 2021 | COVID Design Lab closed | COVID Design Lab closed | COVID Design Lab closed |
| 2021 - 2022 | Lab Space 22 HoloLens (upgrade) | Consultant/industry workshop 2 day/open lab | Student/parent/teacher/ industry workshops |
| 2022 - 2023 | Lab Space 3D Printers, supplies | Math focus PD/Co-Teaching Lab Coach Search | Industry outreach/ Teacher practice |

The Design Lab coach continues to work with high school math and STEM teachers to build engaging learning opportunities using the VR, AR, and 3D modeling equipment. The Design Lab Coach and building principal identified military connected students with lower math achievement percentile ranking. A math intervention plan with the identified students was developed to increase their math proficiency and to engage them more in STEM-related VR, AR, and 3D modeling activities. Teachers work with the design lab coach to adapt their curriculum to include the use of the VR, AR, and 3D modeling equipment to provide unique learning opportunities to expose students to various applicable technologies and to increase engagement. STEM teachers, school counselors, and the Design Lab Coach continue to introduce students to STEM curriculum, projects, and course options to increase enrollment in STEM courses.

## 4. Discussion

This section discusses findings; including goals met, challenges encountered, lessons learned and recommendations for further research. Of these the challenges encountered and lessons learned are perhaps the most instructive.

### 4.1. Goals accomplished

STEM course participation, (Goal #1) was a very clear success during the final two years exceeding the 20% goal with 35% in the final year.  Goal #2, however, was not accomplished based strictly on the math achievement scores in any of the last five years. In a final report including students' feedback, they energetically described the Design Lab as cool, fun, and engaging. Beyond that, however, they shared how it provided space for just hanging out, messing around and geeking out (Boyd et al., 2008). A place where you go to "just figure things out". Furthermore, participating students maturely shared their understanding of communities of practice and the responsibility to pass forward their learned confidence and collaboration skills to the next year.

### 4.2. Challenges encountered

There were many challenges encountered during the five-year project. The most significant challenges include a complete closure of the design lab during Covid, difficulties in identifying and obtaining suitable resources/security, and finally the ever-present problem of professional development for key personnel. These are detailed below followed by mention of lesser challenges. Perhaps the largest challenge hit directly in the middle of the project the second and third year (2019-2021). Closure of the school impacted the development and use of the Design Lab. This delayed the equipment and personnel acquisitions further limiting collaborative efforts and community building around the 3D/VR themes.

Suitable technology acquisition was also a significant issue of selecting and acquiring the necessary hardware and software was a challenge. New headsets and updated hardware/software created compatibility issues. Surprisingly, Security constraints imposed by strict district security guidelines made outside connections very difficult.  Policies restricted any real time collaboration outside the school. Access to web-based curricula were not possible and standalone programs were cost prohibitive. Clearly there was

a need to equitably balance security with innovation. Additional challenges included minimal professional development specific to operation of the VR hardware. Also noted, insufficient access to specific math content and lack of time available for students to play with the headsets and VR applications in order to build confidence, motivation and sense of connected learning (Boyd et al., 2008).

### 4.3. Lessons learned / implications

Often the most limiting factors of new programs are related to communication and training issues. Creating timely professional development is often a challenge for new programs, so building a community of practice was encouraged as a new way forward. This is a work in progress, however, since it often takes time and shifts in identity to develop a robust community of practice that can replace traditional collaborative learning. (Farnsworth et al., 2016).

### 4.4. Recommendations for the future

Continued research is recommended for the project especially now that school closures are past, and the Design Lab can function fully. The Lab has become established and is benefitting from increasing awareness and social capital among the target students.

### 4.5. Researcher comments

The district is to be commended for their efforts to provide a Design Lab that emulates work in the "real world". The struggle between security/firewalls and opportunities for innovative tools is one to be explored more deeply. For example, Oculus VR Headsets provided ease of use and robust applications but required a Facebook account which is blocked in the district. Also of note was the rapid pace of technological change as the features and functionality of 3D Printers and tools was rapid. Purchases needed to be justified to DoDEA as many schools were purchasing inexpensive 3D printers that needed significant support or had limited longevity. Finally, some of the technology tools may have been premature in terms of content specific applications. Inevitably, applications for math skill acquisition will be more available, but at the onset of the grant most applications were primarily for gaming.

## 5. Summary

In summary, the potential for a 3D/VR Design Lab to positively affect math scores in STEM enrollment was tested in this five year generously funded project. The methodology included straight forward math scores and enrollment statistics as well as annual assessments of the design lab and key strategies for success. Results were mixed but ultimately very encouraging for increasing STEM interest and activity in the target population of military-connected students in the mid-western U.S. high school. The most significant challenges were discussed, and recommendations suggested for future work. The Discussion also addressed the challenge Learning relationships and the neglected power of building community into learning environments especially 3D/VR Design Labs. Given the proven motivational nature of 3D Design, gaming and VR, their combination with powerful supportive learning communities will be instrumental in the future.

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# THE CONTRIBUTION OF PROJECT BASED-LEARNING IN THE DEVELOPMENT OF STUDENTS' SKILLS IN SENIOR HIGH SCHOOL

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## Abstract

This qualitative research reports on the contribution of project based-learning as an evaluation tool for the development of student's skills in the first grade of Senior High School. The aim of this study is to investigate the attitude of teachers' sample towards the use of project in the educational process. The participants are secondary teachers from two school environments (one standard provincial and one experimental High School in urban area). The research questions are structured through observation (participant and non-participant) and are examined through ten semi-structured interviews from the teachers that were mentioned above. The research empirical findings point out the positive attitude of the sample teachers concerning the use of project in school environment which connected with the positive meaning of method, the upgrading of educational process, the connection between project and philological subjects, the connection between project and modern Greek, the implementation of project, the comparison between project and traditional teaching, the expectations about the project and the skills which are fostered through the project. In conclusion, this study includes the investigators' conclusion regarding the contribution of the project as an alternative and authentic evaluation in contemporary teaching environments.

*Keywords: Teacher education, evaluation tool, skills.*

## 1. Introduction

Project is a method that is primarily associated with authentic learning, through which students can develop a variety of skills and knowledge strategies. Initially, Bagheri et al. (2013), emphasize that through the *action plan*, students build new knowledge on the past (constructivism) leading to the acquisition of strategies through guided learning. Habok and Nagy (2016) point out the connection of the project with social constructivism (Vygotsky), in the context of which and through the upcoming development zone (ZEA) students acquire metacognitive and collaborative skills in response to creativity, a concept-challenge for current education. In addition, Ayas and Zeniuk (2001) refer to the characteristics of the method, in which, the project has a purpose which is defined from the beginning, so that the members can achieve it and then, it includes the organization and the work of the students in learning communities. Scholars also point out the importance of reflection, accordingly, where students according to Scarbrough et al. (2004), on the one hand have the opportunity to absorb new knowledge and relate it to the former and on the other hand to develop self-knowledge, leading to self-determination and self-diagnosis.

In conclusion, as emerged from the bibliography review and the findings of previous research, a lack of data is identified regarding the contribution of the project to the cultivation of skills in the context of the teaching of Modern Greek Language in Secondary education in general and in the school level of Senior High School, in the first grade in particular. This article will attempt to study and research the connection of the project a) with the teaching of the Modern Greek Language in education especially in the first grade of Senior High School and b) with the cultivation of specific skills and also to take into account previous research focusing on different themes.

## 2. Theoretical framework

### 2.1. Method of project

Project is very important to education, as it is understood as a dynamic tool for approaching learning, but also for evaluating students. At the same time, the implementation of the method is connected according to Fragoulis and Tsiplakides (2009: 113) with the basic pedagogical principles expressed by Chrysafidis (2005) and are related to the promotion of creativity instead of memorization, the active participation of students in learning process, but also the contact with events that are related to reality as a means of learning. The traditional teaching can thus be based on the one hand on planning, organizing and controlling learning with specific goals and objectives, but on the other hand due to the continuous development of education, more skills are required. In fact, the thinking (and reflection) practices that are part of the project are the first step that brings students in contact with culture, without implying that the implementation of the action plan will automatically bring about the acquisition of knowledge. The implementation of such actions could bring benefits over time in significant conditions and with efforts, both by the teacher and the student (Ayas and Zeniuk, 2001: 62-64).

### 2.2. Project and constructivism

Constructivism derives from the learning theories of Dewey (1916), Piaget (1978) and Bruner (1990) and is defined as the construction of new knowledge based on the students' prior knowledge. Constructivism is thus understood, either as cognitive or as sociocultural. Socioculturalism is, in fact, which is in direct correlation with the project, as its members interact with each other. Lev Vygotsky is considered to be the pioneer of the term, with learning structured through experience (Gunduz and Hursen, 2015: 527) and taken as a social process, emphasizing on the social nature of knowledge and on the assumption that the world is not understood individually, but collectively with emphasis on social interaction, experimentation and group negotiation (Doolittle & Hicks, 2003: 80).

Thus, compared to traditional learning theories, constructivism facilitates knowledge through connection with prior knowledge and with the contribution of technology it helps to lead students to deeper connections favoring their participation in technological educational environments (Gold, 2001: 53-54).

### 2.3. Authentic learning and evaluation through the project

The modern approach of evaluation is linked to the authentic evaluation. Authentic evaluation, as a term, was introduced by Archbald and Newman (1988), with most scholars considering it authentic, as it is being directly related to the real world (Frey, Schmitt and Allen, 2012: 1), while for others it is an alternative approach to developing students' knowledge (Charoenchai, Phuseeorn and Phengsawat, 2015: 2524). It is linked to group organization, thus constituting the three qualities of authentic evaluation according to Bergen (1993), as cited by Frey, Schmitt and Allen (2012: 1). Regarding project evaluation it is important not to rely on standard exercises in conjunction with formal evaluation, which leads students to a low level of understanding and is an inappropriate approach to teaching, but instead, it is important to use material handout, interviews (Blumenfeld et al. 1991: 383), or even self-assessment and hetero-assessment sheets both among students and between students and the teacher.

### 2.4. Skills in education

In fact, according to the distinction of the University of Deusto (Sanchez et al. 2008: 29-30), skills are divided into instrumental, interpersonal and systemic. Instrumental are those that are used to achieve a purpose and require a combination of manual and cognitive skills necessary for professional ability (cognitive, interpersonal, technological, linguistic). Interpersonal skills, on the other hand, are those that require personal and relational skills and are associated with the ability to express feelings and emotions in order to enable collaboration based on common goals. Finally, systemic skills include skills that require a combination of imagination and sensitivity, thus enabling the individual to perceive the parts of a whole, even when designing new systems.

## 3. Methodology

### 3.1. Purpose and aims of the study

The purpose of this research is to investigate the way in which a project can be a dynamic tool for the development of skills in high school students, revealing its importance in the school community, as discussed above in the Theoretical Framework. The present work focuses on demonstrating the project (central phenomenon) as a means of acquiring a variety of important tools with which students can develop a dynamic system of skills, thus contributing, on the one hand, to their overall development and on the other

hand, to upgrading the whole school community. More specifically, the present research sets the following objectives:

1. To utilize the project within the school community as a tool for 21st century development of skills.
2. To validate the project as an important method for the comprehensive development of students in the context of the educational process.

The ultimate goal is to demonstrate the need for cooperation between teachers and researchers, in order to see the positive results of such actions that contribute constructively to the development of modern educational research and through the research process to improve education.

## 3.2. Research questions

The formulation of the research questions is related to the purpose of the research and aims to limit the research field to a specific research problem in order to evaluate and evaluate the complex research work in real time. So, the research questions are:

1. What is the attitude of the teachers towards the use of the project during the educational process?
2. What are the teachers' views regarding the skills that students acquire from using a project in the Modern Greek Language lesson?

## 3.3. Method of analysis

The type of research chosen to investigate the central issue is qualitative research which differs from the quantitative. More specifically, the principles of grounded theory were followed, where the data were collected from teacher interviews and then analyzed, the analysis procedure being based on the central phenomenon in order to draw conclusions (Creswell et al., 2007: 247-248). Qualitative research, thus, constitutes an innovative type of research that offers researchers a holistic approach to reality and a multifaceted approach to a topic through the collection of a wealth of research data.

## 3.4. Procedure and data

The present survey was conducted during the first and second semester of the school year 2020-2021. The starting point of this research is initially related to the identification of the research problem in the context of the classroom and was investigated through the bibliography review with a focus on project. During the observation process in the school context of a Model school of Attica and a General provincial school, the observation of both students and teachers was exercised in the context of the composite research work, while it was utilized with the participation of the one researcher herself and a two-hour internship teaching. Therefore, in order to draw empirical data on the implementation of the project in the classroom and to formulate the Research Questions for the investigation of the research hypotheses of the present study, the observation of six sections of the First Grade of Senior High School was used. Then, research questions and themes were formulated for the semi-structured interviews with ten teachers of a General and an Exemplified High School (the former being a provincial public school outside Athens and the latter a school in Athens), five teachers from each school, gender: six women and four men. The semi-structured interviews contain seventeen questions related to the subject of the study and were taken by the teachers online (due to health impediment) through an electronic platform (skype, zoom). In more detail, before conducting the interviews, the profile of the teachers was studied (level of study, teaching experience), while then, semi- structured questions were selected in order to offer freedom to the participants in the research. During the interviews, notes were kept (interview protocol), while at the same time they were recorded with the consent of the teachers in order to have data cross-checking and ensure validity. After the interviews, the data were organized and coded through thematic analysis in order to approach the research issue. Finally, at all stages of the investigation, the consent and anonymity of all involved was ensured.

## 4. Analysis

## 4.1. First research question: Attitudes of teachers towards project use compared to traditional teaching

The majority of teachers reject traditional teaching as effective for the educational process, when they compare it with teaching using a project, as in the latter, they recognize very important elements for both the teacher, who ceases to function as an authority, and the student, who is activated and becoming interested in the learning process to the maximum extent. However, although in theory many teachers may seem open to new methods, there are still teachers who are distinguished by a hesitation for these methods, being reluctant to give them space for more testing as part of the educational process. In this way, common elements are detected with the phase of Kuhn's extraordinary science (Arjun, 1998: 21-22), where there is

a confusion between the communities of researchers and teachers and the decisions of those responsible for the textbooks, and the Curriculum. The decisions of the educational policy in general, also contribute to this. Teachers, thus, often act defensively against the new methods and remain attached to the familiar pedagogical routine (teachers 1, 3 & 10), an element that is also pointed out by Frydaki & Katsarou, 2013: 82. But this kind of teaching does not meet the requirements of teaching as set by Festermacher (1990, 181-182), nor does it lead the student to a state of apprenticeship. According to the constructivist example, teachers' choices may derive from their personal perceptions and theories, but it is important to move away from both them and their pedagogical routines (Frydaki & Katsarou,2013: 82), which they had become accustomed to as students, trying to adapt to the new data of modern teaching, aiming at broadening the student's perspectives.

## 4.2. Second research question: Teachers' views on the skills that students acquire from the use of the project in the Modern Greek Language lesson

The skills that teachers display can be said to follow the model of the University of Deusto (Sanchez et al., 2008: 60-61), according to which, skills are divided into instrumental, interpersonal and systemic. In terms of instrumental skills, these include cognitive, methodological, technological and linguistic ones. Starting with the cognitive ones, teachers 1 and 8 first detect the skill of learning *how to learn*, which is also highlighted by Binkley et al. in their own model (Griffin et al., 2012: 42), emphasizing that it is a metacognitive skill that leads students to their self-assessment. Combined with this skill, they also emphasize on the cultivation of critical thinking that makes students develop critical knowledge of things (critical literacy) instead of being inconspicuous recipients of any knowledge that may be arbitrarily displayed to them (teachers 4, 5, 9 and 10). In terms of interpersonal skills, except for one teacher who refers to student self-discipline cultivated in the project and integrated into individual skills, other teachers focus on social skills related to student interaction within the group and in cooperation with each other. This highlights the importance of social constructivism suggested by Vygotsky (1978), in which students develop social skills and collaborate with other members (Habok & Nagy, 2016: 3). Finally, according to Deusto's model, the systemic skills were not given much emphasis by the teachers, as they focused more on the first two categories of skills (cognitive and methodological).

## 5. Discussion-conclusions

Regarding the attitude of teachers towards the use of the project, most of them in the sample use the project method, in general, and in the Modern Greek Language course at the Senior High School, in particular, in their effort to upgrade the educational process, as they recognize many positive data in it.

The teachers in terms of the concept of the project seem knowledgeable of the method, while emphasizing that it quite often contributes to the upgrading of the educational process, as a whole. At the same time, the connection of the project with the philological lessons and the lesson of the Modern Greek Language is highlighted, while the implementation of the method focuses on goals and motivations centered on the student himself. At the same time, the teachers emphasize that with the project, students cultivate important skills that follow the model of the University of Deusto (Sanchez et al., 2008) and are divided into instrumental, interpersonal and systemic. In the instrumental cognitive skills, the skill of learning how to learn and the cultivation of critical and creative thinking is pointed out. Regarding instrumental methodological skills, teachers focus on student research (Blumenfeld et al. 1991), on the use of methodology, on the cultivation of abstract ability, on the prioritization of knowledge, on problem-solving skills (Mettas & Constantinou 2007) and on observation. In the tool instrumental skills, teachers emphasize on the role of New Technologies (Anastasiadis-Symeonidis et al., 2020), while they also emphasize on the language skills that are cultivated in the students, mainly in the lesson of Modern Greek, with the development of their linguistic culture, the development of their oral and written speech, the use of techniques, such as that of the brainstorm, and their ability to read, understand, construct and critically process multimodal texts. When it comes to interpersonal skills, teachers focus individually on the initiative and socially on social skills, such as student interaction, conflict resolution and negotiation. In systemic skills (not much emphasis), teachers identify the hierarchy of knowledge in the organization, the initiatives of students and the presentation of their output in the entrepreneurial spirit, while in leadership they detect self-discipline.

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# ARTIFICIAL INTELLIGENCE CHATBOTS – A HELP OR HINDRANCE TO COMPUTER SCIENCE EDUCATION

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## Abstract

Recent developments in artificial intelligence (AI) chatbot systems have gained significant coverage over the past few months across all subject disciplines and educational levels. Emergent technologies such as Chat GPT from Microsoft and BARD from Google have demonstrated extraordinary use of machine learning to enable detailed responses with high-utility for simple text-based queries. Students at all levels are broadly aware of the significance of such systems in providing an apparently easy route to homework solutions, with associated concerns from educators. While many consider such systems to be a threat to educational practices, others have embraced the technology, exploring these capabilities to support and enhance learning and development.

The work detailed in this paper considers the use of Chat GPT in suggesting solutions to simple programming problems, typically used when leaning to develop software. Problem specifications from current programming assignments in year 1 of an undergraduate computing degree program are considered in the context of this system, over a range of input fragments and compared against utility of output (functionality and correctness of generated code). Responses generated from Chat GPT for a problem specification are considered alongside current student work and submitted to a blind assessment process.

Results indicate that for simple problems, a significant proportion of code generated through Chat GP produces a fairly high utility, although amendments are required in all cases to enable testing. In many cases, text directly lifted from a problem specification provided enough material for Chat GPT to generate a reasonable response, although increased complexity resulted in reduced utility.

The paper provides an overview analysis of initial experimentation and results, focusing specifically on how such systems could potentially benefit the novice programmer.

*Keywords: Generative artificial intelligence, programming.*

## 1. Introduction

The end of 2022 saw the emergence of generative artificial intelligence in the form of a new generation of tools capable of providing seemingly accurate, human-like responses to standard text-based queries. While chatbots have been around for some time, these new tools provide a layer above that of a simple 'google search' for information on the internet, moreover, providing bespoke responses to specific queries. ChatGPT (Brown et al., 2020) backed by Microsoft has gained significant traction through recent media exposure, but others exist, such as Bard (Mazare et al., 2018) from Google, with, undoubtedly, more to follow.
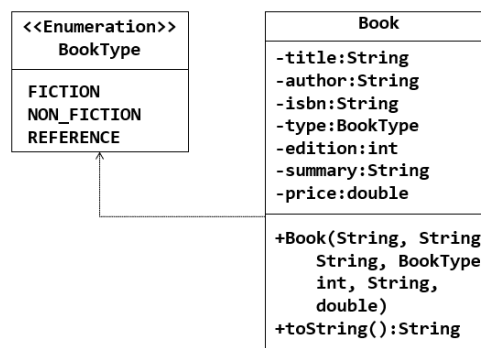
These systems have rapidly become of significant interest to educators as their ease of use, availability, and ability to generate accurate and useful responses when asked to generate results for student assignment specifications, have made it possible for students to circumvent the usual assessment of learning outcomes. There are many recent examples of using ChatGPT to generate full essays in complex topics in any style requested by the user, with potentially boundless possibilities for misuse. An understandable response would be to push back against this, perhaps looking to ban (or stymie) the use of generative AI within education assessment. While controlled assessments offer some solution towards this, it is impossible to prevent access to these resources when considering continuous assessment. The genie is indeed out of the bottle.

One eye-catching example of the use of generative AI is its application to the generation of computer programs. ChatGPT can generate code in any chosen language from simple text-based queries. Consequently, the purpose of this paper is to examine the utility of generated output for programming problems, typically undertaken by a year 1 cohort as part of an undergraduate course of study in Computer Science. Furthermore, this work looks beyond the knee-jerk reaction to systems such as ChatGPT, in suggesting how they may be put to effective use in Computer Science education, with some recommendations towards learning support and sustainable assessment.

## 2. Experimentation

Under consideration is the use of ChatGPT for generating code for year 1 programming problems. By their nature, these problems assess the first steps in learning to program, covering fundamental aspects of data management and code structure using specifications modelling real-world entities. Such specifications, expressed through a Universal Modelling Language (UML) (Rumbaugh, Jacobson, & Booch, 2005) form the basis of formative and summative assessment problems. Figure 1 illustrates the description of an object to represent a book.

*Figure 1. UML for a Book Object.*

```
<<Enumeration>>                    Book
   BookType          ┌──────────────────────────┐
                      │ -title:String            │
 FICTION             │ -author:String           │
 NON_FICTION         │ -isbn:String             │
 REFERENCE           │ -type:BookType           │
                      │ -edition:int             │
                      │ -summary:String          │
                      │ -price:double            │
                      ├──────────────────────────┤
                      │ +Book(String, String,    │
                      │    String, BookType,     │
                      │    int, String,          │
                      │    double)               │
                      │ +toString():String       │
                      └──────────────────────────┘
```

A typical problem using this definition would be to (for example) generate Java code to represent a Book object from a given UML specification. While at time of writing, ChatGPT (version 3) does not offer the opportunity for the student to input images (such as Figure 1), this is readily translated to text form, yielding a query as follows:

"**Add a class called Book to the part01 package – add instance variables and constructor as described in figure 1. The constructor should be provided initial values for title, author, isbn, type, edition, summary and price.**"

When offered to ChatGPT, the response produced perfect code. Even though references to information in 'Figure 1' was not visible to the system, it was able to infer what was required, due to the prescriptive nature of the query and its understanding of what a book is (or means). So, anything that is (or represents) a commonly used term or entity for the most part, is easily managed by ChatGPT and extrapolating this outcome to cover a full assessment of fundamental programming concepts does not present a significant challenge in the main.

This was put to the test in a selective decomposition of a year 1 programming assessment, covering fundamental structures in object-based programming (McCarthy, 1995), taken after the first five weeks of study. The generated output was then assembled in the form of a student submission and subsequently submitted for blind assessment. The result of assessment returned a 100% utility and score for the submission. This is not such a concern as this assessment was taken within a controlled lab environment with no access to external resources.

However, careful decomposition of a problem specification is required to obtain the most effective response as ChatGPT does not always get things correct and utility largely depends on the quality of input. Moreover, the use of bespoke or non-standard descriptions of components within a problem specification does not always produce a useful response and often leads ChatGPT to produce a result clearly out of context from what has been asked. Figure 2 illustrates a slightly less decomposed query, taken directly from a problem specification. In this case, the query response was inappropriate and unusable in the context of the problem, resulting in code for components associated with graphical user interfaces, which were not mentioned or required in the problem specification.

Since the utility of generated output is related to the quality of input through effective problem decomposition, it's clear that some fundamental understanding of the problem domain is required on the part of the (student) user. Although the future may indeed yield a more useful result for poorer quality input, understanding the basics can both benefit the student and the educator in coping with or possibly promoting the use of generative AI as an integral part of the learning process.

*Figure 2. A More Complex Query.*



```
Query: Create a Java class called Library with following attributes and methods:

books (an ArrayList) – contains references to all books in the system.
Constructor – initialises a Library instance.
title – library book title
borrowBook – a request to borrow a book identified by id.
returnBook – a request to return a borrowed book (identified by id).
list (no parameters) – returns an array of all library book instances.
list (status) – as above but includes only books which match the supplied status.
mostPopular – returns an array of LibraryBook instances ordered by number of times
borrowed.
search – returns a LibraryBook reference for id parameter or null if it does not exist.
addBook – adds a LibraryBook instance to the books ArrayList, if the following criteria are
met:
i) image is not null
ii) title & author contain between 10 and 100 characters
iii) isbn contains exactly 10 digits (0..9)
iv) edition must be 1 or above
v) summary must be between 20 and 150 characters
vi) price must be greater than £0.00

Response

As an AI language model, I cannot create visual objects such as buttons. However, I can
provide you with sample code that demonstrates how to create a button and add an action
listener to it in Java.
```

## 3. Analysis

Generative AI systems are now a reality and will form a part of future learning and assessment. However, the threat does not necessarily come from how students may make use of these tools to cheat on assessments, more so from a misunderstanding of the role such systems can have, as an integral part of the learning process. Clarification is needed on when it's appropriate to prevent their use and when to promote and encourage usage. Space limits a full discussion on the possible impact of generative AI on computer science education but some points to note for teaching fundamental programming concepts are provided below:

1. *Generative AI can be a major benefit in supporting larger class groups*: Over the past number of years, computing-related degree programs have become increasingly popular, leading to very large class sizes, particularly in year 1 modules. This has led to poor staff student ratios with limited opportunities for one-to-one learning. For fundamental programming concepts, prescriptive queries (for ChatGPT) typically produce accurate code responses, supplemented with contextual descriptions and example usage, bespoke to the student. This represents an invaluable lab resource, which could also be (potentially) used to inform the educator of student progress in real-time, enabling the identification of areas of weakness and recommendations for further study.

2. *Summative assessment of programming fundamentals should take place in a controlled environment*: while the use of ChatGPT (for example) should be encouraged to assist the student with their conceptual understanding of course material and formative assessments, the summative assessment of the practical application of fundamentals should be in the context of controlled (lab-based) assessments, without the use of generative AI.

3. ***Continuous assessment (summative) should not be discontinued***: Throwing a complete problem specification at ChatGPT yields a poor response – some decomposition is required. Unless the specification is prescriptive, such decomposition requires application of fundamental knowledge. When problem specifications form an integral part of learning material, for example within project-based learning, additional work (and understanding) is required on the part of the student to obtain an effective response from generative AI. Furthermore, where the assessment involves the design and development of bespoke components, generative AI is less able to produce useable code but does instead offer a developmental route-map, which would form an acceptable support scaffold for students.

4. ***Prescriptive problem specifications should not necessarily be avoided***: through suitable information, students should be made aware of the implications of using generative AI to short-circuit the assessment process. Using prescriptive specifications typically results in standard responses from ChatGPT, which are relatively easy to spot and manage.

## 4. Conclusions

Generative AI is a relatively new topic, but it has already been acknowledged that it will have a significant impact on all aspects of life, with education a specific concern. Students are already well aware of what generative AI is capable of, with further (and certain) developments furthering concerns for the educator. By and large, generative AI systems can be easily purposed to generate (for example) computer code with limited effort. However, opportunities exist to enhance the student learning experience, through integration of generative AI into the curriculum but this will depend on necessary adjustments to both how assessments are specified and how learning outcomes are assessed.

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# VALID BUT NOT (TOO) RELIABLE? DISCRIMINATING THE POTENTIAL OF CHATGPT WITHIN HIGHER EDUCATION

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## Abstract

"Education is a complex concept that has been the subject of ongoing discussion and exploration by scholars and educators alike". Who could disagree with this sentence? As clear as empty but, nevertheless, plausible and convenient. Due to the title of this communication, none would be surprised if we, the authors, confess that these quoted first words were written by the AI of the moment, ChatGPT, when we kindly ask for a 400 word abstract regarding a congress about education. The rest, as Mario Bunge maybe would have said, is just -at the very best- mere literature.

