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Digital Technologies for Mathematics Learning in Rural Higher Education: Students' Perspectives

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ABSTRACT
The use of digital technologies is a fundamental part of being a university student. Hence, there is a growing interest in equipping students with the skills they need to thrive in a world that is full of technology and constantly changing. Moreover, the need to provide university students with the skills they need to succeed in a rapidly changing, technologically advanced society is also growing. It has become more common for students to learn mathematics using digital technologies and conventional techniques as a result of recent advancements in both the world and technology. To ensure the future of mathematics students and society for sustainability, technology, and education should collaborate. The study investigated how students felt about using digital technology to teach mathematics. This study employed a case study design and was qualitative in nature. The technology Acceptance Model was employed as the theoretical framework which explains how to encourage users to accept and utilise new digital technologies. Twenty second-year mathematics students who were specifically chosen to be information-rich participants made up the study's participant pool. Data were collected using semi-structured interviews. The collected data was analysed using thematic analysis. The findings revealed that students had a positive attitude towards embracing digital tools to learn mathematics. However, they encountered some difficulties as they were learning mathematics using digital tools.

KEYWORDS
Digital technologies; mathematics; students; higher education; digital literacy.

INTRODUCTION

Under the present educational framework, students should be the facilitators of knowledge acquisition rather than the information dispensers that they have historically been, especially in higher education institutions. It has become more common for students to learn mathematics using digital technologies and conventional techniques as a result of recent advancements in both the world and technology. As a result, academic research has concentrated on different digital technologies to facilitate student learning. Additionally, there is a growing interest in arming students with the skills needed to thrive in a domain full of technology and constantly changing. The need to provide students with skills they need to thrive in a fast changing, technologically advanced society is also growing. To ensure the future of both students and society in the twenty-first century, technology and education must collaborate. The paper aims to explore the students' views on the use of digital technology in mathematics education.

A study on the difficulties of blended e-learning instruments in mathematics was carried out by Umoh and Akpan (2014). The overall findings showed that students' perceptions of the difficulties associated with blended e-learning technologies differ significantly. Therefore, the institutions and instructors must evaluate the perceived potential and limitations of blended e-learning. Furthermore, they should also provide different students studying mathematics with useful support, including a Virtual Learning Environment (VLE). Henderson et al. (2017) mention that while some research suggests that digital technologies have a big impact on students' academic experiences, teaching and learning at universities on the other hand are not changing as a result of these technologies. Hence, lecturers should temper their excitement about the possible advantages of technology-enabled learning and have a deeper knowledge of the realities of students' interactions with digital technology. According to a study by López-Pérez et al. (2011), using blended learning can improve exam scores and lower dropout rates. Furthermore, a relationship exists between the students' opinions about blended learning and their age, background, and attendance rate in class, as well as the blended learning activities that determine their final grades (Ariza, 2011). The findings of the study conducted by Agustina and Cheng (2020) revealed that web-based learning is incapable of producing the desired results in developing countries like Indonesia, where a sizable percentage of students cannot afford to use the internet because of financial difficulties and specialization. In addition, the lack of face-to-face engagements with the teacher, reaction time, and absence from typical homeroom sociability were a few more problems that advanced education understudies had. According to Gqoli (2022), it will be advantageous to incorporate interactive technology, such as mathematics apps, into a play-based learning environment for mathematics. Therefore, students who do not learn about technology and how to use it will be at a significant disadvantage in the future.

LITERATURE

This shift in education is being driven by technology, which is rapidly assimilating into society and can meet the needs of the forthcoming generation of learners (Taber, 2017).

Digital Technologies and Mathematics

Becker et al. (2017) and Bullen and Morgan (2015) mention that digital technologies constitute a crucial aspect of teaching in higher education. Furthermore, students use a variety of technologies that are presented to them in order to enhance their learning through integration with formal learning environments. According to Crompton, Burke, and Gregory (2017), proactive programs that demand lifelong learning attitudes are necessary as universities prepare students for the 21st century, replacing reactive techniques and the learning of short-term abilities. Consequently, it is projected that digital technology will be crucial in changing training and education to facilitate deeper, higher-order learning, particularly in mathematics (Howard et al., 2015). Additionally, as noted by Haleem et al. (2022), digital technologies are a useful tool that can improve education in a variety of ways, such as by providing innovative methods of teaching and learning and by making it easier for teachers to design lesson plans. As a result, digital learning encourages students to think beyond the box and builds their creativity and sense of accomplishment, which inspires them to learn more.