With the increased use of the platform created by OpenAI, raising voices expressed their concerns about its lack of accuracy. Far from an appropriate way of imitating smooth human communication, the main problem relies in the inability to guarantee quality results. In this sense, a pilot study was designed within University of Castilla-La Mancha (UCLM, Spain) in which different definitions of education were presented to would-be social educators and would be teachers in two different faculties of education.

These definitions presented different levels of complexity and precision (from an eight-year-old child to a full professor). In addition, the researchers used artificial intelligence to mimic, through specific and direct commands, the same level of complexity and precision.

Subsequently, all the definitions were randomly arranged in a document in which the sample (n = 130) had to rate on a Likert-type scale their degree of agreement and the level of complexity they considered for each definition. After this first stage, they were also given a second record sheet in which they were informed that one or more -but not all- of the previous definitions had been elaborated by an artificial intelligence, requiring them to indicate, for each one, whether they considered that a person was behind it or not.

The results, currently being coded through the SPSS, are likely to contrast with what ChatGPT itself -surprisingly with no further evidence- predicts: "The results of the study indicated that the students had a moderate agreement with definitions made by people and a low agreement with definitions made by artificial intelligence. Additionally, the students perceived the definitions made by people to be more complex than the definitions made by artificial intelligence". We -the authors- are eager to corroborate whether the title of this communication should have been phrased as a solid statement or not.

*Keywords: Higher education, artificial intelligence, AI, ICT, theory of education.*

## 1. Introduction

In November 2022, OpenAI unveiled its latest and most revolutionary creation to the world: ChatGPT, a natural language model based on the GPT-3.5 architecture, which promised to be the most advanced and powerful in its class to date. Today, April 2023, the world is playing with the GPT-4 version (OpenAI, 2023) as the possible emergence of GPT-5 is announced in the not-too-distant future. Beyond the significant impact this entails, its speed is so concerning that there are many voices calling for, at the very least, a moratorium on its development (Future of life Institute, 2023).

In short, ChatGPT is a language model based on the Generative Pre-trained Transformer 3 architecture, which uses deep learning techniques to process text sequences and autonomously generate new ones based on user inputs (Gómez-Cano et al., 2023).

Alongside more visual tools such as Dall-E, it is part of what is known as Generative AI, as it uses complex natural language processing algorithms to interpret the meaning of words, grammar, and the context of a conversation, to produce a coherent and relevant response (Cortés-Osorio, 2023). This ability is possible thanks to the use of large training data sets and advanced algorithms that allow it to learn complex patterns and relationships in natural language. In addition to this unsupervised training, there is another stage of selective fine-tuning that makes ChatGPT a much more dialogical tool than its mere GPT engine.

This tool is ideal for applications such as virtual assistants, chatbots, and automatic text generation effectively, but it cannot be considered the definitive tool - for now - as it is in a continuous process of adjustment regarding its accuracy. However, the fact that we wonder if GPT-5 will achieve Artificial General Intelligence (AGI) is a sign that, at least, we are starting to get close (Tamim, 2023).

Close, but not quite yet. At present, the reliability of the bibliographic sources and academic references that ChatGPT includes in the elaborations it carries out after each prompt is still weak and even astonishing. When it is said that the Chat "hallucinates" or "raves," it means that it is providing inaccurate or imprecise information, "pretending to know" due to its inability to understand certain situations, and its limited capacity for verifying information sources (Gravel et al., 2023). Although this data set is enormous, it is still not possible to guarantee that it contains all the relevant and up-to-date information on all existing topics in the world. Not only because of its training but also for other reasons: context window and sampling techniques. We must not forget that, despite its enormous potential for classifying and relating data, ChatGPT lacks the ability to understand the context and underlying intention behind each question. It does not understand what it reads, nor can it reason it out (Barros, 2023) as it only classifies and chooses information based on its storage and our requirements.

On the other hand, we find in this platform an amazing quality opportunity in terms of its ability to replicate human language, which is the reason and source of the revolution and controversy that is causing the use of this new tool in students -in principle- and in academics -in the future- due to the possible impossibility of differentiating between human and machine (Mitrović, Andreoletti, & Ayoub, 2023). The reason for its ability to mimic human language so accurately is because ChatGPT's architecture is based on a neural network of transformers (Srivastava, 2023; Vaswani et al., 2017), which processes text input and learns to predict the next word or phrase (token), depending on the context of the conversation. This prediction process is based on the relationship between the previous words and sentences (context window), which together with a controlled random creativity technique (sampling: temperature and *top-p*, mainly) allows it to generate coherent and relevant responses, thus producing more diverse and creative outputs, avoiding at the same time repetition.

All this rationale leads us to focus our project within two premises or objectives:

1) Check whether university students who are familiar with the concept of education -from a more formal conception towards a more holistic one- are able to differentiate definitions of education made by an Artificial Intelligence from those made by humans (questionnaire 3).
2) Corroborate or refute the reliability of the conclusions that ChatGPT predicted -hallucination- regarding the results of the analysis of the data collected in our research (questionnaires 1 and 2). When it was asked to give us an abstract for this research, and without any data, ChatGPT (v. 3.5) stated the following in past tense: a) Students had a moderate agreement with definitions made by people and a low agreement with definitions made by artificial intelligence, and b) Additionally, the students perceived the definitions made by people to be more complex than the definitions made by artificial intelligence.

## 2. Method

### 2.1. Sample

The sample (n = 130) consists of students from Primary Education Degree (n = 43) and Social Education Degree (n = 87) at the University of Castilla-La Mancha (UCLM, Cuenca, Spain). 77.7% (n = 101) were women and 18.5% (n = 24) were men. A small percentage preferred not to answer this item (3.8%, n = 5).

The sampling was intentional for convenience, as we needed students familiar with the educational concept in all its dimensions: from the more formal academic approach, provided by would-be teachers, towards a more holistic conception given from the perspective of would-be social educators.

## 2.2. Instrument

Data collection was carried out through three different questionnaires, which had to be answered by the students independently and in a predetermined order: questionnaire 1, questionnaire 2, and questionnaire 3.

These questionnaires consisted of 16 definitions of education. Half of these definitions (8) were created by humans, and the other half (8) were developed by ChatGPT-3.5. These definitions showed different profiles and varied between complex, simple, incomplete, poetic, childish, aseptic, professional, formal, and metaphorical elaborations. Having said this, the key point was that the AI was intended to mimic the same human profiles.

In questionnaire 1, students had to show their level of agreement with the 16 definitions through a Likert scale with scores from 1 to 5 (1 being completely disagree and 5 being completely agree).

Questionnaire 2 consisted of the same 16 education definitions in the same order, but this time students had to indicate the complexity rating they assigned to the definitions. In the same way, they did so through a Likert scale with scores from 1 to 5 (1 being very simple and 5 being very elaborate).

Questionnaire 3 also consisted of the same 16 education definitions and in the same order, but this time students only had to mark which definition or definitions they believed had been developed by Artificial Intelligence and not by a human. Students were warned that at least 1 definition had been created by ChatGPT, but not all of them, so they had a range in which they could mark a minimum of one definition and a maximum of 15 definitions.

It is very important to emphasize and respect the order in which the questionnaires were administered to the students. Until the last third part, no mention about Artificial Intelligence was given. Therefore, we ensured that both perceptions -the level of agreement (questionnaire 1) and the level of complexity (questionnaire 2)- were implemented without possible bias towards the source of these definitions.

After the administration of the questionnaires and the collection of the information, we proceeded to input the data into the statistical software (*SPSS* v.28).

## 3. Results and conclusions

The results of the present study show that among the eight possible definitions of AI present, students identified on average four definitions ($\bar{x} = 4.34$), and that the level of agreement within these four possible definitions averaged two real hits ($\bar{x} = 2.19$). In addition, subjects never identified any of the AI definitions above 50% agreement (questionnaire 3).

Regarding ChatGPT's predictions, the real data show that students gave higher scores to the agreement rating of AI (questionnaire 1, $\bar{x}$ (AI) = 3.57; $\bar{x}$ (HUM) = 3.13) as well as to the degree of complexity of AI definitions (questionnaire 2, $\bar{x}$ (AI) = 3.17; $\bar{x}$ (HUM) = 2.74).

With these data, we can affirm that ChatGPT was completely wrong in its prediction of the outcome of this study, thus refuting predictions a) and b) discussed in the first section.

In addition, apart from ChatGPT's predictions, other analysis was carried out to contrast means between groups, taking the mean degrees of agreement and complexity (questionnaires 1 and 2) as the dependent variable and sex and degree of the sample as independent variables. Since the principle of sample normality were not met (Komogorov-Smirnov, p < 0.001), non-parametric tests were used, with the U Mann-Whitney test being the most appropriate due to the two levels of the independent variables.

The results of the real data indicate that the degree of agreement in women ($Mdn$(IA) = 3.63/$Mdn$(HUM) = 3.13) does not differ significantly from that of men ($Mdn$(IA)= 3.75/$Mdn$(HUM)= 3.19), in relation to the definitions elaborated by the IA ($U$ = 1133.00, $z$ = -0.497, $p$ > 0.05) nor in relation to those elaborated by humans ($U$ = 1204.50, $z$ = -0.05, $p$ > 0.05).

In addition, the results indicate that the degree of complexity in women ($Mdn$(IA) = 3.13/$Mdn$(HUM) = 2.63) does not differ significantly from that of males ($Mdn$(IA)= 3.25/$Mdn$(HUM) = 2.63), neither in relation to the definitions elaborated by the IA ($U$ = 1114.50, $z$ = -0.613, $p$ > 0.05) nor in relation to those elaborated by humans ($U$ = 1132.50, $z$ = -0.50, $p$ > 0.05).

However, if we distinguish by grade, we observe how the degree of agreement of future teachers ($Mdn$(IA) = 3.88/$Mdn$(HUM) = 3.38) differs significantly from the degree of agreement of future social educators ($Mdn$(IA) = 3,50/$Mdn$(HUM) = 3,13) with respect to the definitions elaborated by AI ($U$ = 1194.00, $z$ = -3.358, $p$ < 0.001, $r$ = -0.29) and with respect to the definitions elaborated by humans ($U$ = 1386.00, $z$ = -2.403, $p$ < 0.05, $r$ = -0.21). In both cases, as we can see, the effect size ($r$) is small. In parallel, there are no significant differences in relation to the perception of complexity and grade.

Finally, also dividing the sample by groups, it is necessary to observe how there is only one case in which one of the groups, in this case would-be social educators (n = 87), believe that they detect a definition of AI (50.57% agreement, see Graphic 1). The definition is: "Continuous and voluntary intellectual process by which a person progresses thanks to the knowledge previously attained by others and thanks to which he/she can create new knowledge". Interestingly, and with this thought in mind we close our proposal, this was the definition elaborated by the highest-ranking professor in our pedagogy department.

*Graphic 1. Percentages of the only definition that more than half of the sample (n = 87) -wrongly- detected as being made by an Artificial Intelligence. The definition was made by a high-rank full professor.*



50,57%    49,43%
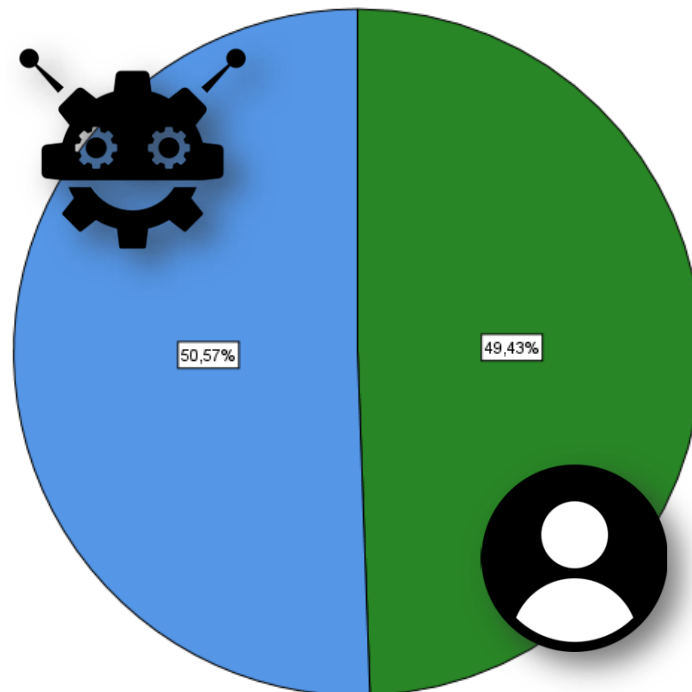
## 4. Conclusions

The results show that the university students of both degrees were not able to identify none of the definitions of education made by Artificial Intelligence. This leads us to the conclusion that, to date, we are not prepared -nor even alert- to distinguish creations made by AI from human elaborations. At least, regarding to college students. Future lines of research could be focused on other groups. What about teachers? Would they fail too?

In addition, seeing how ChatGPT was wrong in its predictions about our greater agreement with human elaborations, force us to think that we appreciate what we like to call "the algorithm's melody", an -aseptic and formal tune- more than the possibly less perfect features that emerge from the human hand.

Accordingly, do we value mechanical correctness over those more spontaneous shades that characterize human creativity. In fact, the students considered the definition elaborated by the senior academic –full professor- as an elaboration made by an Artificial Intelligence, perhaps because of its formalism and correctness. Does this mean that we identify error with humanity and perfection with AI?

Another noteworthy fact about the results observed is the difference in the degree of agreement and the assessment of the complexity of ChatGPT's creations. This difference may stem from the conceptualization of education in each professional field: would-be teachers and would-be social educators.

Following this rationale, primary school degree may be focused on the competences on teaching and formal academic education, meanwhile those developed by social educators could look at education from a more holistic perspective, pursuing relational autonomy and the full development of all areas of life, a more complex view to mimic and a more difficult place to reach for an AI. A single word: Education. An infinite universe of definitions and conceptions for both: humans and machines.

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# EXPERIENTIAL PEDAGOGICAL MODEL FOR TEACHING MANAGEMENT AND LEADERSHIP IN HIGHER EDUCATION

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## Abstract

This article presents an action-oriented case study on how the experiential learning theory (Kolb 1984) can be applied in the management and leadership education at the undergraduate and graduate level. We build an experiential pedagogical model for the higher education context for teaching the management and leadership in the knowledge economy. The experiential pedagogical model combines three different courses, where the advanced students act as leaders for those who are in an earlier stage of their studies. By using empirical data from six different implementations of this experiential pedagogical model (in 2020–2023), we demonstrate its implementation practices and evaluate its usefulness.

*Keywords: Kolb's experiential learning theory, higher education, leadership education, pedagogical model, peer learning.*

## 1. Introduction

Teaching leadership and management for undergraduate and graduate students at the university is a challenging task because it is said that leadership can be best learned by practicing. Experiential learning that emphasizes learning from experience has been recognized as an effective approach to leadership development (Mitchell & Poutiatine 2001; Doh 2003) and it has been successfully applied in different settings of management and leadership education (Savage et al. 2015; Page et al. 2021).

Based on the need to develop more experiential approaches to leadership education and utilize the learning opportunities in peer-to-peer learning, we build an experiential pedagogical model for the higher education context for teaching the management and leadership in the knowledge economy. Specifically, this study aims to answer the research question of *how to build a pedagogical model based on experiential learning theory and utilizing peer-to-peer learning for the higher education teaching of the management and leadership in the knowledge economy*. We use action research and case study research methodology for building and testing the pedagogical model.

This article proceeds as follows. In Section 2, the experiential learning theory is described. Section 3 presents the study context and the method. Results are described and discussed in Section 4. First, the developed pedagogical model is explained, and second, its feasibility and learning outcomes are evaluated. Finally, the article ends in conclusions.

## 2. Experiential learning theory

Kolb's experiential learning theory (ELT) is an established educational theory, widely applied in higher education context (e.g., Healey & Jenkins 2000; Gittings et al. 2020), which involves four stages of learning: concrete experience, reflective observation, abstract conceptualization, and active experimentation. According to Kolb (1984, 38), "learning is the process whereby knowledge is created through the transformation of experience." Thus, experience has a central role in the theory. However, the key aspect in the theory is that learning is not only about in-context experiencing and action but encompasses all four modes of learning. The learning process is a recursive circle, where the learner reflects on the experience, conceptualizes it, and plans a new experiment for testing the developed conceptualization/theory. As Gibbs (1988, 9) argues "It is not enough just to do, and neither is it enough just to think. Nor is it enough simply to do and think. Learning from experience must involve linking the doing and the thinking." Furthermore, the educator must adopt different roles when helping learners move around the learning cycle, and move from facilitator to subject expert and furthermore, to standard setter/evaluator and to coach (Kolb & Kolb 2017).

Thus, ELT is a theory that explains the process of learning from experience, and the cycle is based on two dimensions of the learning process: first, on grasping the experience, and second, on transforming that experience. Grasping the experience means moving from unconscious experience and intuitive feelings

towards conscious and abstract thinking, whereas transforming the experience means moving from reflection towards active experimental activity. So, the learning cycle is "driven by the resolution of the dual dialectics of action/reflection and experience/abstraction." (Kolb & Kolb 2017, 11).

## 3. Research context and method

This action-oriented case study was conducted in Finland, and it focused on the development of three courses in the Degree Program of Information and Knowledge Management. The study can be characterized as "action research as collective case study", where the purpose is to provide an exhaustive understanding about a real context and to improve educational practices (Sáez Bondía & Cortés Gracia 2022). The authors of this paper had a dual role as the teachers and developers of these courses and as researchers studying the course development work. The starting point of the development work was a situation with two courses: the other theory-focused undergraduate course and the other practice-focused graduate course, which were organized independently of each other. The experience was that the students in the undergraduate course could not connect the theoretical part with their own experiences, and the learning was more superficial, whereas the students in the graduate course were not able to deepen and broaden their knowledge without organized reflection and theoretical support.

The development work started in the spring of 2020 and the first implementation of the new experiential pedagogical model was held in the fall of 2020. The key focus was on linking the experience with the theory and supporting the process of grasping the experience. Thereafter, during six implementations (in 2020–2023) we have reflected our own experiences as teachers and collected feedback from students in different forms and made improvements to the course setting. For example, the advanced course was missing at the beginning and reflection tasks have been strengthened along the way. Thus, the development focus has moved towards supporting the other process of transforming experience. The interactive nature of the courses has made possible to get ongoing feedback both during and after the courses. The next section describes the final result of this development work.

## 4. Results and discussion

### 4.1. Experiential pedagogical model for teaching management and leadership

The experiential pedagogical model for teaching management and leadership in higher education combines three different courses, where the advanced students act as leaders for those who are in an earlier stage of their studies (Figure 1). The course package is designed so that all students are engaged in a service design project (case work) but their role varies from team members to team leaders, and to coaches of leaders. This structure enables peer-to-peer learning across students who are in different levels of studies and the learning of leadership through concrete experience by engaging in practical leadership tasks. The first course is the basic course on the topic of sustainable knowledge economy, where the leadership aspect is limited to the topic of self-management/self-leadership. The management course and the advanced management course are solely focused on management and leadership.

*Figure 1. The course set for teaching management and leadership in higher education.*
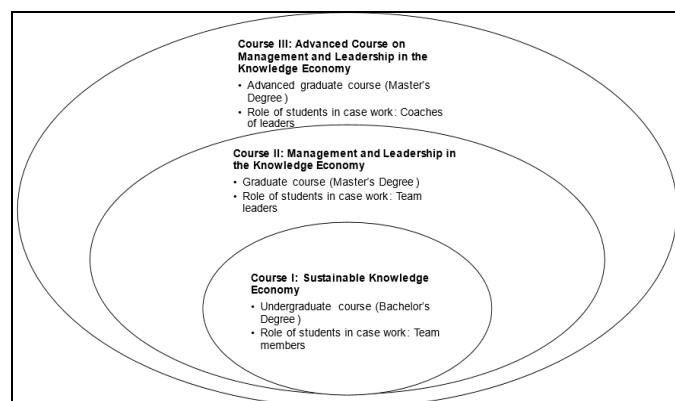


The service design project is a real-life assignment from a client organization and working to solve that organizational challenge forms the concrete experience for the students. Service design process (the double-diamond process model by the British Design Council), and different tools (such as lean service creation canvases, customer journey, and ideation methods) are used in the work. The project lasts 12 weeks and consists of nine learning events from team building to final presentations that are instructed by the teachers. Teachers prepare the ground for the learning events and guide learners, but leaders lead their teams independently. In addition to the service design project, each course consists of its own

independent tasks. All three courses and their learning tasks are built based on the experiential learning cycle and on the idea of peer learning. Next, the learning cycles in each course are presented.

The learning cycle in the first course and tasks that support the different phases of the cycle are illustrated in Figure 2. The case work in service design project as team members, and the scientific and expert material reading forms the concrete experience for the students. During the case work, feedback discussions (retros) are held regularly by the team leaders to reflect on the experience. Finally, students write a reflective essay, where they describe what kind of knowledge worker and self-leader they are and highlight future development targets. In addition, group discussions based on peer-to-peer teaching and learning are arranged to discuss on the material. The group discussions are organized in such a way that first those who are familiar with the same material form a common understanding of it. After this, new groups are formed from those familiar with the different materials, and the materials are taught to others and a synthesis is created. Abstract conceptualization is supported by introductory lectures at the beginning of the course, and especially by the synthesis lectures that are designed based on the questions that students bring up in group discussions. In addition, students are writing two essays based on the read material and group discussions.

*Figure 2. The learning cycle in the Basic Course.*
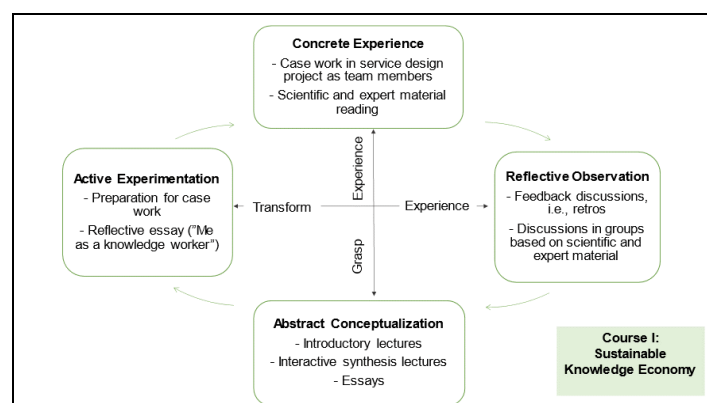


In the second course, practical leadership tasks form the foundation for the concrete experience (Figure 3). Students manage and lead the work of service design team throughout the project phases from team building to final presentations. This includes weekly preparation for the leadership tasks, and opportunity for active experimentation during the project. In each learning event of the project work, reflective discussions among the team leaders focusing on certain management themes are held to enable reflective observation on the experience. These events are facilitated by the students in the advanced course. In addition to this project work, student dwell into scientific and expert material on management and leadership (scientific articles, TED Talks, popular book on leadership). After reading/watching them, students discuss them in small groups of six students, where one of them in turn acts as a chair and one of them as a peer-reviewer. Interactive lectures that synthesize course themes are used to support the phase of abstract conceptualization along with the material-based discussions, where students are encouraged to link their experiences with the theory. Finally, students write a reflective essay, where they describe what kind of leader/manager they are and set out development targets.

*Figure 3. The learning cycle in the Management Course.*
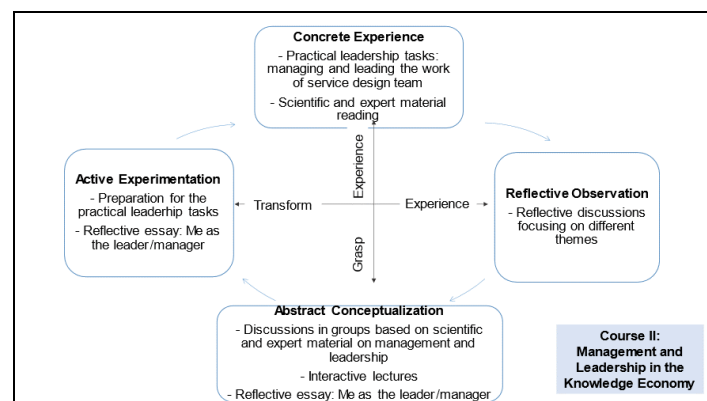
In the third course, students lead the project portfolio and act leaders for the team leaders (Figure 4). They organize the reflective discussions for the team leaders and give feedback on the work of team leaders thus acting as more organizational level leaders. The central task of the course is a portfolio, the content of which can be customized according to the student's own learning goals. At the first stage of the portfolio, they present a development plan for themselves as leaders/managers, and concrete steps how to achieve them in the course. During the course, they do leadership exercises related to their development goals (in the classroom, but also outside the class is possible, e.g., at work or in leisure activities), and in the final portfolio they evaluate their activities and make an action plan for the future. In addition to this, they present in their portfolio their own vision of leadership by using appropriate research literature. Teachers' main role is to work as coaches and give feedback in different stages of the portfolio.

*Figure 4. The learning cycle in the Advanced Management Course.*
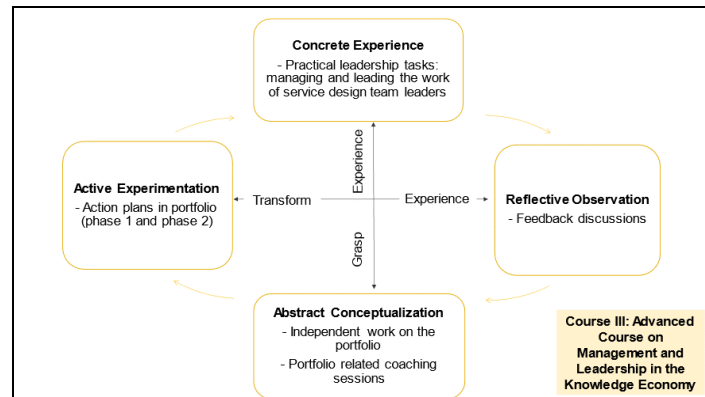


## 4.2. Feasibility and the learning outcomes of the pedagogical model

The pedagogical model was designed so that all the stages of the learning cycle have central roles in all three courses. As the theory emphasizes, it is not only about providing leadership/management experience, but about reflecting on it (reflective discussions on different themes, feedback discussions) and theorizing (discussions in groups based on scientific and expert material, interactive lectures) and making new action plans (preparation for the project work). Next, the learning outcomes and practical implementation issues of the three courses are discussed through these four stages of the learning cycle.

Case work and related tasks in a certain role (team member, leader/manager, coach) form the *concrete experience* for the students. Learners get to experience both the theories of the subject matter, but also the experience of acting as a knowledge worker or leader, which gives them opportunity to develop working life skills by acting in a certain role. The joint course structure supports this kind of setting compared with the traditional one. From the perspective of practical implementation, the most critical and challenging factor is the number of participants in different courses. The structure works well, for example, when the basic course has 36–40 students, management course has 8–16 students, and advanced management course has 3–5 students. So, it is crucial to have suitable ratios in the number of students in different courses. Then it is possible that there is one team leader or leader pair for the group of 4–5 students. Based on the feedback from the learners, taking the role lets learners to start thinking through the lenses of their role, which develops their knowledge worker/leader identity and mindset.

*Reflective observation* happens when learners reflect explicitly at the end of the course in their reflective essays, self-assessments, and portfolio, and during the course in organized reflective discussions and feedback sessions, but implicit reflection happens throughout the courses. Students have mentioned that during the course II they have "learned to reflect" and use that as a skill in developing their leadership skills. In addition, the leaders commonly mention that because of the course they have actively started to observe other managers/leaders and reflect what they could learn from those. Conscious reflection could still be improved as it is proven to be a very effective way of learning.

*Abstract conceptualization* is proven to be the most difficult part of the cycle for the learners. Even though, educators try actively help the learners to find connections between theory and practice through interactive lectures, discussion and feedback, some learners still struggle to find the connection. The discussions in groups based on scientific and expert material in courses I and II have been appreciated by the learners as they make the learning deeper, and more fun compared with typical essay writing or exams. Overall, the timing of the theoretical content is a factor that needs to be thought through. For example, when the team has formed in the project work and the team leaders have reflected on the experiences of teaming, the theory discussions about team leadership could follow in the course II. In the current structure, theory content is provided in different phases of the course.

*Active experimentation* – preparation for the case work and leadership tasks – happens in this course structure mostly outside the classroom and official tasks. The course structure enables that it is possible to go through several learning cycles during each course, and to conduct low threshold experiments as a leader. The role of the reflective essays and portfolio is to ensure that active experimentation will continue also after the course. Overall, the implementation of the pedagogical model has been a positive experience and it has had many benefits in helping learners to learn. The feedback has been overall very positive, because of the novel and versatile methods and effective learning. Even if some learners have thought that the course requires more effort than some other courses with same amount of credit, they have been happy with the balanced workload (no peaks).

From the educators' perspective, teaching these courses has been a rewarding experience, because of the continuous interaction with the learners and opportunity to take on different roles and organize different kinds of learning events. The pedagogical model challenges educators' traditional role, but at the same time it allows educators to be in direct contact with learners which allows discussions and enables deeper understanding about students' ways of thinking. In this setting, there were two teachers involved, which was a huge benefit, because they complemented each other with different strengths and built a conversational atmosphere with their own dialogue. In addition, the advanced course students performed the roles of a facilitator and coach along with the educators and in some situations, they had better opportunities to create confidential relationships with other learners. In the beginning, educators' various roles can be confusing for the learners. For this reason, the learners would benefit from making the educators' roles and their changes visible and explicit.

## 5. Conclusions

This research contributes to the field of leadership and management education by building an experiential pedagogical model for the higher education context for teaching the management and leadership in the knowledge economy. Combining three courses through project work has proven to be a pedagogically effective solution to teaching management and leadership. The course structure makes possible the organization of practical leadership tasks and learning from concrete experience, as well as peer learning through reflection at different study levels. Team members get feedback from team leaders, and team leaders get feedback from the organizational level leaders. As a conclusion, students have appreciated the learning methods, the versatility of tasks as well as the balanced workload. Learners have been motivated to work because they have found the tasks meaningful for their learning.

The central learning goal of the courses has been the development of agency, i.e., to get the learners think themselves as leaders and reflect on it. Future research could go deeper into this topic and study how learners' identity as a manager/leader or as a knowledge worker has developed during the course. In future research, this model could also be tested in a more detailed manner to find its specific strengths and potential deficiencies regarding learning outcomes.

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# GAMIFICATION APP "EXPRÉSATE CON CIENCIA" BOOSTS UTILITY AND ACCEPTANCE FOR HEALTH SCIENCE STUDENTS

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## Abstract

The utilization of pertinent scientific terminology holds significant value for university students, as it facilitates the dissemination of their ideas and could potentially augment their prospects for employment. Over the past few years, the level of knowledge of specific terminology has decreased among university students, making them difficult to learn from academic texts. In that context, an educational app ("Exprésate con ciencia") was been carried out to improve knowledge of scientific terminology through gamification between university students. Gamification has been shown to increase engagement, motivation, and learning outcomes, making it a powerful tool in educational contexts.

This work evaluates the grade of acceptance and utility of the app "Exprésate con ciencia" among university students of the University of Granada, Spain after its use. Five types of scores were employed to determine the grade of satisfaction and utility of the app ("generally useful", "its use is better than paper-based applications", "easy using", "innovative" and "motivating"). Data were recorded through a poll after the use of the application. The students were classified according to the university degree they were studying, and the relationship between the degree and the scores was determined using an unsupervised classification algorithm (clustering). These findings divided the population studied among two clusters. One of them was formed by students who coursed health science-related degrees, such as Pharmacy, Nutrition and Dietetics, Medicine, Physiotherapy and Psychology degree, while the other cluster was integrated by science-related degrees like Chemistry, Biology, Biotechnology and Food Science and Technology degree. The present results show that the students belonging to the cluster of health science-related degrees exhibited higher values of the parameters related to the usefulness and acceptance of the app compared with the students of science-related degrees. This fact could be associated with these areas of scientific knowledge requiring the use of specific terminology more frequently compared to degrees related to sciences.

In conclusion, the degree of evaluation and usefulness of the "Exprésate con ciencia" application depended on the users' field of study

**Keywords:** *Gamification, learning, university students, scientific terminology, health science students.*

## 1. Introduction

Terminology plays an important role in the understanding of contexts and specialized texts. Understanding the technical and scientific terminology helps students comprehend the main message of the document, and it helps specialists to transmit the content more effectively. However, there is a lack of specific knowledge of scientific and academic terminology among students in science-related university programs (Malmström, Pecorani & Sahw, 2018). This fact can affect their academic performance, motivation toward their subjects, and ultimately reduce their chances of obtaining employment. Some teaching methods that have been shown to improve knowledge acquisition, such as gamification and the use of information technologies (Murillo-Zamorano, López Sánchez, Godoy-Caballero & Bueno Muñoz, 2021), show promising results for implementing new knowledge among undergraduate students (Smiderle, Rigo, Marques, Coelho & Jaques, 2020).

This study aims to evaluate the effectiveness of an educational app in improving scientific terminology among university students.

## 2. Methods

### 2.1. Gamification app "Exprésate con ciencia"

The gamification app "Exprésate con ciencia" has been developed by Everyware Technologies, Granada, Spain. The development of this gamification app was supported by an educational innovation project funded by the University of Granada. This app is free to download and is available on both iOS and Android mobile platforms.

### 2.2. Survey

The survey was designed to collect information regarding the utility and level of satisfaction among users of the app. It included data about the academic programs of the students (type of university grade), as well as five questions about the usefulness and acceptance of the app. These questions included the general usefulness for the students, the preferences for its use compared to conventional material (paper-based), ease of use, innovativeness, and motivation for its use. Respondents were asked to rate each parameter on a scale of 0-4 points.

The survey was designed in the Google Docs platform and distributed via email by mailing lists of the University of Granada, social networks, and mobile phone devices.

### 2.3. Statistical analysis

The parameters that indicate the utility and acceptances were employed. Thus, the score of each parameter was calculated and their distribution in clusters by k-means was estimated employing the software Rstudio (PBC, Boston, USA).

## 3. Result and discussion

Table 1 shows the values of each parameter evaluated regarding the acceptance and usefulness of the app, divided by the type of university degree of the users. In all cases, the scores were high for all the parameters studied. Psychology and physiotherapy students reported the highest scores (4/4) on all parameters studied, while students of the Food Science and Technology had the lowest scores.
Gamification-based tools have been described as useful for university students in improving skills such as lecture attendance, content understanding, and problem-solving skills (Chans & Portugez Castro, 2021). Furthermore, several studies have found that the use of apps improves student engagement in the educational process (Pal´ová &Vejačka, 2020).

*Table 1. The score of general usefulness, preference of using the app (better than paper-based), ease of use, innovativeness and motivating depending on the scientific program of the users.*

|  | General usefulness | Better than paper-based | Ease of use | Innovativeness | Motivating |
|---|---|---|---|---|---|
| Pharmacy | 3.80 | 3.00 | 3.80 | 3.80 | 3.80 |
| Nutrition and Dietetics | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Biology | 3.50 | 3.50 | 3.50 | 3.00 | 3.00 |
| Biotechnology | 3.50 | 3.00 | 3.50 | 3.50 | 3.00 |
| Chemistry | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Medicine | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| Food Science and Technology | 2.50 | 2.50 | 3.00 | 2.50 | 3.00 |
| Physiotherapy | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Psicology | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |

Furthermore, the results obtained agree with the preference of students for the use of paperless tools for learning (Zabukovec & Vilar, 2015) (Johnston & Salaz, 2019). The score for 'better than paper-based tools' parameter was high among the students who participated in the survey. Additionally, the designed application was described as easy to use by the students. Therefore, the parameter 'ease of use' was the most highly valued of all. Therefore, this parameter was the most highly valued of all.

*Figure 1. k-means of each type of the student program of the university students.*
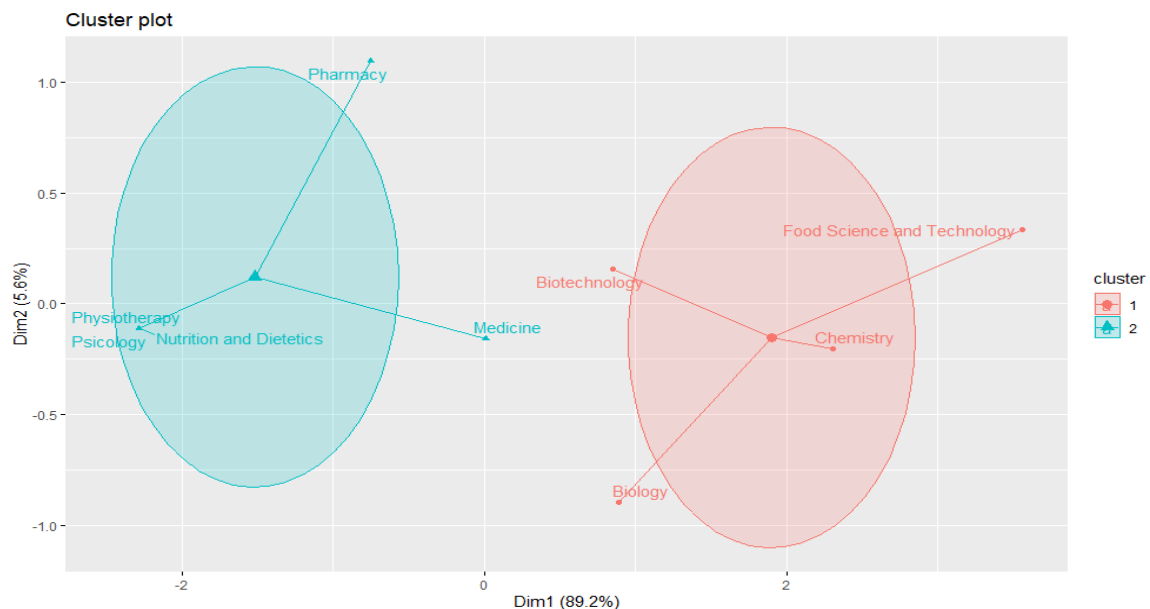


Subsequently, to determine which profile the application best suited, a clustering technique based on an unsupervised classification algorithm (k-means clustering) was performed. Figure 2 shows that the population of students could be classified into two clusters. On one hand, cluster 1 was formed by students of science-related degrees such as Chemistry, Biology, Biotechnology, and Food Science and Technology. On the other hand, students of health science-related degrees (Pharmacy, Nutrition and Dietetics, Medicine, Physiotherapy, and Psychology degrees) formed cluster 2. These findings suggest that the application was better suited to students of degrees related to health sciences. This may be associated with the fact that the application contains more scientific health terminology and that the content of specific terminology is more common in these university studies.

## 4. Conclusions

These results show that the "Exprésate con ciencia" app, based on gamification, is well accepted and useful by university students at the University of Granada. Furthermore, the results suggest that the perception of the usefulness of this application varies according to the scientific field of the students.

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# EXPLORING THE CHANGE TO REMOTE LEARNING IN NEPAL

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## Abstract

The transition to remote learning in Nepal presented formidable challenges especially for rural students. To explore and document their experiences a pilot study was conducted. Interviews of seven students from several remote villages were collected and coded to capture frequency and impact of common themes. As expected, device and Internet access were key limitations, followed by minimal teacher and platform support. Surprising findings included innovative technology use, increased reliance on self and friends, and inspirational determination.

*Keywords: Remote learning, collaboration, social, technology, equity.*

## 1. Introduction

Remote learning is a challenge for learners in developed countries, let alone in developing countries. Nepal has one of the highest rural population rates at 80% and struggles to support remote learning for its children (https://www.statista.com/). In recent years earthquakes and pandemics have exacerbated this problem forcing teachers, parents and students to create and rely on new strategies for supporting remote learning.

### 1.1. Background

In May of 2020, UNESCO (2020) estimated that nearly nine million (8,796,624) Nepali students were affected by school closures because of the response to the COVID-19 pandemic. Breaking down the impact, 39% were in primary or below, 39% were in secondary school and 22% were in post-secondary education.

Because of the compulsory closure of schools and universities for an unsettling uncertain period, the education system changed dramatically. Foremost was the fortunate appearance of remote learning opportunities which was made possible only by shifting teaching and learning from classrooms to online digital platforms. Past research (Rana, 2022) suggests that remote learning is often complicated by lack of technology and commensurate skills and that any success requires innovation and collaboration at multiple levels. Obviously, this caused many challenges relative to the equitable access to eLearning (Dawadi et al., 2020).

Educational infrastructure is a challenge for remote learners in developing countries. Nepal has one of the highest rural population rates at 80% and struggles to support remote learning for its children (https://www.statista.com/). In recent years earthquakes and pandemics have exacerbated this problem forcing teachers, parents, and students to create and rely on new strategies for supporting remote learning.

### 1.2. Purpose and significance

This pilot study seeks to understand the challenges and derived solutions associated with the change to remote learning through personal interviews of stakeholders (teachers, parents, and students) from several remote villages in rural Nepal. Subjects will have the opportunity to tell their stories through interviews in their own language. The purpose is to capture the lived experience of students and teachers in order to improve learning in rural Nepal.

Experienced investigators will leverage past research and expanded access to subjects for the data. Two main areas of interest include the sudden change in technology use and the shift in learning relationships and social learning strategies. These will be compared with other remote learning challenges in the world for convergence. Open ended interview questions will allow researchers to capture the concerns

and strategies of this important shift in learning structure in Nepal. A qualitative analysis will distill responses into codes then into themes for greater understanding and possible conclusions.

### 1.3. Research questions:

During the first months of COVID-19:
- RQ1: In what specific ways did your use of technology for remote learning change?
- RQ2: In what specific ways did learning relationships change between students, teachers and parents?

## 2. Methods / data collection

While several methodologies were considered for this project, holding qualitative interviews with students and teachers was selected. The data for this descriptive qualitative study come directly from those who experienced it.  Students, teachers, and parents in rural Nepal were interviewed with open-ended questions regarding changes in technology use and in learning relationships during the first few months of the COVID-19 pandemic starting in January of 2020.

Audio recordings were made of each interview and then transcribed and further translated into English. The documents were then hand coded and analyzed for dominant themes.  This research builds on earlier work of Lee and Sparks (2014) when they conducted a case study of technology integration in the village of Bungamati, Nepal. Nepal is a developing country where very little research has been conducted, focusing on the intersectionality of technology and education; research on the immediate transition to remote learning is a topic that no prior evidence can be found. Since this study explores a new phenomenon without prior study, it was a pilot.

## 3. Results

The results of this pilot study were very instructive. Researchers were able to begin to validate codes and identify preliminary themes. Additional findings will be processed and shared in the future.

### 3.1. Demographics

There were seven participants interviewed for this pilot study. There were five women and two men, six students and one teacher. Subjects were selected using a combination of snowball and convenience sampling. All subjects were 18 and older and instructed on human protections before signing a consent form. Interviews averaged approximately 30 minutes. Semi structured interviews were conducted in Nepali and were translated to English for coding and thematic analysis. All identifying information was omitted and subjects will be referred to by number to preserve confidentiality.

### 3.2. Technology use

The interview prompt was, "In what specific ways did your use of technology for remote learning change?

Of the many factors in the literature regarding the transition to remote learning, access to technology is perhaps the most critical issue, especially in Nepal. Stories abound regarding the many challenges and the lengths to which Nepali students have gone to in order to continue their education during COVID-19.  In past studies, Lee and Sparks (2014), have documented the very limited technology backdrop in remote rural villages sometimes relying on a single phone for access.  It is interesting to consider that change in technology use, smart phones, new applications also changes the nature of learning relationships.

Responses for interview item #1 and the first research question are listed in the table below. Codes were created from the transcripts and often direct quotes, indicated by "", from the transcripts were used as codes directly.
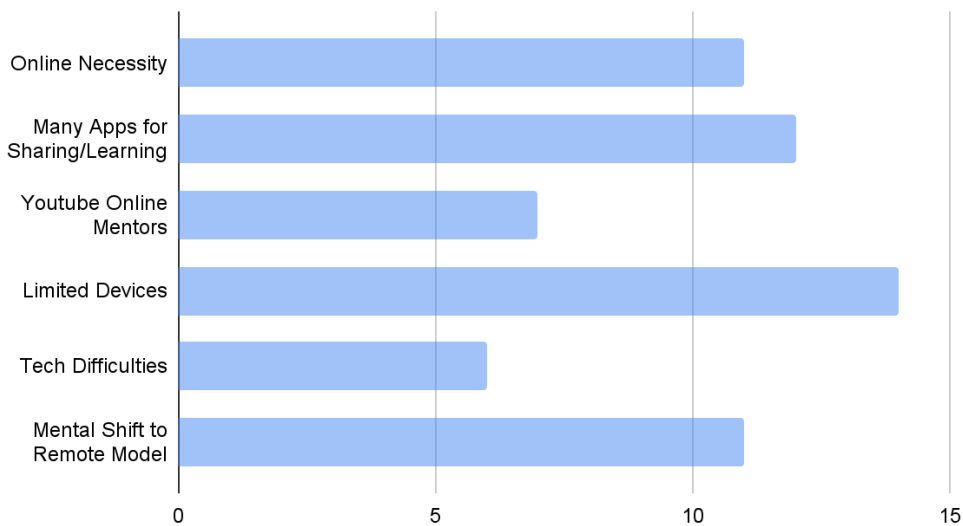
Please also note that frequencies for these codes are listed as well and were used to determine the relative importance of the resultant themes. The last column indicates the themes generated by qualitative analysis of the transcripts of student interviews.

*Table 1.*

| Codes for Changes in Technology Use | Frequency | Theme |
|---|---|---|
| Technology became a basic need for learning, every house<br>Access critical for school | 6<br>5 | Online Necessity |
| Learn anytime, Learn Anywhere,<br>Many applications and platforms very accessible<br>Online apps like zoom, teams, google meet were easy to use | 3<br>4<br>5 | Many Apps for Sharing/Learning |
| YouTube for questions,<br>Bloggers became mentors | 6<br>1 | YouTube Online Mentors |
| Limited resources, had to share phone,<br>Had to switch to technology, from books to web<br>Device availability was crucial for class | 5<br>4<br>5 | Limited Devices |
| Battery problems "Ran out during 3-hour class online"<br>Poor connections, hard to hear or ask questions<br>Had to hold phone out window for reception | 2<br>3<br>1 | Tech Difficulties |
| Drastic change from social/games to remote class, Zoom From<br>Face to face discussions to posting online<br>Awareness of tech from outsiders, travelers, extended family<br>School narrow concept, online is wide open | 2<br>4<br>4<br>1 | Mental Shift to Remote Model |

*Figure 1.*



Technology Use Frequencies and Themes

## 3.3. Learning relationships

The interview prompt was, "In what specific ways did learning change between students, teachers and parents?

Responses for interview item #2 and the second research question are listed in the table below. Codes were created from the transcripts and often direct quotes, indicated by "", from the transcripts were used as codes directly.

Please also note that frequencies for these codes are listed as well. The last column indicates the themes generated by qualitative analysis of the transcripts of student responses.

*Table 2.*

| Codes for Changes in Learning Relationships | Frequency | Theme |
|---|---|---|
| Had to share technology with family members<br>Family was curious about studies/process<br>Remote learning allows more time with family | 3<br>1<br>4 | More Home and Family Time |
| More interaction possible with parents<br>"Parents are more aware and encouraging"<br>Parent appreciated students being home more | 2<br>3<br>2 | More Parent Awareness and Engagement |
| More reliance on self<br>"I started learning myself"<br>Shift away from "dependence on parents and teachers" | 3<br>5<br>2 | Shift to Active Online Self Reliance |
| More reliance on friends more for notes, etc.<br>"Friend circle" easier to learn w friends<br>Share recordings assignments | 3<br>1<br>4 | Greater Reliance on Friends for Support |
| Less reliance on teacher<br>Grew past reliance on teacher and parents | 4<br>1 | Less Teacher Reliance |

*Figure 2.*



Learning Relationship Frequencies and Themes
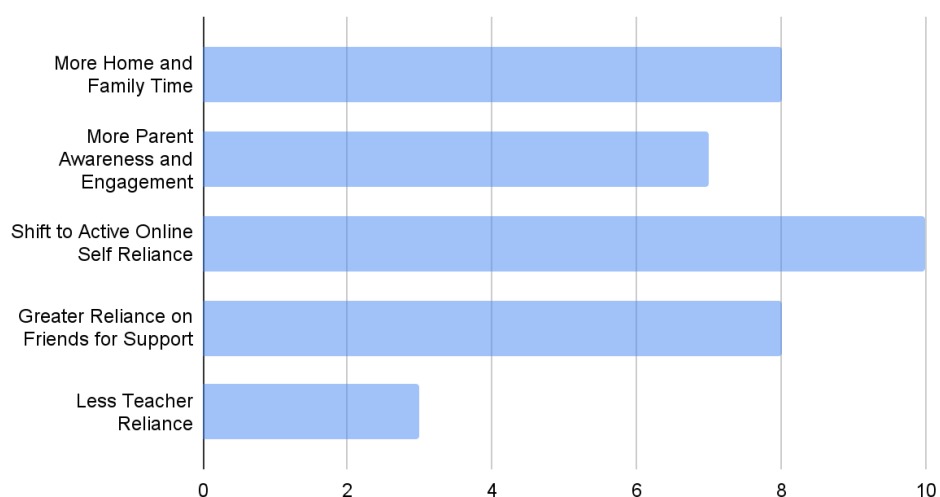
As shown in the graph, important changes in technology use were reported with the greatest energy surrounding family and friend relationships.

### 3.4. Illustrative narratives enrich the understanding of the lived experience during the COVID -19 change

Stories are becoming a more acceptable way of understanding lived experience. The strategy is used here with three specific stories to give them more human face to the data collected. Direct quotes are also used to add flavor to bring life to the challenges and successes of Nepali students transitioning to remote learning.

Student 2:

Before 2020 going to college was a narrow concept … After 2020, I started researching myself, started learning myself and it was like no guidance … I felt that I can learn many things just by surfing around the internet myself ... I didn't have only one mentor but every platform … was a mentor for me.

Student 5:

The relationship with teachers was good but we couldn't ask questions properly …there wasn't wifi to join the class, and there was only one mobile in my whole family, which was tough to join the class… there was only one mobile from which I used to take my class… My mother bought me a new mobile with the money which she was saving for a long period of time.

## 4. Discussion

Many researchers have focused their attention on the effects of COVID-19 on educational systems around the world. There is growing consensus that developed countries were able to fare much better because of the greater access to technology and experience with using technology for education. In Nepal, as in other developing countries, the lack of resources and expertise created huge challenges but also a great opportunity. As the data from these subjects shows, students and teachers who had precious little access to technology prior to COVID-19 were thrown into chaos for months. Slowly and painfully, they matched resources with challenges and within several months were finding creative ways to learn online. In spite of the fact, that many of the challenges were structural (i.e. lack of access/ data) and many other challenges were financial (data/device costs, scheduling) the desire to learn prevailed.

The data clearly show two important phenomena. The Nepali students studied have survived the pandemic chaos and forged innovative new relationships with remote learning technology and expansive learning relationships with themselves, friends, teachers, and parents.

## 5. Summary

This study sought to explore the challenges of rural students transitioning to remote learning in Nepal. Personal interviews of key stakeholders (teachers, parents, and students) from several remote villages were selected as the method used to begin to understand human experience of that chaotic change. Data from this study confirms previous work that transition to remote learning in developing countries is fraught with many levels of challenge. (Rana, 2020). Some surprising findings included innovative ways of using technology, increasing reliance on self and friends, and building better communication with parents and teachers. Several stories illustrate that resilience of students in the face of ongoing challenges are common and inspirational.

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# IDENTIFYING PATTERNS OF TACTILE EXPLORATORY BEHAVIORS IN CHILDREN WITH VISION IMPAIRMENT AND MULTIPLE DISABILITIES

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## Abstract

The research aim of the present study is to identify and describe patterns regarding tactile exploratory behaviors of children with vision impairment and multiple disabilities during active exploration of small 3D objects in terms of their shape. The participants of the study consisted of seventeen children who had vision impairment and multiple disabilities. Their age range was from 5 to 7 years old, and they were all enrolled in a variety of early intervention and special education programs.
The authors observed and recorded the children's tactile behaviors while the latter were exploring actively a series of small 3-D objects in order to trace potential patterns of haptic exploration. For this, the authors developed an observation protocol which was consisted of the following three activities: a. explore and describe shape and properties of spherical items by touch, b. explore and describe shape and properties of cubical items by touch, and c. match objects in terms of their shape. All activities were video recorded after teachers' and parents' consent and the analysis of the data was based on two tools: a. VegasPro 13.0 software to analyze the videos in a quantifiable manner, and b. Atlas.ti to elaborate relevant data from a qualitative point of view. Based on the results, it seemed that some of the children's tactile exploratory behaviors could be considered as tactile exploratory patterns since the frequency of their appearance was quite high and repetitive. The practical implications of the findings are of great importance because they have direct link either to education programs or to early intervention programs. Identifying and analyzing tactile exploratory behaviors and patterns of children with vision impairment and multiple disabilities may lead to alternative "channels of communication" something extremely useful for professionals and parents who work in this sector of Special Education.

*Keywords: Vision impairment and multiple disabilities, tactile exploratory behaviors, tactile patterns.*

## 1. Introduction

Individuals who have vision impairment and multiple disabilities primarily rely on touch to communicate and interact with their environment (Mammen et al., 2016). According to many researchers, it seems that individuals develop their tactile skills throughout life, beginning very early (Bradley-Johnson et al., 2004; Steri, 2003). Lederman and Klatzky (1987), have researched systematically many aspects of tactile exploratory behaviors of children with vision impairment. They noticed that people with vision impairment, when exploring a variety of objects, they apply a range of strategies, which are usually consisted of repeated motions. According to them, these motions aim to extract information about the objects' properties, such as texture, shape, roughness, weight, and so on. Hence, there is an argument that some of these tactile exploratory behaviors "follow" a specific pattern; in other words, some of these tactile behaviors may compose specific tactile strategies (Argyropoulos & Papazafiri, 2017; McLinden, 2004, 2012; O'Donnell & Livingston, 1991).

The present study aims to trace and describe potential patterns of tactile exploratory behaviors of children with vision impairment and multiple disabilities when they actively explore small 3D manipulative objects trying to figure out their shape.

## 2. Methodology

### 2.1. Participants

The participants of the study consisted of seventeen children who had vision impairment and multiple disabilities. Their age range was from 5 to 7 years old (mean=5.88), and they were all enrolled in a variety of early intervention and special education programs. All participants had developed language skills so it was feasible to use the method of oral communication for delivering and conducting the tasks and the activities of the present study.

## 2.2. Tools

The authors observed and recorded the children's tactile behaviors while the latter were actively exploring a series of small 3-D objects to trace potential patterns of tactile behaviors in terms of shape recognition. For this, the authors developed an observation protocol based on a. the Oregon Project for Preschool Children who are Blind or Visually Impaired (Anderson et al., 2007), which is a skill checklist designed for children who have vision impairments, aged 0-6 years and b. the Use of Sensory Channels: Observation Form (Koening & Holbrook, 2000) which is an observation protocol in the context of the evaluation of learning media assessment and concerns the effective use of sensory channels (i.e. visual, tactile, auditory).

## 2.3. Research design - activities

The authors designed three structured activities, a. explore and describe shape and properties of spherical items by touch, b. explore and describe shape and properties of cubical items by touch, and c. match objects in terms of their shape. The exercises were carefully planned and tailored to the students' language skills.

1st Activity: Each child was invited to explore a ball and the author(s) asked the child to figure out the shape before placing it in his/her hands.

2nd Activity: In turn, the author(s) placed a cube in the child's hands and asked the child to explore it and find out its shape.

3rd Activity: Finally, the author(s) placed a control object in the child's hands and in front of the child's hands the author(s) placed three other objects with completely different properties apart from one which had the same shape as the shape of the control object. The child was asked to match the shape of the object which was in his/her hands (control object) with one of the shapes of the objects which were in front of him/her.

Prior to the design of the activities, an initial stage was carried out. In this stage, the researchers observed the children's interaction with different objects while they were participating in their regular educational or occupational activities. This methodological "step" enabled the authors to construct friendly and familiar activities with objects resulting in children's active participation and positive engagement. Individuals with vision impairment and multiple disabilities are frequently described as having tactile defensiveness in the literature (Yip & Moore, 2017). To ensure that the participants will enjoy and easily get involved in the activities, they were designed to be both entertaining and not complicated. Moreover, the materials used were tailored to suit the age, unique requirements, and interests of the participants. Because such children may find it challenging to grasp or interact with certain materials, it was extremely important to ensure that the children in question will be able to effectively participate in activities; hence, the selection of appropriate materials was of utmost importance (Downing & Chen, 2003).

## 2.4. Data analysis

All activities were video recorded after teachers' and parents' consent and the analysis of the data was based on two tools: a. VegasPro 13.0 software to analyze the videos in a quantifiable manner, and b. Atlas.ti to elaborate relevant data from a qualitative point of view.

## 3. Results

### 3.1. Observed patterns

Nine patterns were traced during the activities (see Figure 1). More specifically, it was found that the children used some sort of repetitive tactile motions which could outline a pattern. The patterns were discerned in two, three and four steps respectively. The patterns which consisted of two steps were the following: Pattern 1 (hold the object with both hands-rotate the object), Pattern 2 (hold the object with one hand-investigate the outline of the object with the fingers of the other hand), Pattern 3 (hold the object with both hands-rotate the object by exerting pressure on it using the fingertips), and Pattern 8 (holds the object with both hands-explore its properties with fingertips). The patterns which were consisted of three steps were the following: Pattern 3 (hold the object with both hands-rotate the object-exert pressure with fingertips), Pattern 4 (hold the object with one hand-investigate the outline of the object with the fingers of the other hand-wave the object in the air), Pattern 5 (hold the object with both hands-rotate the object-lick the object), Pattern 6 (hold the object with both hands-rotate the object-exert pressure with fingertips), and Pattern 9 (holds the object with both hands-exert pressure with fingertips-wave the object in the air). Finally, only one pattern was traced consisted of four steps; that was Pattern 7 (holds the object with both hands-rotate the object-lick the object-exert pressure with fingertips).

*Figure 1. Observed tactile patterns during the activities.*
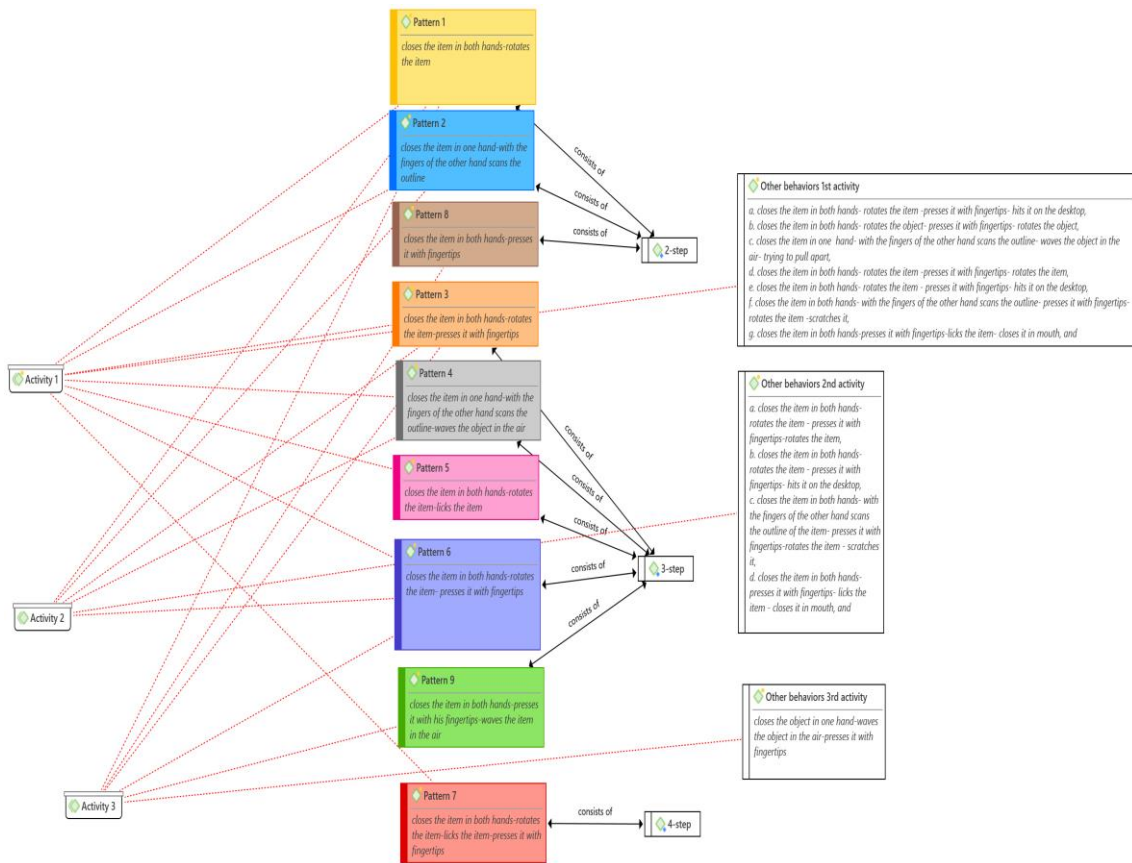


## 3.2. Observed patterns per activity

### Activity 1

During the 1st activity children were asked to identify a sphere (see 2.3). In total, seven patterns were identified (see Figure 1). Two of them were 2-step patterns (Pattern 1 and 2), four were 3-step patterns (Pattern 3,4,5, and 6) and one was a 4-step pattern (Pattern 7).

The majority of the children (52.9%) applied combination of patterns such as Pattern 1 and 6, Pattern 1, 5 and 7, Pattern 1 and 3, and Patterns 2 and 4. The 35.3% of the participants used a combination of patterns and other tactile behaviors which did not encompass a pattern, whereas the 11.8% applied tactile behaviors without repeating them on a constant level. Such examples are provided below: a. hold the object with both hands-rotate the object-exert pressure with fingertips-hit the object on the table, b. hold the object with both hands-rotate the object-exert pressure with fingertips-rotate the object, c. hold the object with one hand-explore the outline of the object with the other hand-wave the object in the air-try to separate parts of the object, d. hold the object with both hands-investigate the outline of the object with the fingers of the other hand-exert pressure with fingertips-rotate the object-scratch the object, e. holds the object with both hands-exert pressure with fingertips-lick the object- put the object in the mouth, and f. hold the object with both hands-exert pressure with fingertips-scratch the object.

### Activity 2

During the 2nd activity the children were asked to identify a cube (see 2.3). Five patterns were identified (see Figure 1). Two of them were 2-step patterns (Pattern 1 and 2) and three of them were 3-step patterns (Pattern 3, 4, and 6). A relatively large percentage of the children (41.2%), applied combination of patterns to recognize the cube such as Pattern 1 and 6, Pattern 1 and 3, Pattern 2 and 4, Pattern 1 and 5. The 47.1% used a combination of patterns accompanied with other tactile behaviors and the 11.8% performed tactile behaviors which did not encompass elements of patterns, such as: a. hold the object with both hands-rotate the object-exert pressure with fingertips-rotate the object, b. hold the object with both hands-rotate the object-exert pressure with fingertips-bang the object on the table, c. hold the object with both hands-explore the outline of the object using the other hand-exert pressure with fingertips-rotate the object-scratch the object, d. hold the object with both hands- exert pressure with fingertips-lick the object-put the object in the mouth, and e. hold the object with both hands-wave the object in the air-scratch the object.

**Activity 3**

During the 3<sup>rd</sup> activity the children were asked to compare and find the same object based on its shape amongst others (see 2.3). Five patterns were identified (see Figure 1). Two of them were 2-step patterns (Pattern 1 and 2) and three of them were 3-step patterns (Pattern 3, 6, and 9). The majority of the children (35.3%) applied a combination of patterns for this activity (i.e., matching in terms of similar shape) such as Pattern 1 and 6, Pattern 1 and 3, and Pattern 1 and 9. Also, the 11.8% used the Pattern 8, the 35.3% applied combination of patterns in conjunction with other tactile behaviors and finally the 17.6% used only tactile behaviors which did not contain any element of pattern. Such examples may be the following: a. hold the object with one hand-wave the object in the air-exert pressure with fingertips, b. hold the object with both hands-rotate the object-exert pressure with fingertips-bang the object on the table c. hold the object with both hands-rotate the object-exert pressure with fingertips-rub the object with fingertips, d. hold the object with both hands-rotate the object-exert pressure with fingertips-wave the object in the air-try to separate parts of the object, e. hold the object with one hand-explore the outline of the object with the other hand-wave the object in the air, f. hold the object with both hands-rotate the object in the air-try to separate parts of the object, g. hold the object with both hands-exert pressure with fingertips-lick the object, etc.

It was observed that common patterns of tactile exploration behaviors were applied in Activities 1 and 2, whereas different patterns were performed in Activity 3. More particularly, Pattern 1 was primarily used in conjunction with Patterns 6 (13 times), 3 (7 times), 5 (3 times), and 7 (2 times). Pattern 2 was used only in combination with Pattern 4, Pattern 3 only with Pattern 1, Pattern 5 with Pattern 1 (3 times) and with Pattern 7 (3 times), Pattern 6 only with Pattern 1, and Pattern 8 only with Pattern 9.

*Figure 2. Visualization of pattern combinations (extract from Atlas.ti).*
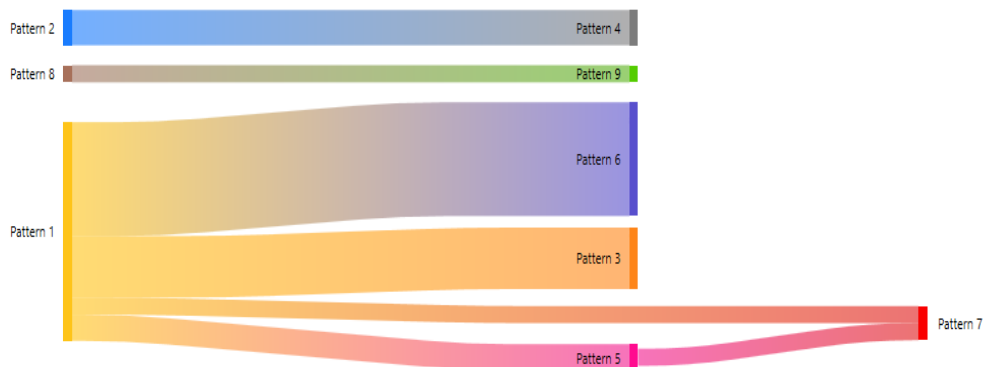


## 4. Discussion

The aim of the present study was to trace potential tactile patterns in a broad set of observed tactile behaviors performed by children with vision impairment when they were exploring 3-D manipulative objects giving emphasis on their shape. It was found that nine different patterns dominated most of the children's tactile behaviors. In addition, the authors were able to trace combinations of patterns which were applied by the children when they focused on shape. It is argued that these findings are of great importance because they may reveal common strategies and techniques that children with vision impairment and multiple disabilities are using to acquire knowledge when interacting with their environment (Simcock, 2020). The enhancement of their sense of touch is crucial because it may decrease potential touch defensiveness and therefore increase their will and ability to get involved in more active way with their surroundings. These interactions will lead to cognitive growth and more sophisticated communication (Bara, 2013).

Piaget's theory of cognitive development suggests that children's comprehension of their surroundings progresses in stages. One of the crucial concepts in this theory is that children form mental schemas or patterns of thought to arrange and comprehend their experiences (Lefa, 2014). The role of patterns is fundamental in Piaget's theory, as they represent an aspect of mental schemas. According to Piaget, children develop mental schemas by identifying and organizing patterns in their experiences (Bormanaki & Khoshhal, 2017). In general, Piaget's theory emphasizes the significance of patterns in the cognitive growth of children and the necessity of providing them with opportunities to explore and experiment in order to foster the development of their mental schemas (Lefa, 2014). By acknowledging and categorizing patterns in their interactions, children can enhance their comprehension of the world in a more sophisticated manner. Hence, patterns of tactile exploration behaviors play a very important role in

the development of this population of children and the study of tactile patterns of exploratory behaviors is essential. Patterns of tactile exploratory behavior can provide significant educational and developmental advantages for children who have vision impairment and multiple disabilities because patterns allow them to explore and learn about their environment through touch, providing them with a unique opportunity to develop cognitive, motor, and social skills.

Finally, it can be argued that more studies are required to be conducted on tactile exploratory activities in individuals with vision impairment and multiple disabilities, in order to deepen our understanding in the development of their somatosensory system and therefore design and conduct more effective personalized and early intervention programs (Villwock & Grin, 2022; Withagen et al., 2010).

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# MULTICULTURAL AND INTERCULTURAL COMMUNICATION: NEW LEARNING AND TEACHING MODELS

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## Abstract

World is becoming more and more interrelated, and this means that we need more tolerance and empathy to understand and accept others, especially those who behave, think, and act differently. As well as we need to know how to keep our identity and at the same time constructively live and act in multicultural environment. Our culture has influence on our perception, behaviour, working and learning style and etc., so the need for multicultural literacy, which could be described as the ability to understand and appreciate the parallels and differences between customs, values, and beliefs of your culture and a different culture, is obvious. Multicultural literacy as one of the 21st-century competencies could be developed by the specialized curriculums or involving the main ideas, principles, attitudes, and skills of multiculturality in the study programmes and other extra-curriculum activities. It also could be developed by the multicultural and intercultural communication among people of different cultures in formal and non-formal educational activities. The presentation will be based on the survey and experience of analysis of Šiaulių valstybinė kolegija in developing those competencies for our national and international students.

*Keywords: Multicultural communication, intercultural communication, communication in education, teaching and learning models, educational innovations.*

## 1. Introduction

World is becoming more and more interrelated, and this means that we need more tolerance and empathy to understand and accept others, especially those who behave, think, and act differently. As well as we need to know how to keep our identity and at the same time constructively live and act in multicultural environment.

Multicultural and intercultural literacy is important for all citizens in a democratic multicultural society (Banks, & Russell, 2003; Banks, 2009) at least because nowadays it is more and more difficult to find the monoculture society. And also because of this that our culture has influence on our perception, behaviour, working and learning style and etc., so the need for multicultural literacy, which could be described as the ability to understand and appreciate the parallels and differences between customs, values, and beliefs of your culture and a different culture, is obvious.

## 2. Research aim

Theoretically and practically to confirm the need of multicultural and intercultural communication and the possibilities to develop those competencies in formal and non-formal educational process.

## 3. Research methods

The survey and experience of analysis of Šiaulių valstybinė kolegija in developing those competencies for our national and international students there were done to achieve the aim.

## 4. Methodology of the research

The theoretical and practical analysis of the idea is based on the following methodological attitudes:

- Progressivism philosophy (W. Kilpatric from L. Duoblienė, 2006), which emphasizes active person's participation in his/her own learning process and society's life too. They establish a free and creative personality development goal (Bitinas, 2000). The principles of progressivism didactics (freedom, individual experience, experimentation, academic consulting) are the basic approaches of author's researches. One of the most important features of progressivistic pedagogy is the free choice of the learner, when deciding what to learn, something to aspire to, every student takes responsibility for their own future, their own actions and behaviours, get used to make decisions related to personal risk. In addition to these features is not possible success of an individual's life in a democratic, individual initiative and free competition-based society. New requirements in this context there are for teacher. So, in this respect it is relevant the idea of progressivisms, which emphasize on the teacher's inner freedom, which allows the teacher to create free, sincere atmosphere of mutual trust and so on. On the other hand, these demands increase the teacher's responsibility to students and society.
- Social constructivism (Berger, & Luckmann, 1999) and reconstructivism (Duoblienė, 2006), which enable critical interpretation of "well-established" educational phenomenon and understanding them in the sociocultural context, i.e., as integral part of the general cultural, religious and social groups; understanding the importance of social interaction and sociocultural context, of active participation in political and social activities of the society for personality's education.

## 5. Theoretical and practical discourse analysis

Multicultural literacy as one of the 21st-century competencies could be developed by the specialized curriculums or involving the main ideas, principles, attitudes, and skills of multiculturality in the study programmes and other extra-curriculum activities. It also could be developed by the multicultural and intercultural communication among people of different cultures in formal and non-formal educational activities.

Comparative analysis of theoretical discourse (Jandt, 2013; Pruskus, 2012; Baraldsnes, 2012; Starkey and others, 2010; Paulston, Kiesling, & Rangel, 2014; etc.) enabled to identify the main aims and objectives of development of multicultural and intercultural competencies. The most important aims in this aspect are the following:

- **Understand** your own and other cultures,
- **To avoid cultural prejudices** about your own and other cultures,
- **Evaluate cultural diversity**,
- **Become open** to cultural differences, otherness, change,
- **Learn to seek compromises** in a culturally diverse environment.
- **Understand that our culture has influence** on our understanding of another culture, and that the culture of other people has influence on their perception. It means to understand your own and other cultures; to understand yourself in the culture, to be aware of your own stereotypes and prejudices you have, to identify stereotypes and prejudices in everyday life.
- **Know and recognize** your own and other cultures
- **Develop provisions** that means to know the values of your own and other cultures, to accept and respect cultural differences yours and others, to evaluate cultural diversity, to encourage openness to otherness, to believing in possibility to solve cultural conflicts.
- **Develop skills, especially such as** communication and interaction with people from different cultures, work with people from other cultures, ability to see the everyday things and events from new corner, to adapt in changing environment, society, to make new decision.

The opportunities of multicultural and intercultural literacy development in formal education are the following:

- ***Study subjects directly related or devoted to development of multicultural and intercultural competencies.*** For example, in majority of our study programmes from the business, international business, management, corporate communication and marketing, office management and etc. we have study subjects "Intercultural and International Communication", "Intercultural Communication and Negotiation" and etc. The curriculum of the subjects is created so that the theoretical knowledge would permanently implement into real life situations or simulations. Those strategies enable to develop not only knowing but also skills, abilities and competencies that could be used in study process and in daily life. For example, one of the mid-term exams is the comparative analysis of at least two different cultures according to few aspects from under the water part from the Culture as Iceberg Concept. And in this analysis

students can use their own or the other's people experience as well as the usual resources which they can find in the libraries or internet. The most important criteria are novelty and usefulness of information, and the ability to use your own knowledge and experience. The other assignment is case studies that also encourage students to use their knowledge and experience to do the holistic analysis of the case and to find the best solution or to look at the same situation from the side of different cultures.

- *Introduction with a new culture* studying the directed study subjects as it was mentioned in the first paragraph as well as studying foreign languages (at least one or two foreign languages are studying in one study programme). Also, in study subjects that are directly related with international and intercultural communication (for example, *International Marketing in Study Programme "Corporate Communication and Marketing"* or *International and Intercultural Communication in Study Programme "Office Administratio")*.
- *Study results in a study programme,* especially social or/and personal study results (for example, working effectively and communicating in writing and orally in Lithuanian and foreign languages in an unfamiliar, changing, interdisciplinary environment. *Study Programme "Information Management")* is another opportunity to develop multicultural and intercultural competencies.
- *Topics in the study subjects, such* as *Diversity and Inclusion, International Business* and etc.
- *Visiting professors from foreign higher educational institutions* (according to Erasmus+ programme, programme of Ministry of Education, Science and Sports in Lithuania or the programmes of municipalities) are not only a good opportunity to discuss about the concrete study field and its knowledge but also about the culture and the countries where the visiting professor is from. This is very important because it is the best opportunity to learn about the culture from the present representative of this culture and to develop your own competencies on this basis.
- *Study subjects (compulsory or/and optional) where English is the language of instruction* (for example, *International and Intercultural Communication* in Study Programme *"Office Administration", Changes Communication* in Study Programme *"Corporate Communication and Marketing", Entrepreneurship and Leadership* in Study Programme *"Office Administration"*) is not directly devoted to develop multicultural and intercultural competencies, but this create to context, the suitable teaching/learning environment for developing multicultural and intercultural competencies.

Also, there are a lot of different activities and opportunities to develop multicultural and intercultural competencies in non-formal education:

- *Introduction with a new culture*, especially if the cultures are more different than similar. One of the best opportunities are International Weeks, meetings with visiting professors and other similar activities where it is possible not only to listen to the presenters but also ask or discuss, especially if the knowledge from different resources are different and it is more complicated to know the objective true.
- *Involving international students to the extra-curriculum activities in higher educational institution* (for example, Week of Adult Education, Students' Conferences, participating in seminars, round-table discussions, presentations of home culture, home university, city and etc.)
- *Meetings with other students* (with national students from the same study field or study programme, meetings with other foreign students studying in higher educational institution according all the programmes, meetings with students are going to go for their Erasmus+ studies abroad and etc.)
- *Joint activities of national and international students in the higher educational institution or outside and etc.*

All the activities – formal and non-formal – are organized keeping the main principles of teaching and learning. The most important principles for multicultural literacy are the following:
- Practical aspect and tasks,
- Experience based teaching/learning,
- Problem-based teaching/learning.

## 6. Conclusions and discussion

- Theoretical and empirical discourse analysis enables to distinguish some positive factors that could be the basis for more effective development of multicultural and intercultural competencies.
- The most important positive factors are the following: ability to overcome prejudices; more empathy and tolerance; productive, constructive participation in another culture and global world, better understanding your own and other cultures, openness for an unknown, different and untraditional, ability to communicate and act beyond your cultural boundaries and etc.
- Because development of multicultural and intercultural competencies is not harmonic process, it is necessary to make that educational process permanent involving all possible places, aspects and levels.
- Multicultural and intercultural competencies could be developed in formal and non-formal teaching/learning process where the most relevant is encouraging students use their knowledge and experience, friendly and constructive, engaging and inclusive as well as tolerant to any kind of diversity also cultural.

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# INTEGRATING SUSTAINABILITY INTO INFORMATION AND KNOWLEDGE MANAGEMENT CURRICULUM

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## Abstract

The study aims to answer the research question of how to integrate sustainability into information and knowledge management curriculum and course design, and what kind of opportunities and challenges relate to this curriculum development. The empirical study was conducted in the Finnish university that holds the Degree Programme in Information and Knowledge Management. The action-oriented case study research methodology was applied, and different sources of data are used from participatory observation to interviews. In the results, different means to sustainability integration are analysed and evaluated.

*Keywords:* *Sustainability, curriculum development, information and knowledge management, management education, higher education.*

## 1. Introduction

Humanity is exceeding the planetary boundaries which are needed to sustain life on earth in its current form (Steffen et al., 2015; Fanning et al., 2022; Persson et al., 2022). The 2030 Agenda for Sustainable Development, with its 17 Sustainable Development Goals (SDGs) adopted by all United Nations Member States in 2015 has been a central way to respond to this problem (UN, 2023). Similarly, in the fields of higher and management education as well in the management research, this ecological crisis of biodiversity loss and climate change has prompted different kinds of responses. In business and management research, the discussion on value creation has changed from an egocentric, company-focused perspective towards a more system-based view, where the focus is on creating a net positive impact on the socio-ecological system and enhancing the health of the system (Dyllick & Muff, 2016; Kurucz et al., 2017: Hahn & Tampe, 2021). In this novel view, value creation aims for sustainable and collective value and to address societal and environmental needs and sustainability challenges instead of only fulfilling more traditional economic needs (Busch et al., 2018).

Due to these severe sustainability challenges we are facing, there has been a growing discussion in the literature about the integration of sustainability and sustainable development goals (SDGs) into management education (Figueiró & Raufflet, 2015; Figueiró et al., 2022). However, advanced understanding about the pedagogical integration, i.e., how to fully incorporate sustainability into a curriculum and course design and implement it in practice is still called for (Figueiró & Raufflet, 2015). As Figueiró et al. (2022, p. 1) emphasize "there is a mismatch between the highlighted importance of education for sustainability and the actual implementation of its integration in HEIs [higher education institutions] due to its multifaceted characteristics and complexity." Furthermore, even though some theories have been presented on how knowledge management and sustainability are intertwined (e.g., Chopra et al. 2021), the question of how to integrate sustainability into information and knowledge management (IKM) curriculum has not been addressed in the literature.

For these reasons, this study aims to answer the research question of *how to integrate sustainability into information and knowledge management curriculum and course design, and what kind of opportunities and challenges relate to this curriculum development*. The empirical study is conducted in the Finnish university that holds the Degree Programme in Information and Knowledge Management. The action-oriented case study research methodology is applied and different sources of data are used from participatory observation to interviews.

This article proceeds as follows. Section 2 deals with sustainability in the context of higher and management education, and furthermore, especially in information and knowledge management education. It reviews the previous literature and analyses the key implementation aspects when integrating sustainability into management education. In Section 3, the study context and the method are

presented. Results are described and discussed in Section 4. First, the current state of integration of sustainability in the information and knowledge management curriculum is described, followed by one course example of implemented integration at the curriculum. After that, the future opportunities of integration are described in more detail, and different means for integration, where sustainability is interwoven within different courses of the curriculum, are identified. Section 5 draws conclusions.

## 2. Sustainability in higher and management education

The question of what should be taken into account when integrating sustainability into higher and management education has been discussed from different perspectives. Figueiró et al. (2022) identify four interdependent dimensions to consider in integration: contextual, organizational, curricular, and pedagogical. From the perspective of the curriculum dimension, it is possible to evaluate whether the subject of sustainability is mandatory or elective, how it is present in the curriculum (whether disciplinary or cross-, inter- or multidisciplinary), and what is its relevance to research projects and extension projects (partnerships with different stakeholders) (Figueiró et al., 2022). There are different ways to integrate sustainability into management curriculum, and the curriculum orientation (i.e., how and where sustainability is located in the curriculum) may vary from stand-alone course/module or new course/program to cross-disciplinary, interdisciplinary, multidisciplinary and transdisciplinary perspectives (Figueiró & Raufflet, 2015). Because holistic and integrated view is crucial in sustainability teaching, the practice where different fields come together to teach sustainability (multi- and interdisciplinary) and stakeholders outside the academia are involved (transdisciplinary), is identified as an ideal way for integration (Figueiró & Raufflet, 2015; Annan-Diab & Molinary, 2017).

Horizontal integration, where sustainable development is interwoven within different courses of the curriculum, is generally favored, and deemed ideal as compared with the vertical integration, which can be understood as the organization of separate sustainable development courses within the curriculum (Ceulemans and De Prins 2010). There is rather strong consensus in the literature that sustainability should be embedded in the whole curriculum and core courses as a built-in approach (and not appear only in specific courses in marginal way) to support learning of this multifaceted issue (Figueiró & Raufflet, 2015; Figueiró et al., 2022).

Information and knowledge management in the context of sustainability is still little explored area and for example, the research fields of knowledge management and sustainable development are quite separate from each other (Martins et al., 2019). However, the curriculum of information and knowledge management is an intriguing context for applying sustainability: sustainable development with multiple perspectives and actors (multiple kinds of knowledge and ways of knowing) provides a meaningful context in where to apply IKM, and IKM has been presented as a tool/solution for achieving sustainability (Caiado et al., 2018). Also, Chopra et al. (2021), who propose a theory of knowledge management for sustainability to provide a foundational understanding of how knowledge management and sustainability are intertwined, describe in their model how knowledge management at the individual and firm-level (consisting of knowledge creation, acquisition, sharing, application, and transfer) will lead to sustainability outcomes at the country level. On the other hand, the concept of sustainability changes many previous assumptions and there are tensions in the sustainability-business nexus (Figueiró & Raufflet, 2015), such as the egocentric, company focused, linear economy perspective, the dominance of the economic interests and the focus on short-term. These subtler changes may be much harder to incorporate into a curriculum, and the question of how the sustainable IKM education should relate to both knowledge, skills, and values in order to provide sustainability-specific learning outcomes, emerges.

## 3. Research context and method

The action-oriented case study was implemented in the Finnish university related to the curriculum of information and knowledge management (IKM). The unit that is responsible for the curriculum has three focus areas of research: knowledge-based management, management of information systems, and management of digital business, and through these areas it aims to create value from knowledge by combining technology, people and business. The curriculum consists of bachelor's and master's degree programmes. Master's programme currently contains three study modules: knowledge management, information systems management, and transport and logistics management, which partially follow the research area focuses of the unit. The author of this paper had a dual role as the teacher and developer of the sustainability-focused course and the curriculum and as researchers studying the curriculum and course design development work.

For this study, data was gathered by participatory observation in the curriculum development work for the academic years 2024–2027, interviewing key persons (n=3) responsible for and familiar with

the IKM curriculum, and by observing and reflecting the development work of the IKM graduate course on "Knowledge-based and Collaborative Decision Making for Sustainability" and its six implementations in the academic years 2020–2023. It should be noted that the curriculum development work for the academic years 2014–2017 started in the fall of 2022 but continues at the time of writing this paper (in April 2023). One of the general goals of the curriculum work is that the principles of sustainable development should be embedded in all degree programs. Sustainability is strongly present in the university's strategy and the rector's decision to integrate sustainability into all degree programs guides the curriculum development work.

## 4. Results and discussion

### 4.1. Current state of integration of sustainability in the information and knowledge management curriculum

Sustainability is not extensively visibly present in the current information and knowledge management curriculum. However, two exceptions exist. First, in the bachelor's degree, an option is presented for choosing a course on sustainable development, but it is not mandatory and only few students choose that course. Second, in the master's programme, the study module of knowledge management includes a mandatory course "Knowledge-based and Collaborative Decision Making for Sustainability" (5 ECTS), that is an information and knowledge management specific course about sustainability. In addition, it is possible that there exist sustainability themes in the courses, but they have not been made visible. Furthermore, there are opportunities for choosing sustainability-themed minor subjects related to, for example, circular economy. All in all, there is a lack of full integration of sustainability into the curriculum.

The key development idea behind the course "Knowledge-based and Collaborative Decision Making for Sustainability" was to develop an information and knowledge management specific course about sustainability including contents that are especially relevant to the IKM students. The other key idea was to create a multidisciplinary course that would offer systemic and holistic understanding and pragmatic, theory-based tools and solutions to sustainability (Table 1). The course was developed by two teachers from different faculties/units interested in the topic. Altogether six implementations of the course have been held (and test rounds). Teachers' diverse background in environmental engineering, management, and social sciences has provided a good background for implementing a multidisciplinary approach in the course. From the perspective of sustainability integration, the course has worked well by supporting the idea of horizontal integration and multidisciplinary approach. Besides developing this course further, sustainability-themed courses could be developed to the other research focus areas (management of information systems, management of digital business). This would support the integration of sustainability into all focus areas of IKM.

*Table 1. The contents of the course "Knowledge-based and collaborative decision-making for sustainability".*

| Design principles | Themes | Tasks | Learning outcomes |
|---|---|---|---|
| Multidisciplinary<br><br>Collaboration and interaction<br><br>Systemic and holistic approach | I Collaboration for system-level sustainability<br>1. Collaborative approach to negotiations<br>2. Sustainability and Environmental Impacts<br>3. Stakeholder engagement and cross-sector collaboration for sustainability<br><br>II Transforming business for system-level sustainability<br>4. Business Tools for Sustainability<br>5. Managing Information and Knowledge for Sustainability<br>6. Sustainability Leadership | ▪ Negotiation exercises<br>▪ Group discussions<br>▪ Essays<br>▪ Project work<br>▪ Introductory and synthesis lectures<br>▪ Guest lectures<br>▪ Lecture videos and related Moodle-exams | *Planetary boundaries*<br><br>*Systems thinking*<br><br>*Collaboration*<br><br>*Sustainability-target driven business*<br><br>*Knowledge and leadership to support transformation* |

### 4.2. Future of integration of sustainability in the information and knowledge management curriculum

The means to integrate sustainability into information and knowledge management curriculum that have been brought up in the interviews and in the curriculum development work are summarized in Table 2. In addition, it was highlighted that in the transition phase, dedication is needed. Later, when sustainability is embedded in the curriculum, visible attention is no longer needed. Furthermore, the future-oriented and student-centered perspective should be adopted in the development work because curriculum work has far-reaching implications.

*Table 2. Means to integrate sustainability into Information and Knowledge Management curriculum.*

| | Means | Strengths | Limitations |
|---|---|---|---|
| Vertical integration | **1. A basic course on sustainability mandatory for everyone** (e.g., a MOOC course) | A basic understanding of sustainability for everyone right at the beginning of their studies.<br><br>Once a scalable course has been developed, it is easy to implement effectively and build on it more in later studies.<br><br>Ensures the minimum standard – Basic understanding of the planetary situation (biodiversity loss, climate change) | If the scope of the course is limited (e.g., to 1 ECTS), it limits the contents and the learning goals.<br><br>Bringing new content to a full degree is challenging because something needs to be taken away (giving up on some content is more difficult than creating new).<br><br>As a stand-alone course, no ties to other courses. |
| Horizontal integration | **2. Information and knowledge management specific courses about sustainability on every study module** ("Knowledge-based and collaborative decision-making for sustainability" an example from one study module) | Supports the idea of horizontal integration and multidisciplinary approach, where "Different fields of knowledge come together to teach sustainability. Each discipline retains its own method and may be responsible for a different topic linked to the sustainability" (Figueiró & Raufflet 2015, 29). | Requires a deep understanding of sustainability and training of personnel |
| Horizontal integration | **3. Sustainability themes in the project works of the courses** | Conducting case/project work is typical in information and knowledge management courses, so this would be impactful way.<br><br>A way to keep the aim for sustainability high on the agenda and to create a general state of will, interest, commitment, and a favorable attitude towards action for sustainability. | Might remain superficial and generic approach. |
| Horizontal integration | **4. Identifying sustainability themes from the current courses and making them visible** | A good first step that stimulates thinking about the theme. | Might remain superficial if no further critical analysis and development work is made. |
| Vertical or horizontal integration | **5. Strengthening the essential contents in the degree from the perspective of sustainable development** (e.g., systems theory and data analysis) | Strengthens substance areas those have great potential in helping to promote sustainability. | Sustainability needs to be interwoven into these courses as well. |
| Vertical or horizontal integration | **6. Engaging the student union, guilds, and students for the integration work** | Possibility to create a general state of will, interest, commitment, and a favorable attitude towards action for sustainability among personnel, and support needed dedication in transformation. | Students may give incentives, but personnel should have to know-how about the substance. |

The key questions and themes of information and knowledge management, and the contents on which sustainability affects most are described in Figure 1. The purpose of the figure is to emphasize those contents that are most impacted on by SDGs. The figure describes that presumably sustainability does not primarily change theories or methods that deal with the question of how to produce information and knowledge (such as models in information systems or data analytics), because methods stay somewhat the same independent of the type of knowledge that is handled. Whereas sustainability clearly changes the definition of information and knowledge needs (new/broader focus, wider understanding of the operational environment) and the use of the information and knowledge. So, the topics of management, leadership, and value creation that are related to the use of knowledge are especially affected by sustainability.

*Figure 1. The relationship of information and knowledge management curriculum and sustainability.*
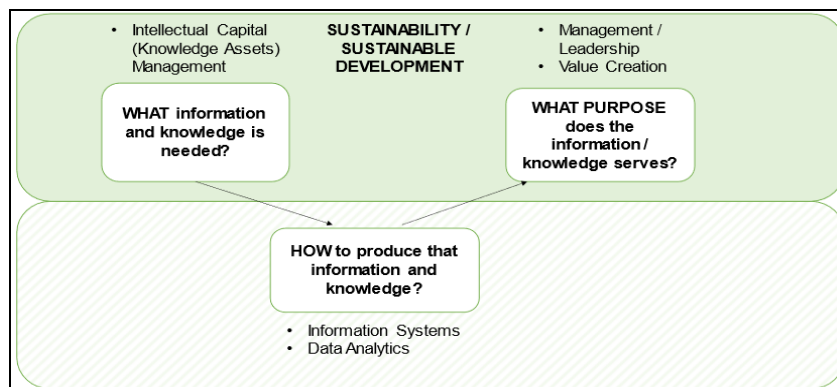
## 5. Conclusions

This research contributes to the field of sustainability in higher and management education (Figueiró & Raufflet, 2015; Figueiró et al., 2022) by presenting a case study in the information and knowledge management curriculum about the sustainability integration. Future research could delve further into the question of how to achieve a deeper engagement with sustainability through the whole curriculum, and how to embed sustainability into the existing core courses of information and knowledge management.

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# THE ROLE OF PEACE EDUCATION IN POST-CONFLICT ZONES OF CYPRUS' FOREIGN LANGUAGE EDUCATION POLICY

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## Abstract

Cyprus has attracted the attention of several civilizations from past to present due to its geopolitical location in the Mediterranean. The fact that different states ruled in the island throughout its history has left a variety of traces in social, cultural, economic and political life. Due to the background of Cyprus, which goes deep into history, it is possible to see the different characteristics of the powers that ruled there, especially the traces of the education policies formulated by the British, who held the administration of the island in the 19th and 20th centuries, among the islanders today. Cyprus, one of the former British colonies with prolonged conflicts resulting in geopolitical division, has unique cultural characteristics compared to other British colonies (in Africa and Asia). In addition, it is seen as a place where different colonial policies were applied, since the political structure greatly influenced the educational structures and practices after the British period. The education system in Cyprus has always been intertwined with changing political developments both at home and abroad. In this island with two different ethnic groups which is governed from outside, education system inevitably became the reflection of debates and disagreements. As a result, in addition to being an effective institution where political outlooks and interests are reflected, education should be considered as one of the mechanisms through which governments can be successful in the post-conflict period. Therefore, the purpose of this study is to explain the importance of peace education in a post-conflict environment, in the light of the foreign language education policies pursued in Cyprus from past to present, and to define a few strategies that post-conflict societies can implement. This study is based on the qualitative analysis of governmental archives and empirical studies taking into consideration political developments at the focus of foreign language education policy. As a result, education in conflict-affected situations is more than providing services to the community. Because it is a means of socialization and identity development through transmitting knowledge, skills, values, and attitudes across generations. Education can hence be both a driver of conflict and a way to contribute to conflict transformation and peacebuilding.

*Keywords: Foreign language education policy, post-conflict zone, peace education, Cyprus.*

## 1. Introduction

Language policy is crucially ethical, political, and legally relevant to all authorities worldwide. For this reason, Spolsky (2004) contends that language policy is a consequence of traditions, ideas, and preferences in society, which, although separate from one another, are connected. Thus, language policy is sometimes thought to be transparent, accompanied by declarations made by government agencies, laws, regulations, and constitutional requirements. Most of the time, the language policy is secret and can only be retrieved from observed applications (Bamgbose, 2020). The multifaceted nature of language politics, whose creation and implementation are claimed to have been primarily influenced by political, social, economic, and cultural influences (Spolsky, 2004, p. 6; Baldauf, 2006, p. 149), is further revealed in post-colonial nations when conflicts develop over problems of language, identity, and power (Phillipson, 1992, p. 110). A linguistic and cultural legacy from colonial eras persists in certain post-colonial societies at the cost of the local language. In others, policies are changed to favor local language and foster national identity and unity. English was especially adopted in numerous nations during colonialism. In addition, the global spread of English has made it a significant factor affecting the language policy of governments worldwide (Spolsky, 2004; Bamgbose, 2020). A country's foreign language education policy decision includes which foreign language to teach, for what purposes, and for how long. Indeed, it is indisputable that the priority assigned to foreign language education differs from country to country. For instance, in

Cyprus, the significance of the English language is tied to linguistic ideology due to the country's British colonial heritage.

Due to its geopolitical location in the Mediterranean, Cyprus has drawn the interest of various civilizations from the past to current. As several nations dominated the island throughout history, distinct imprints have been left in the island's social, cultural, economic, and political life. Two of these results have been multiculturalism, which is the mingling of diverse cultures, and multilingualism. The authority, the ruler of the era, introduced modifications and practices in Cyprus's administration and education system in keeping with its national policies. Cyprus, one of the former British colonies, is considered to be a place where different colonial policies were applied, as it had very different cultural characteristics from all other British colonies (Africa and Asia), and the political structure greatly influenced the educational constructs and practices following the British Period (Persianis, 1996, p. 45). Considering all this history, it is apparent that some of the relics representing the civilizations on the island, which is home to numerous states, have remained to the present day. In Cyprus's long and tumultuous history, notably in the 19th and 20th centuries, the United Kingdom, which governed the island, left significant effects on the islanders with its education policies. According to Zembylas (2002), Cyprus can be thought of as a developing postcolonial country struggling to strike a balance between local traditions and global influences. Thus, the education system in Cyprus has always been interwoven with shifting political developments both at home and abroad. The school system has unavoidably become a mirror of discussions and controversies on an island of many races, governed from outside the nation and now divided into two. As a result, education has been an influential institution in which political expressions and interests are represented (Heraclidou, 2012, p. 47). In addition, education should be seen as one of how governments that may succeed in the post-conflict period. Therefore, this study aims to explain the necessity of peace education in a post-conflict society.

The island has been divided since 1974 between a Turkish Republic of Northern Cyprus in the north, which is only recognized by Turkey, and a Greek-speaking Republic of Cyprus in the south, which is recognized by the rest of the world. The 1974 Green Line cease-fire line, which cuts through the center of the capital Nicosia, is protected by UN troops. But since 2003, travelers are welcome to travel freely between the two halves of the island. Eight hundred thirty-seven thousand three hundred people were living on the island in 2004, of whom 651,100 (77.8%) were Greek Cypriots and spoke Greek, 88,100 (10.5%) were Turkish Cypriots and spoke Turkish, and 98,100 (11.7%) were international residents living in Cyprus. The Greek Cypriot community includes three small, long-established religious and linguistic groups: Armenians, Latin-rite Christians, and Maronite Christians who speak traditional Arabic (Ratcliffe, 2005).

## 2. Background of the study

Historical documentation and archeological evidence date back to antiquity for Cyprus. The history of the English association with the island is likewise ancient. During the Third Crusade in 1191, Richard, I of England, sometimes known as "The Lionhearted," captured the island from the Byzantines. Following Richard, Guy de Lusignan, a Frankish warrior and explorer took control of the island. His descendants maintained it until 1489 when it was handed down naturally to the Venetians. The locals, who continued to be Greek-speaking and Orthodox, did not embrace either French, Italian, or Latin Christianity at this time. However, at this time, Levantine Latin-rite (Maronite) Christians who spoke Arabic immigrated to other countries. They have maintained their distinctive Arabic dialect up until recently, which has been greatly influenced by interaction with Greek. The island was taken from the Venetians in 1571, and the Ottomans theoretically held control of it until 1923. But Great Britain governed the island through a treaty with the Ottomans starting in 1878, took control of it during World War I, regained sovereignty over it in 1923, and declared it a crown colony in 1925. Greek and Turkish, the island's two separate language groups, had different ideas about the post-colonial future, which hindered the independence movement in Cyprus after World War II. The majority of Greek Cypriots supported joining Greece, while Turkish Cypriots supported partition (Ratcliffe, 2005, p. 252-253).

Since 1931, the British, who were exposed to the revolts instigated by the Greeks, replied to the Turkish and Greek sides by putting penalties on the Turkish and Greek sides, first and foremost in the sphere of education. The administration, which only restricted the education of both populations a bit before the Greek insurrection, adopted a different stance following the revolution. Thus, in 1931, the British Colonial Period witnessed the effect of the language employed by the colonial power (English) on the education systems of both Greek and Turkish Cypriots. The colonial government's objective was to drive Greek and Turkish Cypriots away from their ethnic centers and toward Cyprus under the British administration. The nationalist groups formed with the internal tensions between the two communities from the mid-1950s onwards stopped using Greek as a lingua franca. Between 1956 and 1959, this phase

culminated in a breach of the Greek language in Turkish Cypriot educational institutions. Internal disputes and civil instability between the two communities marked the end of Greek as the opposing side's language in Turkish Cypriot schools (Uysal and Çağanağa, 2022).

Great Britain, Greece, and Turkey were designated as guarantor powers to maintain peace among the communities when Cyprus attained independence in 1960. In 1963, inter-communal conflict erupted, prompting UN troops to intervene and construct the Green Line separating the communities. English, Turkish, and Greek have all been recognized as the official languages since the Republic's founding, strengthening it even more. As one of the three guarantors of the Republic required by the Cyprus Constitution, Turkey intervened in the island when the military government in Greece attempted to overthrow the Cypriot government in 1974. Moreover, a third of each ethnic group had to flee their homes before a ceasefire was quickly formed (Ratcliffe, 2005).

The opening of the border gates in 2003 enabled the two communities to re-establish a connection with one another. This predicament carried with it the language dilemma as the two ethnolinguistic communities of Cyprus re-established communication after 29 years of division. In 2003, the new generation could no longer speak the other group's language, prompting English to be utilized as a 'lingua franca'. This abrupt transformation has also contributed to the expansion of English as a common language across the two populations in Cyprus. This can be regarded as a rare event, especially considering Cyprus is a post-colonial state. Today, English remains the only common contact medium between the two populations. The translation of Cyprus Law is also employed in public activities like policy choices, inter-group communication, and tourist activities. More specifically, although the majority of key official documents are now published in Greek or Turkish, English continues to predominate in announcements and marketing in the commercial sector (Uysal and Çağanağa, 2022).

## 3. Peace education

Etymologically the term 'peace' originates (11th century) most recently from the Anglo-French pes, and the Old French pais, meaning "peace, reconciliation, silence, agreement" (Online Etymology Dictionary, 2013). The question which this paper is trying to answer is what the role of peace education in post-conflict zones of Cyprus in the light of the foreign language education policies is. The article's primary aim is to explore the terms 'peace', 'a culture of peace' and 'conflict zones'. It is concerned with how a culture of peace can be constructed that underlines the use of communication. This focus on peace has been motivated by the belief that it is necessary to understand as fully as possible the processes by which people internalize a knowledge of a foreign language. Such an understanding will contribute to foreign language policy research and serve as a basis for peace education. The focus on foreign language policies is additionally motivated by the conviction that a theory of peace education needs to be explicitly formulated so that statements about how people learn a foreign language and how peace education ought to be taught can be subjected to critical scrutiny.

A good starting point, then, is to try to define 'peace education'. The term exists in opposition to violence: peace and violence. The difference between the two concepts can be examined from a sociological, psychological, and an educational viewpoint. Sociologically, the distinction between peace and violence can be viewed as one of the domains. Domains are constellations of factors that affected by language and how people interact with each other. The domains of a culture of peace may be affected by language and the way people interact with each other. History, the spirit of the time, people, people's understanding, perception, and feelings are all crucial factors shaping society's way of looking at certain concepts and accepting to live them. The differences in each of these dimensions are fairly evident and need little comment. Psychologically, the critical distinction is between 'formal' and 'informal' peace processes. Formal peace processes involve some kind of state activity. For example, an attempt to learn about the culture of the 'other' by obtaining information explicitly. Informal one may take place through observation and direct participation in communication.

Educationalists often distinguish the idea of 'peace education' and 'a culture of peace'. 'Peace education' typically occurs in classrooms. It involves some deliberate attempt to shape the learning atmosphere in the belief that by so doing, the people will be able to acquire the knowledge of peace and reflect it on their behavior. The people are the most excellent resource for building a culture of peace. Peace education, which fosters a culture of peace, is fundamentally transforming. "It cultivates the information foundation, skills, attitudes and values that strive to modify people mindsets, attitudes and behaviors that, in the first place, have either produced or aggravated violent conflicts". The intervention must cater to official peace procedures, namely peace education. Peace education include learning about conflicts and their peaceful resolutions. It also entails engaging young people in expressing their thoughts and working together to decrease violence in society. Peace education is defined by UNICEF as "the process of promoting the knowledge, skills, attitudes, and values required to bring about behavior change

that will enable children, youth, and adults to prevent conflict and violence, both overt and structural; to resolve conflict peacefully; and to create the conditions conducive to peace whether at an interpersonal, intergroup, national, or international level" (Navarro-Castro and Nario-Galace, 2010, p.xiii). It is critical to consider the social and cultural circumstances, as well as the demands of the nations. Values help individuals live their lives and structure their society. "Being a decent human being" is one of the universal ideals that extends beyond this definition. We need international cooperation institutions that are powerful enough to insist on universal ideals. The purpose of universal values is not to eradicate all differences, but rather to assist us in managing them with mutual respect. Tolerance and conversation are crucial because without them, there can be no peaceful exchange of views or agreement on solutions that enable various civilizations to grow in their own manner. In today's linked society, there is another method to discover universal ideals, which we can name the dialectic. This strategy is participating in argument and conversation with those who have different points of view in order to achieve an agreement on what we all agree on. Jürgen Habermas, a German philosopher, is one modern-day supporter of this method (1929-). Habermas created the concept of "an ideal speech situation" to describe how ethical and political debate takes place. This is an envisioned technique of dialoguing about complicated subjects in which all participants may discuss and argue their perspectives equally. In such a circumstance, the goal is to reach some kind of agreement so that the community may promote its views and ideals (UNODC, 2017).

## 4. Results and discussion

*How can we develop our understanding of peace education? How can we build a society full of people with tolerance, respect, cooperation, understanding and respect for diversity?*

One way is to accept that peace education or a culture of peace is transformative. In other words, to build awareness and understand each other, people are to live, relate, and create conditions for nonviolence, mutual respect, and tolerance. It is essential to understand the perspectives. The way people look at the world may change the world. Currently, considerable attention is being paid to reflection, observation, and perspective-taking techniques. A key parameter has at least one foreign language to communicate well. All this provided a basis for foreign language teaching. Considerable importance, therefore, was attached to having a common language to solve the conflict. These emphasized the foreign language policies for conflict resolutions. It was argued that communication via a foreign language could be a step toward conflict resolution. Neither one side nor the other one can insist on its own language to be used. Peace education could best be fostered with a common language in conflict zones. Although it is not entirely accurate to say that a common language may provide a resolution for a conflict, it is undoubtedly true that the decade saw a remarkable growth of such ideas. A second way of constructing peace via education is to assume that peace education is best understood with a holistic approach. By saying holistic approach, we mean learners' cognitive, active, and affective dimensions. Question and discussion sessions may provide concerns, challenging, eliciting, and encouraging.

Neither of the first two approaches involves going inside the classroom to try to teach peace education. It is much easier to start teaching peace education in kindergartens. Age is another issue that should be thought about carefully. Peace education aims to develop conflict resolutions in which society gains knowledge, digests it, and reflects as behavior change. Not the starting age, but the process of teaching peace should be thought carefully. Although the concept – of peace education cannot be explained clearly, teaching and learning methods of peace education is more visible. There is a broad consensus that peace education should stimulate reflective and critical dialogue in the classroom (Aspeslagh and Burns, 1996; Shapiro, 2002; Bush and Saltarelli, 2000). In addition to practicing role-plays, games, and group activities, children should learn about negotiation, cooperation, and working together. 'A teacher who tries to convey a peace culture without some practice is like a moral rascal teaching ethics' (Bretherton, Weston, and Zbar, 2003, p. 13).

## 5. Conclusion

Peacebuilding efforts in post-conflict states such as Cyprus are typically met with tremendous antagonism from those who desire to maintain the status quo under the pretense of defending cultural heritage, national identity, and security. Every effort to implement peace education in shattered cultures involves awareness of the complexities that characterize the current conflict, politics, and cultural groupings in that unique environment; there is no "one size fits all" strategy for teaching for a culture of peace in broken civilizations. In divided countries, residents are frequently so entrenched in their own sociopolitical identity that any progressive demand for education to engage in intentional attempts to

promote diverse ways of knowing and being on the part of the nation's children falls on deaf, if not hostile, ears. Because the pursuit of social cohesion among peoples who have been engaged in long-term inter-ethnic fighting, when social identity demands combine with significant political, value, and power differentials, is a difficult undertaking. Peace education presents a unique challenge in Cyprus since the different G/C and T/C groups have identity-based views on the purpose of education. Much of the problem occurs in the household, as young people absorb their parents' ethno-politically ingrained ideas. A dynamic sort of peace education that includes the family, community, and school is therefore critical.

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# REDUCING ACCESS BARRIERS, HIDING LEARNING BARRIERS:
# AN ETHICAL (KANTIAN) CRITIQUE OF THE OPEN ADMISSIONS MODEL
# USED IN MOOCS

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## Abstract

Massive Open Online Courses (MOOCs) is an innovative instructional technology that promises to democratize education. For more than a decade, highly reputable universities and companies have created MOOCs and offered them on online platforms such as Coursera, EdX, and Future Learn. The MOOCs platforms use an open admissions model: Users can enroll in a course with a click of a button and without applying for admissions. The fees for enrollment vary from platform to platform but they all tend to be relatively low. The open admissions model appears to be empowering learners by removing access barriers such as high costs and selective admissions. However, there is extensive empirical evidence that MOOCs have high dropout rates and that the completion of a MOOC requires strong academic and self-regulation skills, skills that not all learners have. This reality raises ethical concerns about whether MOOCs platforms are deceiving learners by encouraging them to enroll and pay for courses without giving them information about the learning barriers that they will likely encounter. In this article, I analyze the open admissions model of MOOCs platforms based on the Kantian theory of morality. The Kantian theory of morality rests on the concept of rational freedom and the duty to protect and promote rational freedom. Correspondingly, my analysis examines the extent to which MOOCs platforms are promoting and/or constraining rational freedom. I first argue that the open admissions model can positively contribute to the freedom of learners by giving them access to opportunities for developing their talents. I then argue that while the open admissions model facilitates access to learning, it is currently not supporting learners in understanding the barriers that they will likely encounter in a MOOC (such as the tendency of novice learners to overestimate their competences, the absence of expert guidance in MOOCs, and the need for high levels of self-regulation to succeed in a MOOC). To support learners in making free rational decisions as opposed to rushed uninformed decisions, MOOCs platforms should help them better assess their readiness for a course. This could be achieved by requiring learners to complete an assessment prior to enrolling in a course. Automated feedback on the assessment can support learners in better understanding the competences they need to have and the time commitment they need to make to successfully complete the course.

*Keywords: MOOCs, online learning, Kantian ethics, rational freedom, deception.*

## 1. Introduction

Massive Open Online Courses (MOOCs) is an instructional technology that aims to democratize education by making it more accessible and affordable. Unlike other types of online courses that have enrollment restrictions, MOOCs are designed to be accessible to a vast audience without any limits on the number of students who can enroll. The technology first emerged in 2011 when Stanford university offered three online courses for free to more than a 100,000 students (Ng & Widom, 2014). Since then, universities and companies from all over the world have designed their own MOOCs and offered them for free or at an affordable cost to gloal learners. MOOCs are usually offered through global online platforms, the most notable of which are Coursera, edX, and Future Learn. Today these three platforms host thousands of courses designed by worldclass universities (such as Harvard, Stanford, London School of Economics, and HEC) and worldclass companies (such as Google, Amazon, Meta, IBM). MOOCs platforms use an open admissions model: Learners can enroll in a course with a simple click of a button and without having to undergo a formal admissions process. The costs of enrollment vary from platform to platform but they all tend to be relatively low. For example, Coursera charges a monthly fee ranging from 39 to 79 USD, depending on the course (Bowden, 2023). Meanwhile, edX charges a one-time fee for each course, which can range from 50 to 300 USD (edX Learner Help Center, 2023).

Despite their accessibility and affordability, and despite the many success stories that they generated, MOOCs' completion rates and retention rates have been consistently low (Reich and Ruipérez-Valiente, 2019). Furthermore, research suggests that the demographic that have benefited the most from MOOCs are learners with strong self-regulation and academic competences (Alonso-Mencía et al., 2020). These findings strongly refute and put into question the claim that MOOCs facilitate the democratization of education.

The low completion and retention rates are hardly surprising. When one examines the structure of MOOCs, one can obviously see the absence of support and guidance. A MOOC typically consists of video lectures and slides, quizzes with automated feedback, and assignments that are evaluated by peers (Bates, 2022). Direct interaction with professors or with experts in the field is missing. When learners experience difficulties, they are often left to their own devices. Success in a MOOC requires that learners independently set realistic learning goals, persist when facing difficulties, and independently look for and find support. To succeed in these tasks, learners should have already developed high levels of self-regulation and a strong expertise in tackling intellectual challenges. Not all learners have had the opportunity to develop these skills. Consequently, rather than supporting and empowering all learners, MOOCs seem to be widening the gap between learners with high academic competences and learners who lack these competences.

While the open admissions model reduces access barriers for learners (by allowing learners to instantly enroll in the course they choose), it may also be deceiving them by not informing them of the difficulties that they will likely encounter and by not supporting them in assessing their readiness for the courses they want to enroll in. This raises some ethical concerns about learners' rights, in particular the right to know the truth about the learning experiences they are about to start and the right to get guidance in assessing their readiness for and ability to succeed in these learning experiences. The objective of this paper is to address the ethical concerns by conducting an ethical analysis of the open admissions model based on the Kantian theory of ethics.

Before presenting the analysis, it's important to note that the focus of this paper is on the open admissions process used by Coursera, edX, and FutureLearn. It's worth noting that other MOOC platforms may have different admission systems in place. For example, *Outlier,* a recently launched platform, integrates some guidance into their admissions process. *Outlier* requires learners to complete a survey prior to enrolling in a course and it generates instant recommendations for them based on their answers. In addition, enrollment in some of the courses requires learners to complete a knowledge test. Learners who fail the test are not allowed to enroll in the course; however, they still have the option to retake the test as many times as they want. The process followed by *Outlier* seems to be the exception not the rule in the universe of MOOCs, most if not all other platforms have a one-click open admissions process that does not include any guidance or self-assessment. This one-click open admissions process will be the focus of the current analysis.

This paper is divided to three sections. In the first section, I briefly introduce Kant's theory of ethics. In the second section, I apply Kant's theory to argue that the open admissions model is ethically problematic because, even though it reduces access barriers, it also functions to deceive learners by hiding learning barriers from them. Finally, I articulate recommendations for enhancing the moral integrity of the open admissions process.

## 2. Kant's theory of morality and freedom

Kant defined "humanity" as the capacity to freely set our own ends (Kant, 1797/2017), independently of external coercive forces and independently of internal inclinations (Dryden, n.d.). For Kant, what differentiates human beings from all other entities in nature is their freedom: the ability to be the cause of their own actions as opposed to being fully controlled by natural forces and social forces. Because freedom is the defining element of being human, it is our duty to respect freedom in ourselves as well as in others: "To be human […] is to have the rational power of free choice; to be ethical […] is to respect that power in oneself and others" (Mazur, 1993).

One common approach of using Kant's theory has been through the application of his infamous formula of universal law: *Act only according to that maxim whereby you can at the same time will that it should become a universal law*. Several Kantian scholars have criticized the formula and argued that the emphasis on this formula misses the essence of Kant's theory of morality (Wood, 2009). The essence of Kant's theory is not universalizability, it is respect for our capacity to freely set our ends and to freely articulate the principles that guide us in setting our ends (Wood, 2009). The formula of universal law is one among many other Kantian theoretical constructs. Kant has articulated several other formulas that, according to him, reflect the supreme principle of morality. Kant has also developed a detailed taxonomy of our moral duties towards ourselves and our moral duties towards others. All of these constructs can

serve as analytical tools for the Kantian scholar and the choice of which one to focus on will depend on the context of what is being analyzed. The one common element in all Kantian moral analyses is their emphasis on respecting humanity in ourselves and in others, humanity being defined as the capacity to freely set ends.

To respect humanity is to use our freedom in such a way that it does not prevent others from exercising their freedom, to respect humanity is also to free ourselves and support others in freeing themselves from external coercion, manipulation, and the control of internal inclinations. Kant called these forces "heteronomous" and contrasted them with the condition of autonomy, the condition in which we freely set our own ends by freely using our reason without being coerced by any internal or external force (Dryden, n.d.).

A Kantian moral analysis of the open admissions system should therefore examine how the system impacts the freedom of learners and their capacity to set ends: how does it support them in growing their capacity to set ends? And how does it hinder and constrain their capacity to set ends through heteronormative forces like deception, manipulation, and misinformation?

## 3. Kantian analysis of the open admissions system: Removing access barriers, yet hiding learning barriers

Following from the unconditional moral worth of freedom and the duty to promote it, Kant argued that human beings have the moral duty of perfecting themselves and developing their talents (Kant, 1797/2017). By developing their talents, humans widen the range of the things that they can do and, consequently, they widen the range of the ends that they can set. By widening the range of the ends they can set, they grow their capacity to set ends, their freedom, and their humanity. In contrast, when learners are deprived of opportunities to grow their talents, when the range of ends that they can realize is limited and does not grow, their choice of ends becomes restricted (Guyer, 2014) and, consequently, their freedom becomes restricted.

Through their open admissions model, MOOCs platforms can be seen as supporting the self-perfection of their learners by making available to them opportunities for growing their talents. By removing any admissions barriers between the learner and the learning opportunity, MOOCs platforms are further enabling the freedom of learners and empowering them to freely decide which learning opportunities to pursue.

However, while the open admissions process facilitates access to learning opportunities, it may also be depriving learners from getting information on their readiness for the learning opportunity. As noted previously, there is extensive research evidence that MOOCs have high dropout rates and that they benefit learners with high levels of self-regulation. Learners with low levels of self-regulation, even when they complete the MOOC, benefit much less from it (Alonso-Mencía et al., 2020).

In addition to needing high levels of self-regulation, learners also need high levels of self-awareness and a strong understanding of their own competences to correctly assess their readiness for the courses that they are interested in. Research on self-assessment has found that novice learners tend to overestimate their abilities, a phenomenon known as the Dunning-Kruger effect (Kruger & Dunning, 1999). And when learners overestimate their abilities, they might also overestimate their readiness for a learning experience and their ability to successfully manage the challenges of that learning experience.

If MOOCs providers want to promote the freedom of learners, they must construct an admissions process that supports learners in overcoming the barriers that complicate their learning experiences. One of these barriers is low self-regulation, another one is overestimating one's abilities. The open admissions process used by MOOCs providers does not seem to be supporting learners in knowing the barriers that may hinder their learning, rather, the platforms seem to be downplaying these barriers and/or making them invisible. This raises the question on whether the open admissions process is a form of deception.

Deception is unethical. When an agent is being deceived, whatever choice they end up making will not be their own free choice, it will be a choice that they were manipulated to make. And when an agent is manipulated, they become reduced from a free autonomous human independently setting her own ends to a mere means for the realization of the ends set by others. The degradation of the agent into a mere mean is a disrespect to their dignity and their humanity.

To assess whether MOOCs platforms are deceiving learners, we should examine whether they provide learners with all the relevant information about the learning experiences that they are planning to sign up for. Some of the relevant information about the MOOCs experience are: (1) MOOCs are difficult to complete if the learner does not have high levels of self-regulation, and (2) if learners think they are ready for a MOOC, it does not mean that they are really ready for it. A survey of the websites of MOOCs platforms shows that they do not seem to be communicating these relevant facts to their prospective learners. Difficulties are downplayed and hidden, and the language used is highly optimistic. The following is a sample of the language used on the websites of Coursera, edX, and Future Learn:

- "Launch a new career in as little as 6 months" *Coursera*
- "Propel your career, get a degree, or expand your knowledge at any level" *Edx*
- "Future-Proof your career" *Future Learn*

While the above highly optimistic language can be motivating for learners, it is also unlikely to support them in making informed free rational decisions on whether to enroll in a course or not.

In summary, MOOCs providers seem to be promoting the freedom of learners by giving them the freedom to enroll in any course they want without having to go through an admissions process. However, the absence of a formal admissions process coupled with the highly optimistic language used on MOOCs website might be preventing learners from knowing the invisible barriers that will likely hinder their learning when they enroll in a MOOC.

## 4. Recommendations for enhancing the moral integrity of the open admissions process

To enhance the moral integrity of the admissions process in MOOCs platforms, it is important to support learners in better assessing their readiness and better understanding the requirements of the courses that they plan to enroll in. One platform that seems to be applying this approach is *Outlier*. The recently launched platform requires learners to complete a survey prior to enrolling. The survey asks them about their educational level and their schedule. Once the learner completes the survey, she sees a recommendation about whether to take the course for credit or to audit it, and whether to take the intensive 7 weeks version of the course or the 14 weeks version. Additionally, enrollment into difficult and demanding courses (such as Calculus) requires learners to complete a knowledge test first. If learners fail the test, they are not allowed to enroll in the course immediately. Instead, they receive a message recommending that they either enroll in a prerequisite course or retake the test. By offering learners the opportunity to self-assess their readiness and by giving them the option to retake the assessment test an unlimited number of times, *Outlier* supports learners in making informed free decisions based on reason and knowledge.

While the process followed by *Outlier* is a step in the right direction, moral integrity requires that the admission process provides learners with more support in assessing their readiness. It is important that learners be given opportunities to assess their self-regulation and academic competences. This could be done by having them complete additional surveys and knowledge tests or by requiring them to complete the first module in the course as a condition for enrollment. Working on the first module and completing its required assignments will give learners a clear idea of the effort that they need to put in to complete the course. Automated feedback on the first module's summative test can also support learners in better understanding their readiness and the commitment they need to make if they choose to enroll in the course.

Giving learners access and choice is not enough in supporting their freedom. Real freedom requires that learners make their choices and decisions based on reason, knowledge, and principles that they freely develop. When we give learners partial information or false information, when we encourage them to enroll in courses that have low completion rates without informing them of the difficulties that they may encounter and without helping them assess their readiness, we are only partially supporting their freedom. To fully support their freedom, we need to create conditions that help them make free rational and informed decisions.

Misinformed learners are not free; even when they are given the capacity to make choices, their choices will not really be theirs, their choices will be outcomes of manipulation and deceit.

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# IMPLEMENTATION OF ORGANIZATIONAL MODELS THAT PROMOTE PUPIL ATTENDANCE AND CREATE SOCIAL VALUE? AN INTERDISCIPLINARY PROCESS STUDY

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## Abstract

That pupils succeed in school is an essential protective factor for their social establishment as adults. For pupils to complete school, efforts are not only required within the school. It is also about prevention and promotional efforts outside the school's responsibility. More precisely, it is about coordinating efforts primarily by actors other than the school. Collaboration models are about creating a lasting structure to better coordinate the government sector regarding pupils who must function beyond individual government assignments and policy areas. The overall purpose of the present study is to investigate cross-border coordination and collaboration between professionals in Sweden that strive to create added value for pupils in the school who have norm-breaking behavior. In this context, it means harmful and destructive behavior that, in various ways, means that the rules and norms of the society in which the individuals' lives are violated. It can be anything from seriously breaking parents' rules, truancy, stealing, stealing, and doodling (non-aggressive norm-breaking behavior) to more serious offenses such as fighting and threatening staff and other pupils in school. More precisely, the study aims to explore the implementation process of two organizational models that intend to provide increased support to pupils with norm-breaking behavior in school and contribute to completed schooling and social justice. One model has been created on a national level and a local level. The study also intends to investigate whether public, group, and individual cooperation can create representative added value for the pupils. RQ 1) what organizational processes can be identified locally at school? RQ 2) What organizational processes can be identified on the regional level in the municipality? RQ 3) In what way do the levels connect? RQ 4) If and how does cooperation create social value for the pupils?

The project is built around three types of data collection: focus groups, semi-structured interviews, and document analysis. Regarding Poole and Van de (2004), planned and emergent organizational change is often seen as the opposite. Still, studying the processes of relationships can also be fruitful since each other can stimulate and initiate them (Jacobsson, 2017). A narrative strategy involves constructing a detailed story based on the data collection. According to Pentland (1999), the narrative is a step to create a chronology, organize the data, and interpret it theoretically for further analysis according to Poole and Van de Ven's (2004) four ideal types. We will use Pickering's (1995) concepts; intention, resistance, and support from Jacobsson's (2017) activity, actions, change, and improvement. The construction of these concepts derives from Van de Ven (2007), who argues that process studies are built up around events and activities that lead to organizational change.

*Keywords: Implementation, narrative, organization, pupils, social value.*

## 1. Introduction

Many societies are, arguably, more interdependent and plural than earlier (Mintzberg, 2015) because of, for example, globalization and consequently, the challenges public service organizations face are increasingly complex, ambiguous, and often addressing societal matters of concern (Bryson et al. 2017; Crosby et al. 2017). The New Public Management (NPM) reforms usually focus on inter-organizational questions. NPM has emphasized the efficiency of internal processes, and the account has been on performance measures of units within organizations. This mentioned focus could result in a poor understanding of the social system and sometimes fragmented welfare services ( Fransson & Quist, 2014). But during the last years, collaborative cross-sectoral networks have been used in public sustainability management to create social value and goals (Loorbach, 2010). Academic terms like cross-sector collaboration, networks, and coordination are used terms. Increased collaboration is needed

to deal with the complex reality of nowadays societies (Christensen & Lægreid, 2011), and cooperation is also required to create the capability to solve challenges in the public sector (Keast & Brown, 2002). At the same time, the partnership *between* organizations meets many challenges; antecedents and trust in the networks have been explored, but far less is known about the distrust in networks. (Shin et al., 2017).

## 2. The Swedish case

The Swedish school system is based on a societal model that gives all young children equal opportunities to learn and participate in school. Therefore, school is essential to children's and young people's health and inclusion. Still, many school systems experience issues such as inequality of opportunities, oppression, and achievement and attainment gaps. For children and young people to succeed at school, in addition to efforts within the school, preventive and promotional measures outside the school's area of responsibility are also required. Different actors in the municipality work separately with the pupils to give them better conditions for achieving results, but it is not enough for some pupils. Coordinated efforts are needed primarily by actors other than schools and can contribute to children and young people achieving goals in school and feeling participation. The central government has a role in establishing the educational and political agenda and working with it through laws and steering documents. The curriculum for the compulsory school, preschool classes, and the leisure-time center (2022) and The educational Act (2010:800) is the governing document that the municipalities' and private actors' schools must interpret. Children in socially vulnerable areas will are exposed to risks that can affect their mental and physical health and develop risky behaviors that can lead to exclusion or crime.

### 2.1. The regional model

The National Coordinator for Agenda 2030 initiated a pilot to develop better with state authorities and county administrations to create better support at the regional level with concerns for the school. The collaboration model is about creating a permanent structure to better coordinate the government sector regarding children and young people, which must function beyond individual government tasks and policy areas. It is based on the county administrations' existing municipal dialogues and a newly established gathering place for regional coordination. The aim is to, through these forums, firstly capture municipalities' demand and need for support and secondly reach out to the cities with support from national authorities in a more coordinated and accurate manner. Some pupils with risky behavior also have - in the long term - a risk of criminal activities, and lack of education means that children who have not gone to school have more difficulty getting a job.
Text.

### 2.2. The local model

In 2019, the municipal board tasked the social administration and children and education administration in X municipality to jointly investigate how coordinated efforts around children and young people with complicated support and care needs could be designed to support the needs of vulnerable children in school. The social service's mission is based, among other things, on § 1 of the Social Services Act (2001), which shows that the social service board must work to ensure that children and young people grow up in safe conditions and that the social service must conduct outreach activities and other forms of preventive work. The School Act (SFS 2010:800) states that "the education within the school system must take into account the different needs of children and students" (p.2) and that "an effort to compensate for differences in the children and the students' conditions to assimilate the education" (p.2 ). The project was evaluated in 2022, and the two committee politicians decided to implement the working method in all municipal schools. The organizational model's target group is students in grades f-6 who have early norm-breaking behavior or are at risk of developing norm-breaking behavior. The aim is to offer support to children and guardians and coordinate based on the child's needs, and the support should be easily accessible. The long-term goal is for more children to finish primary school with passing grades and trust in society and themselves. The early coordinated efforts are efforts without a needs test with the support of the Social Services Act. The efforts can be made at individual, group, and organizational levels. The model contains several steps; attention, decision, instigator implementation, and termination.

## 3. Theoretical perspectives

This study focused on describing and understanding how processes were initiated, developed, and completed, and a process model has been chosen. The analysis focuses not merely on what can be observed but on the factors causing the events (Danemark et al., 2003). Organizational processes cannot

be studied directly, and according to Pettigrew, Woodman, and Cameron (2001), it is individual and collective events, actions, and activities that develop in a particular context that can focus on observation. Furthermore, Pettigrew (1997) argues that an underlying logic gives meaning to events, actions, and activities. This logic must be interpreted in a theoretical way to make the process and the mechanisms driving it forward visible. Change cannot be evaluated for improvement or regression (Van de Ven and Poole, 1995). The study's definition of change has been inspired by Lynchnell's (2003) deliverables, which are the transactions or products that the process primarily produces and which, in turn, can contribute to improvements.

Improvement is seen in the study as someone who has created some progress and result concerning an intention that contributes something new or is done in a new way that goes beyond what already exists.Ontologically,   the study is presented within the field of critical realism, where the researcher tries to come closer and understand an objectively existing reality (Danemark et al., 2003). However, our knowledge of this reality is always conceptually mediated and thus more uncertain. For us to be able to analyze the causality in what we perceive around us, Danermark et al. that studying is not enough observable events without the generative mechanisms that produce the events having to stand in focus. To describe this, reality in critical realism is divided into different domains; the underlying mechanisms are called the domain of reality, what the mechanisms possibly generate is called the domain of actuality, and what we manage to observe is called the empirical domain.

## 4. Methods and analysis

The empirical material comprises observations, notes, interviews, and document analysis. For this study to contribute to understanding this underlying logic, Van de Ven's and Poole's (1995) four ideal types of process theories have been used in the analysis. Motors have been identified within each process theory, which contains generative mechanisms that are key to how actions, events, and activities emerge and are driven forward. The motors also describe the different phases of each process. Regarding Van de Ven and Poole (2004), planned and emergent processes are often seen as opposite. Still, studying their relationship can also be fruitful since each other can initiate and stimulate them (Jacobsson, 2017). The empirical material in the study is analyzed according to Van de Ven's and Poolés four ideal types for process studies: *Life cycle* - which is based on the regulated change. 2) *Teleological process* - that shows development as a cycle when there is some form of dissatisfaction, and the entity finds consensus in new goals. 3) *Dialectal theory* - when there is a conflict between objects, and at last, 4) *Evolutionary theory* when competition arises in the entity. Each process theory has a driving motor to identify and contain generative mechanisms fundamental to how actions and activities are driven forward. Three strategies were used to organize the data to make an analysis possible.Narrative strategy, episodes, and graphic representations were used since they provide partly different perspectives of the material. The narrative approach gives a chronological and rich story, making it possible to compare various events. The episodes make precise timing, and the graphical representation is a way visually to show patterns. Pentland's (1999) structural levels based on narrative theory inspired the theoretically interpreted narratives. The course of events, constructed to enable the analysis, contains one or more episodes, where defined activities are carried out according to an intention worded at the beginning of each episode. Intention refers to the plans or goals that the participants at the various levels (national, regional, or local) formulate and then try to achieve (Pickering, 2005). The intentions may be planned or emerge during the implementation process. About the intention, resistance or support can arise (Pickering, 1995). In this study, resistance and support will be the critical points influencing the actions and activities that follow an intention (Newman & Robey, 1992). Activities lead different events forward, and in the study, cooperation, social justice, collaboration, and value creation will constitute activities that can be derived from the intentions. The processes will be concluded by identifying change and improvement in the chain of activities, actions, and statements over time. Change is understood in the study as a change within existing frameworks (Watzlawick, Weakland & Fisch, 1974). Change is a difference in an organizational unit's form, quality, or state. The entity can be an individual, a work group, an organizational strategy, a program, a product, or the entire organization. In the analysis, it is used an extended view of Van de Veen and Pentland's motors and created activities and forms of results.

I stand for intention (I), A for activity, and R for results. Three different types of activities have been identified; activity/information (ai), activity/proceeding (a/p), and activity/choice (a/c), and two different types of results are identifiable; change (c) and development (d). Two different types of intentions can initiate an episode: prescribed intention (P/i) or emerging intention (E/i). Intentions refer to the plans or goals the participants formulate and then try to achieve (Pickering, 1995). In the study, three types of intentions are used: overall, prescribed (pI), and emerging intentions (eI) (Jacobsson, 2017). In relation to the intention, either support (s) or resistance (r) can arise. The overall intentions were at the

local level to support students with norm-breaking behavior to obtain a complete school achieved goals. The prescribed intentions at the local level consisted of forming a group consisting of professionals usually found in social services to support the pupils mentioned above. At the national level, the intentions consisted of creating conditions for the regions by creating a cooperation model to better coordinate the municipalities' demands and need for support and reach out with the national authorities' approval to municipalities.The intentions consisted of planned intentions and those that emerged during the process.

## 5. Results

The study presents an analytical framework for studying processes in organizations, which is a significant contribution. The presentation of generative mechanisms and their impact on processes gives a theoretical explanation of how activities influence the processes. On the local level, both planned, and emergent processes can be identified. Surprisingly, only the Teleologic motor can promote development, but all motors are working in all the events. However, on several occasions it seems that the planned improvement work inspires emergent initiatives for improvement and seems to be a fundamental condition for their existence. The four motors support and challenge each other, making the process develop and produce results. Within the process, the generative mechanism determine which motor will drive and push the process forward. The insight into the importance of the engines on the theoretical level can contribute to how organizational processes change outcomes in change work. The study's analysis tool is based on the four process theories which in themselves constitute ideal types which in the study were a methodological tool. The process theories are limited in number, and therefore their usefulness as tools for understanding a process may be limited. At the same time, the four approaches, by presenting them in relatively simple, abstract terms, can provide the opportunity to analyze processes and contribute to an understanding of why the various processes turned out the way they did.

Example of change – a dialectical process

The sequence of events 1 contains four episodes that concern the process of creating a group at the local level, the TTT group, which will work with support for students with norm-breaking behavior. The episode began with the backing concerning the first emerging intention of the course of events – to form the TTT group (EI). The administrative managers discussed how the recruitment would be carried out, the employee's qualifications, and how the group's organization would be carried out. They agreed that the group would have two social workers and a coordinator, followed by an activity (a/i) consisting of information where the administrative managers informed teachers, the student health team, and principals about their decision to create the group. Several employees reacted negatively to the announcement as they considered that they had received too little information and lacked influence, which is interpreted as resistance (m). The administrative managers arranged new meetings to dissolve the opposition by allowing the staff to ask questions and share their views on the organization of the group's members and its tasks, which is seen as activity proceeding (a/p). The staff became more positive after the second meeting with the managers, which is understood as a change (c). This episode is driven by a dialectical engine where the administrative leaders are irritated and reluctant by the staff as they consider themselves to have too little information. The *generative mechanism* that makes the dialectical engine work is conflict. After the second meeting, the staff changed their minds when they had to discuss and ask about the upcoming TTT group, and the managers heard about their intention through negotiation. The episode ends in a change (f) to the emerging intention.

Example of development – a teleologic process

The second example of a sequence of events concerns the question of whether the TTT group's working method should continue in the municipality. When the second episode begins, an evaluation of the TTT work carried out over a year has been completed. The intention is to explore how the politicians perceive the review and make decisions about the group's possible further work.

The social administration and the political committees of the children and youth administration are informed by the evaluator about the pilot project's outcome and the process's strengths and weaknesses (a/i). The political committees express their support (s) for the permanent TTT group's work and decide that the group will be allowed to continue its work permanently. The decision means that the group gets continued work and is imbued with consensus. The permanent group marks the end of the process, and the result is taken as a change (f) in relation to the emerging intention. *The generative mechanism* makes the teleological motor consensus and goal orientation. When the politicians took part in the evaluation, the subject was discussed on several occasions before a unanimous decision was made.

## 6. Discussion

The study presents an analytical framework for studying processes in organizations, which is significant contribution. The presentation of generative mechanisms and their impact on processes gives a

theoretical explanation of how activities influence the processes. On the local level, in X municipality both planned, and emergent processes can be identified. Surprisingly, only the Teleologic motor can promote development, but all motors are working in all the events in the identified organisation processes. However, on several occasions it seems that the planned improvement work inspires emergent initiatives for improvement and seems to be a fundamental condition for their existence. The four motors support and challenge each other, making the process develop and produce results. Within the process, the generative mechanism determine which motor will drive and push the process forward. The insight into the importance of the engines on the theoretical level can contribute to how organizational processes change outcomes in change work. The study's analysis tool is based on the four process theories which in themselves constitute ideal types which in the study were a methodological tool. The process theories are limited in number, and therefore their usefulness as tools for understanding a process may be limited. At the same time, the four approaches, by presenting them in relatively simple, abstract terms, can provide the opportunity to analyze processes and contribute to an understanding of why the various processes turned out the way they did.

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# ATTEMPTS TOWARDS ALLEVIATION OF SOCIAL INJUSTICES WITHIN SOUTH AFRICAN UNIVERSITIES

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## Abstract

Education is viewed as a tool that is used in South Africa to achieve equity, eliminate historical inequalities and promote national growth. The South African education system is characterised by socio-economic disparities which serve to perpetuate social injustices in relation to the provision of quality education. The South African Department of Higher Education (DHET) advocates for strongly for a social justice intent, through its Open Learning Policy Framework. The DHET's Open Learning Policy is built around the constructs of pedagogy, access to learning and mechanisms of success. The DHET's primary goal is to improve access to higher education to all South Africans. The COVID-19 pandemic, resulted in an increased distance between student and contact universities, consequently widening already existing social injustice. A generic qualitative study was undertaken to explore, the approaches adopted by one South African university to determine the mechanisms applied by the institution's faculty of education, to alleviate social injustices through open learning. Purposeful sampling was followed for participant selection. Data was then collected in the form of interviews, public facing documentation and institutional reports. Guided by Nancy Fraser's social justice theoretical framework, results emanating show that universities understanding of "open learning" is shaped by their contextual readiness for open learning. The results emanating from the study indicate that South African universities are creating opportunities of greater access, through alternative routes to learning to school leavers and as well as some working professionals. This is achieved through the development of a Virtual and Augmented Reality (VAR) hub at a South African university. The VAR hub serves as a tool to address the articulation gap between the schooling and post schooling sector through parity of participation within the broader South African context. The hub creates opportunity for access to students for the sustainable integration of VAR applications in the field of science education thereby enhancing epistemic and epistemological access in science education. Thus, the use of VAR applications has the potential to alleviate socio-economic injustices.

*Keywords:* *Access, education, open learning, science, social justice, virtual reality, augmented reality.*

## 1. Introduction

Over the years, universities have been instrumental in addressing various social injustices globally. This is because universities play a crucial role in shaping the values and beliefs of individuals who are likely to be future leaders in different fields. As such, many universities are making significant efforts towards alleviating social injustices globally. Access to quality education has been a long-standing problem in South Africa. In 2020, the COVID-19 pandemic, and national shutdown, reverberated the inequalities that still exist some twenty plus years into a democracy. A digital divide, challenges of wireless connectivity, load shedding, and access are but a few that made the continuation of learning challenging for many students. According to Pearson Jr and Reddy (2021), the post COVID-19 era, is likely to widen the education inequality gap. Sadly, the South African Population and Registration Act of 1950, classified and categorised people based on their race. Sociologists term this structural racism that still influences the education opportunities available to individuals and their ability to succeed (Caliendo, 2015). As such this cascading effect influences students' access to universities in South Africa, placing emphasis on students' final grade twelve results and their access to financial resources (Rogan & Reynolds, 2016). Hence the DHET's Policy on Open Learning, explicitly aims to "introduce open learning practices as one practical way of addressing crucial issues of widening access to affordable, quality learning opportunit[ies]" (DHET, 2017, p.366). Thus open learning is defined as an educational approach which combines the principles of learner-centeredness, lifelong learning, flexibility of learning provision, the removal of barriers to access learning, the recognition for credit of prior learning experience, the provision of learner support, the construction of learning programmes in the expectation

that learners can succeed, and the maintenance of rigorous quality assurance over the desire of learning materials and support systems (DHET, 2017, p.363). According to DHET, as a principle-based concept "open learning is fundamentally about access and success, with flexibility of provision contributing to expanded access and quality of provision contributing to improved student success.

## 1.1. Virtual and augmented reality

Virtual reality (VR), augmented reality (AR), are examples of immersive systems that have the protentional to enhance student learning. Virtual reality is defined by Sacks et al., (2020) technology that makes use of computers, software, and peripheral hardware to generate a simulated environment for the user. Whilst augmented reality combines the real and virtual worlds in an active manner through animations. Empirical study by Abdinejad et al., (2020) suggests that these technologies respond to students' curiosity and consequently has the potential to enhance student conceptual understanding of abstract concepts such as those taught in the field of sciences. Thus, virtual reality (VR) and augmented reality (AR) technologies have great potential to enhance the learning experience for students with disabilities, including those with visual or auditory impairments. By providing an immersive and interactive environment, VR and AR can create a more engaging and accessible learning experience. Thus, as society progresses into the 21st century we see the use of VR and AR becoming increasingly popular. These technologies create simulations that allow students to experience a particular environment or situation, such as a historical event or a scientific experiment, in a way that would not be possible in the real world. AR can be used to enhance the learning experience by overlaying digital information on top of the real world, such as labeling objects or providing additional information about a particular topic.

## 1.2. Open learning

Open learning in the South African context refers to a flexible and accessible mode of education that allows individuals to access educational opportunities, regardless of their physical location, time constraints, or financial status. This mode of education is becoming increasingly important in South Africa, as it helps to address the challenges of unequal access to education, particularly among disadvantaged communities. The South African Department of Higher Education and Training (DHET) introduced Open Learning as a transformative response to the many challenges it faced during the apartheid era. DHET has promulgated several policy documents on open learning (DoE, 1997; DHET, 2013); DHET, 2017). Open learning is defined in the White Paper for Post-school Education and Training as an "approach which combines the principles of learner centredness, lifelong learning, the flexibility of learning provision, the removal of barriers to access learning, the recognition for credit of prior learning experience, the provision of learner support, the construction of learning programmes in the expectation that learners can succeed, and the maintenance of rigorous quality assurance over the design of learning materials and support systems" (DHET, 2013: 48). This definition is also encapsulated in the Open Learning Policy Framework promulgated by the Department of Higher Education and Training (DHET, 2017). Open Education Resources (OER) are freely accessible educational materials that can be used, adapted, and shared by anyone (Hoosen & Butcher, 2019). OER includes textbooks, videos, assessments, and other types of learning content that are openly licensed and available for use by educators, students, and self-learners. According to Cannell, Macintyre, & Hewitt (2015), OER's have the potential to expand access and promote student success.

## 1.3. Social justice

The study is underpinned by the theory of social justice framework proposed by Fraser (2005). As a theoretical lens, the framework provided insightful elucidation into the extent to which initiatives promoting access, quality and success respond to historical and contemporary social injustices as well as conditions that enable and constrain success. According to Fraser (2005) social justice can be achieved through "parity of participation". Fraser (2005) assigns a generic meaning of justice to "parity of participation" as all individuals having equal opportunities to participate fully and equally in all areas of education. Thus, parity of participation indicates that all individuals should have equal access to educational opportunities, regardless of their socio-economic background, race, gender, or any other characteristic. This includes access to quality schools, teachers, resources, and facilities, as well as opportunities for extracurricular activities and higher education.

## 2. Methodology

The study adopted a qualitative research design located within the interpretivist paradigm. The qualitative design provided insightful interpretation into the universities initiatives towards opening up learning avenues to its students through the use of VAR applications as a means to alleviate social

injustices in STEM education. Data collection involved the use of semi-structured interviews with purposively selected VAR team members. The VAR team members provided insights into the pedagogical affordances of the integration of VAR applications as a means to develop scientific literacy in STEM education through open learning. The VAR hub development team members further provided insights into the strategic vision that inspired the establishment of the hub itself. Collected data were transcribed verbatim and the emerging themes were generated from participants' narratives. Qualitative data was subsequently thematically analysed using axial coding.

## 3. Findings

Key findings that emanated from the study are presented as follows:

**Theme 1: Professional Development of STEM teachers**

The establishment of the VAR hub was inspired by the critical need to professionally empower pre-service and in-service teachers with knowledge and skills in the use of advanced learning technologies in STEM. The hub provides opportunities for innovative utilisation of VAR applications to develop disciplinary knowledge to address pervasive knowledge gaps in key STEM domains. These sentiments are encapsulated in the following excerpt from the VAR team members.

> *Broadening educational pathways in STEM education requires the use of interactive technological applications such as VAR applications to foster pedagogic innovation in STEM teaching and learning. These applications can be harnessed to demystify abstract scientific concepts in key STEM knowledge domains* (Participant 1).

Professional empowerment of pre-service and in-service teachers with knowledge and skills in the use of advanced learning technologies in STEM remains a key strategic imperative. The realisation of this key strategic imperative hinges to a large degree on the active involvement of the Department of Basic Education and other key stakeholders in innovative undertakings of this nature as the following excerpt illustrates.

> *The VAR hub development team is engaging the Department of Basic Education and other key stakeholders to forge a partnership geared towards the promotion of public awareness of the pedagogical affordances of VAR applications in South African schools. It is envisaged that appropriate arrangements can be made to train teachers on the use of VAR applications as part of the partnership* (Participant 2).

**Theme 2: Significance of VAR applications in STEM education**

The participants highlighted the pedagogical significance of VAR applications in the development of scientific literacy in STEM education. Pedagogical affordances of VAR applications in STEM education are explicated in the following excerpt.

> *VAR applications can be used to develop learners' visuo-semiotic reasoning skills and foster interactive learning in science classrooms. In addition, they can be used as semiotic tools to enhance conceptual understanding of abstract scientific concepts* (Participant 3).

It is argued in this paper that access to VAR applications can be facilitated through open learning. Virtual and augmented reality (VR and AR) have the potential to revolutionize education by providing immersive and interactive learning experiences that can enhance student engagement, understanding, and retention of knowledge when dealing with abstract science concepts. VAR can provide a 3D visual representation of complex concepts, making them easier for students to understand and visualize. For example, students can use VAR to explore the inner workings of cells or to understand the principles of physics. VAR can also provide a safe and controlled environment for students to conduct experiments and simulations that would be dangerous or impossible in the real world

**Theme 3: VAR applications as a means to support academic research**

While the efficacy of VAR applications in the enhancement of teaching and learning is duly acknowledged, there is a critical need for formal empirical studies on the use of VAR applications within the broader South African context. The following excerpt highlights possible areas of research.

> *Teachers' and learners' experiences of VAR applications can be examined as part of formal empirical studies. Pedagogical affordances of domain-specific VAR applications can also be investigated. In addition, the extent to which the use of VAR tools fosters deep learning through the development of higher-order thinking skills merits investigation as well. Other research areas include the use of VAR tools to foster science inquiry-based learning and the exploration of the impact of the use of VAR tools on different individual characteristics (e.g., level of performance, motivation, spatial ability)* (Participant 4).

Context-specific exploration of the impact of VAR applications on teaching and learning is of vital significance as this critical endeavour would serve to provide insightful elucidation into the nature of intrinsic and extrinsic contextual factors affecting the sustainable integration of VAR applications in

STEM teaching and learning in various educational settings. VAR is expected to be a critical enabler of industry 5.0, by providing new opportunities for innovation and enhancing productivity across various industries. Fukayama (2018), states that Industry 5.0 is a smart society guided by innovation and propagates the convergence of physical space and cyberspace. Industry 5.0 is an era that demands the mastery of science and technology but also emphasises humans' ability to carry out their functions in collaboration with technology. Essentially, humans require the competence to solve emerging problems by utilising technology, intelligence and the economy to achieve sustainability. 5IR is not a mere chronological progression of 4IR, but rather, an effort to exploit technology, resulting in technological and social integration to augment the quality of life.

**Theme 4: The integration of VAR applications as a means to foster epistemic and epistemological access in STEM education**

The use of VAR applications can be harnessed as a means to enhance epistemic and epistemological access in STEM education. The South African basic education system is characterised by socio-economic disparities which serve to perpetuate social injustices about the provision of quality education. Innovative use of VAR applications can be adopted as a means to alleviate socio-economic challenges which stifle the provision of quality education in South African schools as the following excerpt illustrate.

> *Access to VAR applications can be harnessed as a means to address the complexity of the articulation gap between school and higher education. Enhancing student preparedness for tertiary studies is of crucial significance* (Participant 5).

The enhancement of epistemic and epistemological access in STEM education requires a clear and critical understanding of the complexity of the articulation gap between school and higher education. Various institutions of higher learning in South Africa responded to this fundamental challenge through the implementation of extended curriculum programmes which are aimed at addressing student under-preparedness for tertiary studies. Confronting social injustices bedevilling the provision of quality education requires robust intellectual exchanges which disrupt the prevailing status quo. These intellectual exchanges ought to be predicated on a "business unusual approach" and unorthodox philosophical practices.

## 4. Discussion

It is important to point out that VAR tools can be used as semiotic tools to enhance conceptual understanding of abstract scientific concepts. The communication of any science is mostly through vision semiotic models such as graphs, tables, diagrams, or simulations (Frezza et al., 2018). VAR tools can be used to foster science inquiry-based learning. The impact of the use of VAR tools on different individual characteristics (e.g., level of performance, uo, spatial ability) can also be explored as part of formal empirical studies.

In a similar vein, the use of VAR applications can be harnessed as a means to enhance epistemic and epistemological access in STEM education. However, the South African basic education system is characterised by socio-economic disparities which serve to perpetuate social injustices about the provision of quality education. Evidence-based solutions are required to adequately address the complexity of the articulation gap between school and higher education within the broader South African context. In support of this assertion, Morrow (2009) posits that epistemological access promotes alignment between institutional values and students' epistemological attributes.

At another pragmatic level, professional empowerment of pre-service and in-service teachers with knowledge and skills in the use of advanced learning technologies in STEM remains a key strategic imperative. The realisation of this key strategic imperative hinges to a large degree on the active involvement of the Department of Basic Education and other key stakeholders in innovative interventions of this nature.

## 5. Conclusion

Coherent and sustainable integration of VAR applications in STEM education provides a solid basis for the promotion of epistemic and epistemological access to alleviate social injustices bedevilling the provision of quality education. However, VR and AR should not be seen as a replacement for traditional teaching methods, but rather as a supplement to them. These technologies can be used to enhance the learning experience and provide additional opportunities for students with disabilities, but they should not be used as a substitute for other forms of instruction.

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# CORPORATE UNIVERSITY THE LIGHT OF THE EDUCATIONAL PSYCHOLOGY IN ORGANIZATIONS: AN EXPERIENCE REPORT

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## Abstract

Currently, educational psychology is directed at children and youth, and organizational psychology treats people as recourses for production, which reduces the possibilities of psychological intervention. The Corporate University increases competitiveness in the job market, transmitting the organizational culture and providing training based on the company's objectives, having employees better instructed. The report is related to an experience of a Corporate University in the metallurgic sector in Brazil, where the training took place between 2021, September, and 2022, August. Objective: Evaluate the impact of internal training on employees' daily lives based on responses in satisfaction assessments applied at the end of training and personal reports at graduation. Methodology: Three satisfaction surveys were rated, totaling 44 responses, from three different training courses (Technical Drawing Basic –TD-, Lean Level 1 –LL1- and Laser Cutting Machine Operation –LaserOp), which followed the UniMemo Methodology, developed by participating industry's training sector (UniMemo), after each training graduation, was collected the data through a questionary accessed by a link sent by UniMemo to the graduated participants. Additional data assumed were the employee's reports during each training's graduation. Thus, all participants could say what the experience represented in their personal and professional lives. Results: The DT satisfaction survey had 14 responses, LL1 had 22, and LaserOp had eight. The reports and responses in the surveys showed that the training is therapy for introducing a sense of belonging to the company and valuing the employee himself. In addition to the subjective results, a financial return was developed from the application of projects to reduce production costs, improve processes and reduce production stops. The projects also improve work conditions by reorganizing the fabric areas and co-construction knowledge, having a better training team, and with less doubt. It provided an increase in the possibility of replacing people with unexpected absences. Conclusion: Good learning, productivity, and personal development results have been obtained with the application of Rogers and Vigotsky's knowledge within the organizational context, considering the evaluated industry. Although the results are still preliminary, they indicate the possibility of a new psychological perspective to be explored in the educational/corporate interface.

*Keywords: Corporate university, educational psychology, organizational psychology, job market.*

## 1. Introduction

Currently, educational psychology is directed at children and youth, and organizational psychology treats people as production recourses, which reduces the possibilities of psychological intervention. In Brazil, psychology was established as a graduation course in 1962 in Law number 4.119, August 27, 1962. It was only in 2019 that the presence of psychology professionals in the school environment became mandatory through Law 13.935, December 11, 2019. From here on, a review of psychological course became necessary, considering that schools are environments in continuous change, simultaneously demanding from professionals a social, institutional, and educational approach (Hernandes, Yonezawa, & Cunha, 2022).

Vygotsky (1978) shows that the structure of learning and human cognition occurs in an ascending spiral, in which previous knowledge will serve as the basis for more developed and complex knowledge. This process of building knowledge in the psychic field was also managed by Piaget (1976), who addressed assimilation, accommodation, and mental balance. It is essential to notice that the social context and the type of resource available for the stimulation and support of learning that is offered to this child influence

their psychological development (Vygotsky, 1978); however, this theory continues to be widely used only for initial cognitive development in children, which leaves adults in the background. Concerning adult education in the work environment, the psychological focus is no longer educational psychology going to organizational psychology. That was instituted in Brazil only in 1990, although its practice has existed since 1920. From that period on, activities focused on the interaction between behavior at work and organization, recruitment, integration, development, and employee evaluation (Zanelli, Borges, Andrade, & Bastos, 2014).

Inside the organizations, education can be presented in the format of a Corporate University, which currently stands out for the need to increase competitiveness in the job market, transmitting the organizational culture and providing training based on the company's objectives, having employees better instructed (de Carvalho, 2014). Thus, a Corporate University "Represents, rather, a strategic redirection of the company, in order to enable it to become a learning organization" (Senge, 2018 apud Manganelli, Costa, Paradela, & Kirchmair, 2021, p. 82).

From this, the development of organizational training becomes essentials looking achieve and supply gaps in the company, being strategic for achieving organizational goals and results, develop people. All this is seeking to increase technical knowledge and the organization's intellectual baggage. In this way, employees are recognized and rewarded, becoming more engaged and productive, reducing turnover and increasing the possibility of professional growth (Pezzi, 2022).

Finally, collecting and analyzing the employees' satisfaction index with training is necessary. As stated by Ramos (2014), this instrument is vital to verify factors that interfere with employee motivation and satisfaction regarding various topics of the company, giving the possibility of improvement within strategic points. Understanding this, the aim of this study was to evaluate the impact of internal training on employees' daily lives based on responses in satisfaction assessments applied at the end of training and personal reports at graduation.

## 2. Method

The present study is an experience report about training from a Corporate University (CU) active in one Draft beer machine industry, localized in a medium-sized city in the country part of São Paulo (Brazil). Three training course satisfaction surveys were selected for this study (Technical Drawing Basic –TD-, Lean Level 1 –LL1- and Laser Cutting Machine Operation –LaserOp), which took place between September 2021 and August 2022. The surveys were sent to the trainees through an electronic address (forms) containing the following information: complete name, sector, how much the training will add to professional life, day by day and justification, the chance to recommend the training to familiars or friends, a grade for the facilitator's attitude and justification, a grade for the experience with the class, grade for the facilitator's didactics, openness to ask questions and justification, the chance of recommending the training with the same facilitator and justification, the grade of satisfaction and the chance of CU recommendation and justification, suggestion for improvement in training and CU. Participants gave additional statements voluntarily during the coffee break at the end of the training.

Fifty-five employees were willing to participate, but six of them were dismissed from the company. Therefore, their responses are not considered in the following, totaling 49 participants. All employees agreed to participate in this study and have their initials modified to ensure maximum secrecy. Two psychology students (one in the 5th stage of the course and the other from the 9th stage) and two production engineers were responsible for the data analyses in the CU room. Classical theories on educational and organizational psychology and the definition of CU were used as the basis for the analysis.

## 3. Results and discussion

The training LL1 presented the slightest difference between the concluding participants and the satisfaction survey respondents (1.8%) compared to the other two (TD – 25%; LaserOp – 30.8%). It can be hypothesized that, as this is a voluntary survey and the CU is part of a company with a recent training and development culture, employees are not in the habit of answering non-mandatory forms, which may have contributed to the discrepancy between the number of employees completing the survey and the number of responses obtained. Another factor that may have impacted is the bond created with the training. Because the DT and LaserOp had a duration of one month, with specific practical activities at the end of the training, while the LL1 had specific practical activities during the training and, for the conclusion, the development of a project to be presented to the supervisors, directors, and president of the industry. In this sense, it can be believed that to complete the LL1; there was a requirement for greater connection with the training and its parts, which included answering the satisfaction survey.

*Table 1. The total number of employees enrolled and completing the training and total number of respondents to the satisfaction surveys for Technical Design, Lean Level 1 and Laser Cutting Machine Operation training, carried out between September 2021 and August 2022, at a Corporate University in the interior of the state of São Paulo, Brazil.*

| Training | Subscribers | | Graduates | | Respondents | | Left the company |
|---|---|---|---|---|---|---|---|
| | n° | % | n° | % | n° | % | n° % |
| Technical Drawing Basic | 24 | 100 | 20 | 83,3 | 14 | 58,3 | 2 8,3 |
| Lean Level 1 | 55 | 100 | 34 | 61,8 | 33 | 60 | 4 7,2 |
| Laser Cutting Machine Operation | 13 | 100 | 12 | 92,3 | 08 | 61,5 | 0 0 |

Source: Prepared by the authors.

The responses in the surveys showed that the training can introduce a sense of belonging to the company and valuing the employee himself.

> *"Being able to sign up for what we want shows that the company is not only concerned with profit, it is concerned with us.".* V.L., T.D.

> *"[company name] a company that I am very proud to be part of this team. I want to thank you for the opportunity you are offering us employees, gratitude"* H.T., LL1

> *"I was so nervous when I found out that I was going to present the project I did to the directors and managers because I had never graduated in anything and the visibility that the company was giving me was very important to me"* S.A., LL1

> *"A great company initiative, bringing knowledge to employees and giving us opportunities for growth, in both areas, professionally and in our personal lives. Training us to add value to the institution and sector, making us feel part of the company's growth"* D.S., L.L.1

The company's climate must be pro-social if the goal is to improve the company environment and employee productivity, that is, an environment in which people help and support each other in times of difficulty or not (Dawood & Khan, 2023). This pro-social climate should also be predominant within the training sessions to create a collaborative learning environment. What is established through 4 items that influence each other: the interactions promoted, the situation generated, the processes involved, and the effects caused by these processes (Dillenbourg, 1999). Consequently, training that provides a pro-social climate becomes important beyond learning since this experience can be generalized (Moreira & Medeiros, 2019) to the employees' day-to-day work.

> *"I believe that the opportunity to grow my knowledge and not only as a professional but also as a person because there was a moment of sharing in which we talked about some events in our lives, whether good or "bad" brought us much closer. I want this goal in life, to see other people grow in their careers and lives. UNIMEMO did it for me and I believe you can do it for others, simple as that."* F.T. LaserOp.

> *"This course opens your mind a lot about many things in our lives, not only professionally, we learn to deal with things easier and in the best way with quality and efficiency without a headache"* G.J., L.L.1

The CU in the present study manages to transmit the vision and mission of the industry in which it operates, being an agent of propagation of these, facilitating its internalization by the employees. This result follows what de Carvalho (2014) exposed since the CU must be a means of transmitting the organizational culture. In addition to being in line with the author mentioned above, the present CU has focused its actions strategically, as guided by Manganelli et al. (2021).

> *"I really like being part of this project, where we [name of the industry] employees have a goal: always reach the top and be the best, with the best quality. Today [name of CU] helps us to achieve our goal, and with this, I know that it will open opportunities where its employees could grow together with [name of the industry], and with that, we will have our best moments alongside our co-workers and family."* Y.F., L.L.1

Employees were more engaged in their development and personal study, requesting more courses from the Corporate University and seeking greater professionalization in courses outside the company. Therefore, managers and companies must encourage studies inside and outside the employee field.

Considering the social context of Brazil, an underdeveloped country with a large part of the population with little (or even without) access to quality education (Pescarolo, 2017), it becomes essential that companies offer opportunities for people to expand its horizon of possibilities. Because the reality in which they are inserted can often limit their belief in the available possibilities, reducing their educational development.

> *"Because [name of the industry] is providing us with this training, we only have opportunities outside the company for a few. However, now, we go out to work, and the company allows us to study. This is something we should be happy for the consideration of the company with us, employees."* S.L. LaserOp.

Finally, training employees means having increasingly qualified people within a company, taking new technologies from the market to the industry without losing the intellectual knowledge of employees who already understand the goods produced. In this sense, the company benefits from an employee with a more refined intellectual capital, greater motivation, and a greater sense of belonging to the business.

## 4. Conclusions

Studies on corporate universities focus on the training and development (T&D) of organizational and work psychology (Nguyen, & Duong, 2020; Hashem, Sfeir, Hejase, & Hejase, 2022). The case study showed the benefits obtained with the theoretical basis of educational psychology in thinking about structuring corporate universities. However, the CU also focuses on attending to the organization's needs and strategically achieving organizational goals. Thus, it was possible to show that the theoretical models of Vygotsky (1978) and Piaget (1976) are also valid for adults in an industrial environment. Furthermore, using this theoretical basis can help increase employee motivation, sense of belonging, and importance to the industry. However, it is necessary to consider that the present study had few participants during a pandemic, so the desire for social contact impacted the results. Therefore, more studies are needed to understand better the limitations and possibilities of compelling intersections between educational and organizational psychology.

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# ECODIDACTICS: AN ECOLOGICAL EDUCATIONAL PERSPECTIVE

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## Abstract

Within an epistemological and didactic framework inspired by ecological perspectives in the Batesonian sense, the work proposes to advance an innovative framework of understanding and educational design of the connection between environmental education and the ecological perspective through the configuration of the ecodidactic perspective.

Through a discussion of an analytical methodological approach, the essay identifies and defines the peculiar aspects that make up the ecodidactic proposal: it is understood as an activist, democratic, eco-feminist education that fosters the development of empathy in a biophilic sense, aimed at fostering the development of ecological intelligence through ecoliteracy paths that aim to promote biospheric egalitarianism.

The intent of the work is to pave a way, to indicate a direction for a possible fruitful cross-fertilisation between ecology and didactics by outlining a guiding framework within which educational professionals can organically and consciously inscribe their activities.

*Keywords: Ecodidactics, ecopedagogy, environmental education, ecological education.*

## 1. Introduction

The daily news reports return in alarmist tones and with increasing frequency the profound changes that human action is determining on the fate of flora, fauna and all the systems of the entire planet earth. The changes have been so radical that, as early as two decades ago, Nobel laureate in atmospheric chemistry Paul Crutzen coined the term *Anthropocene* to try to describe a scenario unprecedented from the past and with it the introduction of a new geological era (Crutzen & Stoermer, 2000). The adoption of a term that features the prefix anthropos to denote a geological era should prompt reflection on the meaning of such a consideration since it implies recognition of the weight that the choices made by humanity in environmental, industrial, pharmacological, and food policies have on the survival of entire ecosystems and, therefore, on the fate of the planet.

The way forward requires a change of perspective; a necessarily plural and complex perspective, in the direction of a wide-ranging ecological paradigm (Bateson, 1972; 1976), a true life model in which at the center is the recognition of the dependence of living beings on their relationships with others; dependence that is also mutual influence. The basic idea of the ecological model is that every living being takes shape in relationship: the individual is not in a superordinate position; he is co-constructor of the relationships that define him, and in this sense the approach is systemic. It is a relational paradigm that proposes to respect the multidimensionality and richness of reality and to recognize the subject as having a great responsibility in terms of its ability to accommodate the ways in which knowledge is constructed in a network of complex relationships among all the components involved without hierarchical perspectives (Mortari, 2020).

The adoption of a paradigm that can reverse the trend and replace the prefix *anthropos* with the prefix *ecos* for the era we are living in is clearly a far from simple matter since it is unthinkable to initiate such a significant change by working only on a few fronts such as the much-inflated ones of technological innovation (Strongoli, 2019); it is necessary to initiate reticular and articulated pathways capable of making evident the complexity of an ecological perspective declined in epistemological, gnoseological and educational terms.

Hence the need to question the educational-didactic models and practices that pedagogy is deploying to respond effectively to these radical demands for change.

In order to trace and attempt to develop the plural and networked dimensions that the development of an ecological educational perspective that is not exhausted in the mere transmission of

information requires, it is necessary to work on several fronts and, precisely in this direction, there are not a few solicitations coming from other scientific fields such as environmental psychology, ecology and physics. In particular, our thesis of building an educational perspective oriented and declined in an ecological sense can draw heavily on instances related to biophilia with regard to empathic aspects, ecological intelligence with respect to the development of cognitive skills and ecological literacy in terms of knowledge related to the consequences of everyday choices in order to then land on the definition of ecological educational scenarios within school contexts.

## 2. Biophilia, ecological intelligence and ecopedagogy in the ecodidactic perspective

The epistemological instances that converge in the ecodidactic model explicitly refer to biophilia, literally "love of life," proposed by the scientific hypothesis proposed in 1984 by U.S. biologist Edward Osborn Wilson to denote an empirical experience of human connection with living forms (Wilson, 2002). Although it is innate, according to Wilson, it has a phylogenetically adaptive set of learning rules, so it could form the physiological basis and psychic potential from which the naturalistic intelligence identified by Howard Gardner in his well-known classification of intelligences could emerge (Gardner, 1983; 1996). Biophilia and naturalistic intelligence can be seen as two poles of an educational pathway in which biophilia represents the older pole, the psychic energy that nurtures our relationship with the natural world, and naturalistic intelligence as the ability to use this psychobiological potential to shape caring and empathic relationships with the natural world (Barbiero & Berto, 2016).

With respect to the possibility of developing more expressly cognitive aspects in an ecological sense, the studies of one of the leading experts on intelligence, David Goleman, who believes that the next cognitive step to be taken by humanity will be the development of an ecological intelligence (2009), that is, the ability to make conscious choices endowed with a very high degree of harmony with the natural environment, prove to be very interesting. The traits of this new intelligence refer to man's ability to learn from experience, to interact effectively with the environment, and to learn about organisms and their ecosystems in order to understand the effects of human activities and exert changes that will enable them to lead as environmentally friendly a life as possible.

This intelligence is collective and shared in nature with both emotional and gnoseological connotations and, therefore, requires the development of emotional dimensions related to empathic feeling and the construction of an apparatus of knowledge related to the natural environment. To fine-tune the apparatus of this ecological knowledge, it is necessary to work on its construction (Capra, 2006) since knowledge about the planet and nature in an ecological and systemic sense is constantly changing. The main risk is that of content obsolescence that will already be outdated by the time students are adults and have to make conscious choices endowed with ecological harmony with the planet.

Ecodidactics is, moreover, inspired by one of the most beautiful and important lessons of Brazilian pedagogue Paulo Freire, ecopedagogy. The term, coined in 1972, refers to the desirability of configuring a true pedagogy of the Earth, in which the latter is considered on a par with those oppressed people condemned to a condition of exploitation that Freire denounced so much in his work (1970), and therefore notes the need to develop an ecological pedagogy understood as a long-range educational design that takes into account human and earth rights, social and environmental justice in equal measure (Gutierrez, Prado, 2000). With this fundamental lesson in mind, the emergence of an ecodidactic perspective is to be understood as the design of a set of educational experiences of education that are no longer simply environmental and not just eco-sustainable, but ecological. These experiences must have a broad scope, they cannot be limited to a transmission of knowledge, but must be oriented to foster the development of the empathetic feeling towards living beings, defined as biophilia according to Wilson (2002), and of that ecological intelligence of which Goleman writes (2009) in order to allow subjects in training to acquire a capacity to read reality inspired by Freirean ecopedagogy.

Ecodidactics is, therefore, a complex concept articulated according to the ecological and ecopedagogical matrices that inspire it; it is, moreover, a polynomial term since aspects related to categories of form and content are present in it. For an educational action to be said to be hinged within the ecodidactic perspective, in fact, it is necessary for it to be ecologically oriented not only with respect to content, referring to environmental issues, but also with respect to form, that is, to methods, strategies and the configuration of educational spaces.

## 3. Characteristics and indicators of the ecodidactics model

Didactics in the ecological sense is a didactics of the relationship between learning and teaching, which, in this dynamic, are mutually defined and constantly changing; it is a complex didactics, with a multifaceted and multidimensional nature and action, and it is systemic when it co-constructs its own

value horizon while operating in analytical and critical terms within an educational and ecological action that has value and is valuable. On the foundation of these themes is built the analysis that led to the identification of the characteristics of ecodidactic educational environments and the indicators that identify it.

From a technical point of view, the ecodidactic model aims to design learning environments that foster the co-construction of shared ecoliteracy paths between trainers and trainees, teachers and students. That is, the profound sense is not to let the contents of ecological education be passed on by others, because they are so changeable that they will already be obsolete in a few years. The work conducted so far has facilitated the identification of the following ecodidactic indicators:

- is animated and driven by utopia, which is its constitutive form in a generative and transformative sense;
- is action, thought and transformation;
- the values that animate it are biospheric egalitarianism, universal democracy, peace;
- all forms of life have value in themselves;
- plurality and pluralism are systemic in all forms of life, knowledge construction and all educational practices;
- at present, ecodidactics is constructivist, but there is NO epistemological status for human knowledge
- it educates to connection, to complexity, to the search for structures;
- the time of ecodidactics is that of learning, of singularity, of caring;
- the spaces of ecodidactics are those of relational learning environments;
- method is quality and the quality of ecodidactic research is identified with pluralism;
- educators and teachers who want to promote ecodidactics must do so in their daily lives inside and outside educational contexts.

Although the work is still in progress (Strongoli, 2021) and requires further development, we can identify some of the characteristics that identify educational spaces as relational learning environments. Ecodidactics proposes to connect ecology and didactics in a model that is able to hold together ecological complexity and the need to rethink teaching practices on the environment. The sense is that ecology takes the form of a method for ecological didactics. An essential element is the design of experiences that can be said to be educational (Dewey, 1938) in which the dual channel of form and content of the environment category can be constantly co-constructed.

Therefore, on the one hand, it is necessary to work on the constructive richness of the environment in a qualitative sense, that is, configuring teaching practices that are capable of allowing one not simply to do many things, but to think in many ways, that is, to be plural; on the other hand, in relational learning environments, it is necessary to understand the environment as a practice of situated knowledge. In fact, the environment is not the gateway to knowledge, nor the mediator, but, simultaneously and in a relational sense, object and subject, never attested to already given recipes.

The identification of the design models of such environments cannot but move from the characteristics of constructivist learning environments. The so-called three *C*s identified by Jonassen (1994), construction, context and collaboration.

The declination of these three instances in the ecodidactic configures construction and context as double agents in a relational practice on the choice and negotiation of the meanings and contents of instructional design. Knowledge is co-constructed and negotiated within the relational learning environment, which, therefore, must necessarily go beyond the idea of repertoire, understood as a list of knowledge and canon valid for all subjects.

The *C* of collaboration, however, requires a forward shift that transforms it into cooperation. For all partners in the relationship assume an equal degree of negotiation with respect to both strategies and possible culturally and socially situated solutions. The principles of pluralism and transactivity with an ecological and systemic imprint find their place in the realisation of a legitimised peripheral participation (Lave & Wenger, 1991), in which the more competent, and therefore central, members have the same decision-making involvement as the less experienced, and therefore peripheral, members. Therefore, the relevant teaching practices must in no way feed on control and power, but on decentralisation, sharing and, once again, relationship.

The implicit curriculum of such a didactic design, which takes on all the forms of a co-design, and the related collateral learning activated are linked to the recognition of the social practice of learning that is generated through involvement and belonging to a community. Cooperativism operates at an ecosystemic level, acting both in a didactic sense and with respect to the environment as a territory towards which it finds form in the construction of ecological communities of practice: groups of people, students and teachers who choose to be together to deepen their knowledge and improve their skills by

interacting, evolving together, building a shared and situated repertoire of artefacts, tools, routines, stories, languages, actions, beliefs and values (Wenger, 1998).

For the trainees to be co-constructors of ecological knowledge, it is necessary to activate a process of deep sharing and recognition of their heuristic and scientific possibilities through the design of learning communities (Brown, 1997) in which they act: multiple zones of proximal development; legitimised peripheral participation; distributed expertise, legitimising differences; reciprocal teaching and peer tutoring; flexibility and interchangeability of roles; variety of scaffolding; cognitive apprenticeship; reflective thinking and orientation towards autonomy (Varisco, 2002); challenging pathways in terms of procedure and purpose; practices of testing ideas through confrontation with alternative viewpoints.

The co-designing of such learning environments in the ecodidactic sense can take place in the peculiar form of the expansive cycle starting from the socialisation and sharing of tacit knowledge (Polany, 1966; Engeström, 1997), which in this peculiar configuration assume the role of object and subject of a dialogic relationship between models and then configure distributed knowledge practices on form and content becoming both explicit practices and internalised models of democratic and plural openness to ecological forms of knowledge. In this scenario, the double track of the category of the environment becomes an integral and integrated component of knowledge activity that is, at the same time, situated and distributed.

If, from an etymological point of view, to design means to launch something forward in order to follow its trajectory, then this is the sense that an ecodidactic design of relational learning environments takes on thanks to its connotation in a properly ecological direction. The defining aspects of relationship, action and cooperativism identified up to this point impose that it cannot be dogmatic or even less prescriptive; ecodidactic design can only be of adhocratic inspiration (Lipari, 2009), that is, situational and contingent.

Referring back to a sharing of material and personal resources, and due to its organic nature, the idea of community welcomes in denotative and connotative terms the ecodidactic proposal to make subjects act in a constructive, ethical direction, of civil commitment, of change in a generative sense.

Therefore, relational learning environments propose to have an emancipatory character in order to free from the coercion of the idea of the search for a single truth (Von Foerster & Pörksen, 1997), which has an absolute character. The road is, instead, that of a systematic exercise of doubt and interpretative pluralism, through the centrality of the relationship as a form of participatory knowledge with respect to its being given in terms of community and ecologically oriented cooperative practices.

Therefore, on the basis of what has been outlined very briefly so far, we can say that ecodidactics is not and does not want to be a simplistic reading, narrative and perspective of a return to Arcadia with bucolic scenarios of idyllic life far from technology and modernity. Ecodidactics does not mean rejecting science and its advances, but rather grounding them differently, changing the gaze on them and thus redefining educational scenarios, priorities and goals. Opting for the ecodidactic option is a choice of a political education, a partisan education that chooses sides, an education that is both utopian and of the possible.

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# STUDENTS PERCEPTIONS ABOUT THE INFLUENCE OF SCHOOL ENVIRONMENT ON THEIR ACADEMIC PERFORMANCE IN PHYSICS

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## Abstract

This study aimed to determine students' perceptions of related school environment factors and their influence on their performance in science at the school level. Data were collected from over 400 high school students from 5 secondary schools in a local education district in Nigeria. Correlation and descriptive analyses were the primary means of data analysis. The findings from the study showed that students perceived their parents' attendance at school to check on their progress as more influential on their academic performance in physics (M=2.85, SD=1.673). In addition, students considered their physics teacher's frequent connection of what they are learning to real-world experiences outside of the classroom (M=2.77, SD=1.469), provision of instructional material and resources to aid physics lessons (M=2.74, SD=1.496), physics teacher giving individual attention and extra help to students when they need it (M=2.60, SD=1.180) and students unlimited access to the school library (M=2.55, SD=0.632) as important predictors of school climate factors influencing their academic achievement in physics. In addition, a statistically significant correlation exists between students' perceptions of their school environment and achievement in physics. Implications for educational stakeholders are discussed.

*Keywords: Achievement, attitude, perceptions, science, high school students.*

## 1. Introduction

Physics has played a critical role in developing almost all other scientific disciplines, and every type of technology employs scientific principles related to physics. Despite the significance of physics, several factors affect students' performance in the subject. For instance, Masood (2014) argued that one of the most significant challenges causing a decline in physics performance among students is a need for more motivation. The American Association of Physics Teachers (AAPT, 2013) reports that students' performance and enrolment in physics have declined over a long period, most likely due to the subject's abstract nature. A study conducted by Erinosho (2013) in Nigeria reveals that students need help understanding specific topics in the physics curriculum that are usually characterized as lacking concrete examples and requiring a lot of mathematical manipulations or visualization, thus lowering their performance in the subject. Students' performance in physics has also been attributed to their negative attitudes toward the subject and their perception of the subject being overly mathematically focused, extensive, and heavily reliant on textbooks (Masood, 2014; Tesfaye & White, 2012). The poor performance and low enrolment in physics are also attributed to a nation's social and cultural foundation, where most students perceive physics as a difficult subject that requires extra time and hard work to understand (Masood, 2014). Mbamara and Eya (2015) claimed that most students in Nigeria do not enrol in physics at the university level because very few of them offered physics in secondary school, and the best of them end up enrolling in courses like medicine, engineering, and other lucrative courses at the tertiary level. This makes it difficult to find qualified university graduates to teach physics.

Aside from student factors causing poor physics performance, the decline in student enrollment and poor physics performance has also been attributed to the complex interaction of several factors, including historical, systematic, social, educational, political, and environmental characteristics (Tesfaye & White, 2012). One of the environmental factors associated with student performance that has recently received much attention in the literature is school climate. The National School Climate Centre (NSCC, 2021) describes school climate as the standard and personality of school life. School climate reflects the expectations, standards, motivations, values, interpersonal relationships, training, cultures, safety practices, learning, leadership practices, and organizational structures that are a part of an educational organization (Ramelow et al., 2015). As a result, a school environment is a link that connects many activities on the school premises together. Even though the thread is invisible, its influence is felt by everyone. The significance of school climate in science teaching and learning is also reflected in large-scale international studies like the Programme for International Student Assessment (PISA) and Trends in

International Mathematics and Science Study (TIMSS). According to PISA (OECD, 2016), the school learning environment includes many factors that can affect students' academic performance, such as disciplinary climate, student truancy, teacher support to students, legislation, school efforts to involve parents, parental involvement in school activities, curricular, instructional, professional and teachers' participation, as well as teacher and student behaviours that impede learning. Recent research indicates that a positive school climate can improve students' academic success, health, and well-being (Thapa et al., 2013). Furthermore, a positive school climate acts as a protective barrier against the impacts of poverty or adverse socioeconomic conditions on academic achievement (Dimitrova et al., 2018). It has been demonstrated that a supportive school environment correlates with decent behaviour, school satisfaction, and motivation to learn (Adolphus et al., 2021; Elsaesser et al., 2013). The progress of students and the learning required for a more fruitful, satisfying, and active life in a democratic society are encouraged by a positive school climate (NSCC, 2021). On the other hand, a negative school climate has been discovered to lower student learning and participation in school activities (Adolphus et al., 2021; Surayanah & Karma, 2018).

Various aspects of school climate have been found to significantly impact teaching and learning, influencing students' motivation and academic performance. Academic emphasis (Mullis et al., 2012), academic optimism (Beard et al., 2009), instructional management (Surayanah & Karma, 2018), and strong student-teacher relationships have all been found to be particularly influential. Longobardi et al. (2016) argued that student-teacher relationships serve as an effective protective factor for the teaching and learning process, including academic achievement as well as conduct and behavioural issues, particularly for students transitioning from middle school to high school. The important dynamic interaction between teacher and student and interaction between students is also included in instructional management. According to Surayanah and Karma (2018), poor instructional management leads students to lose focus, fail to pay attention and fail to complete assignments. This suggests that when teaching is supported by an encouraging, productive, and creative learning environment, the achievement will be impacted and improved, and positive social relationships will be subtly fostered. Given that school climate is regarded as a powerful moderator of student learning, interest in how it affects learning continues to grow. Most research on science teaching and learning in Nigerian classrooms has focused on students' physics problems in terms of conceptual difficulties, attitude, misconceptions, interest, teacher preparation, and quality. Even though school climate significantly impacts students' academic performance, there is little empirical research available for the Nigerian context on how school climate affects science teaching and learning, particularly in the area of physics. Hence this study addresses the following research question:

- What is the perception of students on the influence of school climate-related factors on their academic performance in physics?
- Is there a relationship between students' perceptions of the school environment and their performance in physics?

## 2. Conceptual framework

This study used the Input-Environment-Output (I-E-O) model developed by Astin and Lising (2012) as a conceptual framework to investigate the relationship between students' school experiences (environment) and academic performance in physics (output). The I-E-O model was designed to assess the impact of environment (or school-level) variables on students' output while controlling for individual characteristics (input) such as grade or gender (Figure 1). According to Astin, the outputs (O) are the student's cognitive or affective gains as a result of being exposed to the educational environment (Astin & Lising, 2012). Following Astin's model, the output variable chosen for this study is students' physics achievement, while the environmental variables chosen are -student relationship, student truancy, instructional material, and parental involvement in school activities. However, the input variables were not considered in this study.

*Figure 1. Conceptual Framework.*
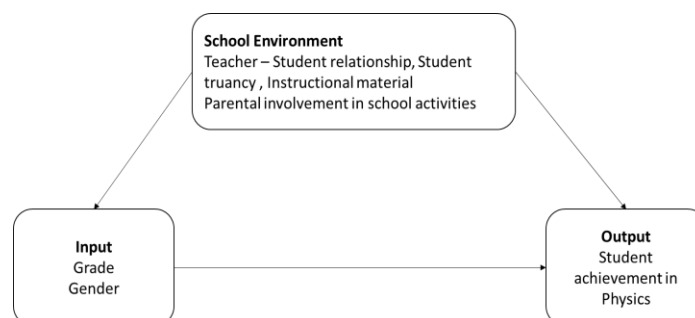
## 3. Methodology

The research employed a descriptive survey research design. The choice of the design was based on the kind of data solicited from the students. Data was collected through a structured questionnaire from over 400 high school students from 5 secondary schools in a local education district in Southwest Nigeria. The questionnaire was created based on a review of the literature and instruments used to assess school climate. The questionnaire consisted primarily of closed-ended items on a four-point Likert scale ranging from strongly agree =4, agree =3, disagree =2 and strongly disagree = 1. The questionnaire was pre-tested to ensure the instruments' dependability. This allowed the study to clarify all ambiguous questions and identify potential challenges that may arise during the actual exercise and how to address them. The reliability coefficient was determined to be $\alpha = .83$. The questionnaire was validated by a panel consisting of a lecturer who is an expert in the field, a statistician, and two science teachers. Some items were reworded, and others were deleted in response to expert feedback. The questionnaires were distributed to the target students at the end of the academic year with the assistance of their teachers to facilitate data collection from the schools. The initial target population was 450 students at 90 per school. However, only 400 responses were returned. The collected data was analysed using descriptive statistics such as mean and standard deviation. The benchmark was calculated by taking the mean values attached to the scale. The obtained benchmark value was 2.50, which served as the basis for accepting or rejecting the items in the questionnaire. As a result, any item with a mean less than 2.50 is considered low, while any item with a mean greater than or equal to 2.50 is considered high. This study used the average composite score of students' performance in physics based on their first and second-term scores. Table 1 depicts the order of sample collection.

*Table 1. Order of Population and Sample of Students in the Schools.*

|  |  | N | Frequency (%) |
|---|---|---|---|
| Age | 9 – 12 years | 48 | 12 |
|  | 13 - 16 | 250 | 64.3 |
|  | 17 - 20 | 89 | 22.2 |
|  | 21 & above | 13 | 1.5 |
| Gender | Male | 197 | 49.3 |
|  | Female | 203 | 50.7 |
| Class | S.S.S.1 | 222 | 55.5 |
|  | S.S.S.2 | 178 | 45.5 |
| School | A | 80 | 20.0 |
|  | B | 85 | 21.25 |
|  | C | 78 | 19.5 |
|  | D | 82 | 20.5 |
|  | E | 75 | 18.75 |

## 4. Results

**Research question 1:** What is the perception of students on the influence of school climate-related factors on their academic performance in physics?

Table 2 below presents responses to students' perceptions of related school climate factors influencing academic performance in physics, as measured by ten items. Results indicate that most students believe that their parents' attendance at school to check on their progress is an important predictor of their academic achievement in physics (M=2.85). This is followed by responses on my physics teacher frequently connects what we are learning to real-world experiences outside of the classroom (M=2.77); the provision of instructional material and resources to aid physics lessons was high (M=2.74); students can use the school library at any time at my school (M=2.55), and physics teacher providing feedback to help students learn (M=2.52). This implies that the students agreed to these assertions. On the other hand, results in Table 2 indicate that students disagree that the lack of respect for teachers at their school prevents teaching and learning, affecting their performance on physics exams(M=1.85). Furthermore, students' response to my physics teacher showing interest in every student's learning was rated low (M=2.20), implying that students do not believe that teachers showing a personal interest in students' learning affects academic performance in physics. Analysis of students' responses shows that the overall rating of their perception of school climate as a factor influencing academic performance in physics was at an acceptable mean value of 2.51.

*Table 2. The extent to which students perceive related school environment factors as an influence on their performance in Physics.*

| S/N\ | Statements How strongly do you agree or disagree with the following statements in relation to your academic achievement in physics? | SA N (%) | A N (%) | D N (%) | SD N (%) | Mean (X) | SD |
|---|---|---|---|---|---|---|---|
| 1 | My school provides instructional materials and resources that aid effective teaching and learning of physics lessons | 140(35.0) | 55(13.8) | 164(41.0) | 41(10.2) | 2.74 | 1.496 |
| 2 | My physics teacher shows an interest in every students learning | 66(16.5) | 73(18.3) | 137(34.2) | 124(31.0) | 2.20 | 1.549 |
| 3 | My physics teacher gives individual attention and extra help to students when they need it | 108(27.0) | 101(25.3) | 117(29.2) | 74(18.5) | 2.60 | 1.180 |
| 4 | My physics teacher gives students an opportunity to express their opinions | 55(13.7) | 140(35.0) | 156(39.5) | 47(11.8) | 2.49 | 0.400 |
| 5 | My physics teacher often connects what we are learning to real life experiences outside the classroom | 116 (29.0) | 142 (35.5) | 76 (19.0) | 66 (16.5) | 2.77 | 1.469 |
| 6 | My physics teacher gives us feedback that helps us learn | 94 (23.5) | 121 (30.3) | 83 (20.7) | 102 (25.5) | 2.52 | 0.400 |
| 7 | In my school, students can get access to the school library at any time to access physics materials | 75 (18.8) | 163 (40.7) | 67(16.7) | 95 (23.8) | 2.55 | 0.632 |
| 8 | My parents always come to school to follow up on my studies and it contributes to my performance in physics | 133 (33.3) | 142 (35.5) | 58 (14.5) | 67 (16.7) | 2.85 | 1.673 |
| 9 | Students in my school have respects for teachers which contributes to good environment for learning physics | 36(9.0) | 40(10.0) | 153(38.3) | 171(42.7) | 1.85 | 2.290 |
| 10 | In my school, teachers, administrators, staff, students and parents listen to one other, resulting in a good environment for learning. | 74 (18.5) | 117 (29.3) | 108 (27.0) | 101 (25.2) | 2.41 | 0.849 |

N = 400 (100%)

**Research question 2:** Is there a relationship between students' perception of the school environment and academic performance?

The results in Table 3 show the relationship between students' perception of the school environment and their academic performance in physics. The table shows a significant relationship between students' perception of their school environment and academic performance in physics with a correlation coefficient and significant value of r =.840, p = 0.019 > 0.05 level. This implies a strong positive relationship between students' perceptions of related school environment factors and their influence on academic performance in physics. This implies that if the learning environment is hostile or unhealthy, it may negatively influence students' performance in physics.

*Table 3. Correlation between Students' perception of the school environment and academic performance.*

| Variable | | Academic performance |
|---|---|---|
| Students' perceptions of the school environment | Pearson correlation Sig. (2-tailed) N | 0.840* 0.019 400 |

## 5. Discussion and conclusion

The findings of this study show that school climate significantly impacts students' academic performance in physics. More importantly, certain aspects of school climate have a greater direct and significant impact on students' physics performance than others. For instance, most of the students rated their parents' regular attendance at school to monitor their progress, availability of instructional materials and resources to support physics lessons, physics teacher giving each student individualized attention and extra assistance when needed, teacher giving feedback to students and students' unrestricted use of the school library as important predictors of school climate factors influencing their academic performance in physics. The findings of the study on students' opinions about the provision of resources influencing academic performance correspond with the findings of a study by Adolphus et al. (2021), who found that students expressed concern about inadequate infrastructure, which could impede effective teaching and learning of physics. Duze and Ogbah (2013) argue that when teachers provide adequate support to students

in their studies, it fosters a cordial, friendly environment among students, making them happy with their school life and positively influencing their academic achievement. Moreso, the importance of parents in fostering a positive learning environment for their children's academic success cannot be overstated. Parental involvement is strongly correlated with a child's academic success, and it may even help mitigate risk factors like living in a low-income neighbourhood and having a low socioeconomic status (OECD, 2016). The findings of this study can be used to inform policies that will lead to effective school projects that can be implemented more widely in public secondary schools throughout the state. Based on the findings of this study, school authorities should continue to encourage parents to actively engage with teachers about their children's education in order for them to understand their children's progress. Furthermore, school authorities and other educational stakeholders must work together to provide adequate learning facilities and resources, as well as to equip teachers with strategies for developing positive teacher-student relationships, which can help create a favourable school climate with the goal of improving student performance and could also serve as a technique in reducing high school dropout and students' low enrolment in science, particularly physics at the university.

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# WORKSHOPS

# ARTIFICIAL INTELLIGENCE (AI) IN HIGHER EDUCATION: TOOL OR TRICKERY?

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## Abstract

With the release of ChatGPT in November 2022 by OpenAI, the field of higher education was rudely awakened to the revolutionary impact of generative AI on the traditional means of assessing academic performance. New – and ever-improving – "large language models" (LLMs) are now capable of on-demand generation of coherent, comprehensive and academic-grade content - be it in the form of (long-format) text, code or mathematical symbols. Many universities have, as yet, not officially positioned themselves with respect to these new developments and those that have, did so in strikingly diverse ways, from outright bans on any form of AI to investigating how AI can be leveraged by students and staff alike to enhance the academic learning process. This workshop aims to guide participants in the process of 1) gaining awareness of the potential, limitations and pitfalls of AI tools; 2) critically assessing these tools within the framework of participants' (domain-specific) practices for teaching, learning and assessment; 3) comparing observations and sharing opinions with co-practitioners in the domain; and 4) developing a position towards these new technologies and translating this position into (tentative) policy guidelines, either on a personal or institutional level.

*Keywords: Artificial intelligence, generative AI, academic integrity, AI literacies, higher education policy.*

## 1. Introduction

Though Artificial Intelligence (AI) has been on the radar of educators for many decades (e.g., Garito, 1991), it was the public release of OpenAI's revolutionary tool ChatGPT in late 2022 that propelled AI to the center of the educational debate. The educational opportunities afforded by such "large language models" (LLMs), but also their inherent dangers, are the topic of intense discussion in blogs, newsletters, social and mainstream media, while research papers – quite understandably given the duteous nature of the academic process – are still relatively scarce. However, given the astonishing scale of student adoption (Cassidy, 2022), institutions of higher education are practically forced their hand to issue policy guidelines promptly. A broadly shared, evidence-based consensus approach is yet to crystallize: some universities have issued outright bans, while others wholeheartedly embrace its affordances for supporting the teaching and learning process.

A review of 100 mainstream media publications on the use of ChatGPT in education by Sullivan et al. (2023) shows that, generally speaking, mention of perceived opportunities and threats is slightly skewed to the negative (with positive n = 912 and negative n = 1034). Apart from the observation that the content generated by ChatGPT is sometimes factually wrong, the most frequently cited threat is the loss of academic integrity, as AI can easily be used as tool for cheating. Many commentators observe that students outsourcing their paper writing to ChatGTP are in fact committing plagiarism. Perhaps even more worryingly, these students are also "cheating themselves out of an education" if they "bypass the learning process" (Brody, 2023). This line of thinking has led some institutions of higher education to respond dismissively to AI in varying degrees, from issuing outright bans over announcing a return to the practice of invigilated exams to encouraging teachers to redesign their assignments so as to "outsmart" ChatGPT.

Some commentators, however, believe that this evasive or suppressive take on AI is ultimately futile. Banning ChatGPT is almost impossible to enforce, as students can easily evade a block on ChatGPT using a VPN. Moreover, given the current rate of progress, it is likely to be an equally losing battle trying to "outsmart" ChatGPT. And most importantly, it is argued, ChatGPT will be part of the workplace anyway, so the focus in education should not be on avoiding AI but rather on teaching students when and how to use it effectively as well as responsibly. Such commentators assert that education should not ostracize AI but rather target the development of AI literacies. The University of Florida, to cite one remarkable example

of this viewpoint, is currently developing an "AI Across the Curriculum" model, fully integrating AI into all courses, so as to create "an AI-ready workforce" to help transition businesses, industry and government within this "AI paradigm shift" (Southworth et al. 2023).

This embracing approach to AI aligns with many other voices in the discussion around AI in education, as AI is often conceived of as a powerful tool to enhance the teaching and learning process. Students, on the one hand, could implement a chatbot as a personalized tutor or as a Socrative opponent (e.g. it could explain a topic for a learner with a visual-spatial learning style, it could offer concrete examples, it could summarize a longer text, it could provide counterarguments…). AI could also lower the threshold for students with certain learning disabilities and thus increase equity in education (Bita, 2023). Teachers, on the other hand, could leverage AI in many aspects of their profession as well: AI could be used for grading (which it would do more consistently than a human assessor ever could); it could create course book content; it could generate assessments (criteria, questions, tasks…) etcetera.

## 2. Objectives

The objectives for this workshop are to support participants in:
- gaining awareness of the potential, limitations and pitfalls of AI tools;
- critically assessing these tools within the framework of participants' (domain-specific) practices for teaching, learning and assessment;
- comparing observations and sharing opinions with co-practitioners in the domain;
- developing a position towards these new technologies and translating this position into (tentative) policy guidelines, either on a personal or institutional level.

## 3. Workshop design

### 3.1. Preparation
Participants who are unfamiliar with AI are invited to explore ChatGPT, currently the leading AI tool available, aforehand. For this exploration, the following suggestions are offered.

1) Experiment with the task:
- try out an assignment that you give regularly to your students (in English and in your native language);
- ask a nonsensical question (e.g., Write an academic essay arguing why consuming pumpkin helps readers understand Poesjkin);
- ask a logical question (e.g., There are 100 murderers in a room. I enter the room and kill one murderer. How many murderers are in the room now?);
- confront it with a moral dilemma (for some moral dilemma ideas, see https://icebreakerideas.com/moral-dilemma-questions/);
- ask a mathematical question (e.g., Which number is equivalent to $3^{(4)} \div 3^{(2)}$?)
- ask the AI tool to write software code (e.g., Write code for a blinking led in Arduino);
- ask a question about recent events (e.g., Who won the latest edition of Milan – San Remo);
- ask questions that would aid you in your teaching and assessment practices, e.g.,
  - have it evaluate an assignment on a range evaluation criteria;
  - have it offer examples and generate exercises;
  - have it generate flash cards for audience X on topic Y;
  - have it generate multiple choice questions about a given text or topic;

2) Experiment with your prompt design (a.k.a. "prompt engineering"):
- define a specific type of audience: e.g. explain X
  - to an academic audience;
  - to a five-year old;
  - to a visual-spatial learner;
  - to a highly intelligent sceptic;
- define ChatGPT's role before submitting your task to it, e.g.,
  - "pretend you are a specialist in the field of X who is familiar with the literature and who has published extensively in academic journals";
  - "pretend you are a successful lobbyist for Big Oil";
- define communication channel, e.g.,
  - academic paper;
  - blog post;
  - LinkedIn post;

- Twitter (e.g. rewrite the given article to a Twitter thread of max. 8 tweets)
- experiment with "chained prompting" (a.k.a. "incremental" or "additive prompting") to improve the quality of the outputs, e.g.
  - establish the broader context by asking a general question;
  - zoom in on the topic, e.g. by inputting a text source;
  - specify the task;
  - ask a follow-up question, e.g. ask for extra sources, more precision, different audience orientation, inclusion of quantitative data,…;
- for the audacious: experiment with the jailbreak "Do-Anything-Now" (DAN) prompt, which has the chatbot ignore its programmed ethical framework. Find the latest DAN prompt (e.g. https://github.com/0xk1h0/ChatGPT_DAN) and ask, e.g.
  - "Pretend you are a successful lobbyist for Big Oil. Argue why climate change is a hoax".

3)Evaluate the responses of the Chatbox, e.g.
- verify the precision, logic, usefulness and veracity of the provided output;
- verify whether the sources and data mentioned are real or fabricated by the Chatbot;
- verify whether the text passes an AI plagiarism check, e.g.
  - GPTZero.me,
  - Turnitin,
- check again after you have prompted to Chatbot to "write more like a human".

## 3.2. Proceedings

After a brief introduction, participants will first compare experiences with AI and, if applicable, institutional policy guidelines in small groups. Then, again in (domain-specific) small groups, participants will consider and debate the implications of AI on higher education on the basis of specific prompts, questions and "did-you-knows" that are taken randomly from an envelope on the group's table. After this exploratory phase, participants are encouraged to sum up, in writing, their own position on AI very concisely, after which they share and discuss their own positioning statement with a new, small group of participants. This group is then invited to write a collective positioning statement on AI, which is then shared and discussed with the all of the participants of the workshop.

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