Numerous studies by Salinas and Crosetti (2018); Norman, Din, Nordin, & Ryberg (2014); Sleeman, Lang, and Lemon (2016), have shown that a broad range of rapidly evolving tools are at the center of the changes brought about by the integration of digital technologies in higher education teaching and learning. Therefore, the time lecturers and students spend interacting is now flexible and extends outside of the classroom through engagement, content sharing, connections, and communication. Additionally, internet-based digital tools, like, social media and Web 2.0, for example, have altered the game by helping students in their daily social lives and potentially fostering greater collaborative learning and student autonomy (Salinas & Crosetti, 2017; Sleeman, Lang, & Lemon, 2016). Hence, the traditional boundaries between formal and informal learning settings, the utilisation of certain instruments for learning and individual usage across learning spaces have become vaguer as digital technologies have been adopted extensively in higher education. In the contemporary world, digital technologies is now an inseparable part of our everyday lives. From the way we communicate, work, and access information to how we entertain ourselves and manage our homes, digital technologies have transformed the way we live. Additionally, digital technologies have expanded access to education through online courses, e-learning platforms, and digital libraries. Therefore, they offer personalized learning experiences and make education more inclusive.

The foundation of current frameworks for defining digital competence is a combination of technological and pedagogical determinism, wherein teachers and technology are viewed as agents of change (Fawns, 2021) and wherein teachers' agency in selecting and utilizing tools and methods to integrate technology into the classroom defines their digital skills (Department of Education and Skills, 2015; Redecker & Punie, 2017). Hence, using digital technology in universities has become a tactic that lecturers can employ to influence students' learning and assist their educational practices (Casey et al., 2016; Casey & Jones, 2011). However, it is crucial

to remember that utilizing technology for purposes other than learning facilitation will not improve the educational process (Bodsworth & Goodyear, 2017).

Digital technologies have revolutionized the teaching and learning of mathematics, making it more accessible, engaging, and adaptable to individual needs. As technology continues to advance, the connection between digital technologies and mathematics will continue to evolve, offering new opportunities for both lecturers and students. However, some students in rural areas may face challenges in terms of access to quality educational resources and instructors. Hence the study explored how students perceive the use of digital technologies in their learning of mathematics in rural higher education institutions.

Digital Literacy

Gilster (1997) described digital literacy as the capacity to comprehend and make use of data collected from many sources in a variety of formats via computers. Furthermore, Belshaw (2014) mentions that digital literacy is about the individual's capability to interpret and manage information and content in digital, online spaces. Therefore, digital literacy encompasses not only the technical skills required, but also the ability to critically assess using electronic instruments, effective information communication, and engaging responsibly in digital environments. Additionally, digital literacy is about being able to adapt and thrive in the digital age, where technology is an integral part of our personal, academic, and professional lives. Moreover, digital literacy is not only a valuable skill but a necessity for students, especially in higher education (Hamakali & Josua, 2023; Kilinc et al., 2023; Moyo et al., 2022).

According to Cartile (2020), digital literacy is especially crucial in online and blended learning settings since these learning environments require students to be able to use digital tools and platforms to interact with classmates and instructors as well as engage with course material. Furthermore, as many businesses demand digital skills and capabilities from their staff, digital literacy is becoming more and more significant in the labour market. As a result, universities have an obligation to give students the chance to advance their digital literacy and get ready for life in the modern digital world. Czerniewicz (2012), revealed that an in-depth report on digital access and use in South African universities emphasised the importance of taking into account the wide range of literacies that students engage in and the innovative ways they exploit technologies. The importance of the cell (mobile) phone as a form of objectified cultural capital that can enable agency and disrupt institutional rules and norms also challenges binary notions of literacy and illiteracy and what is meant by ‘skills’ or literacies (Czerniewicz & Brown, 2012). Therefore, some students at first felt excluded by the digital literacies discourses that predominate in academic settings, even though some managed to find ways around it. The literature mentioned a lot about the literacies the university students engage in and the innovative ways they use to exploit technology. However, little or nothing is mentioned in the literature about the digital literacy that rural university students should utilise during their learning.

Digital literacy, according to Belshaw (2011), is the capacity to recognize and make use of technology in a self-assured, imaginative, and critical manner in order to effectively negotiate the challenges and expectations of working, studying, and residing in a digital society. Furthermore, it empowers students to learn, communicate, and excel in an increasingly digital and interconnected world, while also preparing them for the demands of the modern workforce. Hence, higher education institutions should prioritize digital literacy as an integral part of their educational programs to equip students for success in the 21st century.

Digital literacy in mathematics is vital in today's educational landscape. It enhances the ability to learn, apply, and communicate mathematical concepts effectively in a digitally connected world. Furthermore, digital literacy in mathematics can significantly improve one's mathematical capabilities. Additionally, it can empower students in rural universities to develop essential skills for modern careers and contribute to the economic and social development of their communities. However, it's crucial to address the challenges associated with technology access and ensure that digital initiatives are inclusive and effective in these settings.

Barriers to Accessing and Utilizing Digital Technologies for Mathematics Education

Arthur-Nyarko, Agyei, and Armah (2020) identified specific challenges that students may encounter when utilizing digital learning materials. These challenges include limited internet access, expensive internet data, small mobile device screens, and expensive digital device costs. In addition to the successful use of digital technologies across a range of modules including mathematics. Furthermore, Kim, Lee, Spector, and DeMeester (2013) mention that several factors prevent digital technology from being used effectively for teaching and learning. These factors include students who lack the necessary training to adopt and use digital technologies, a lack of internet access technological facilities and equipment, and poor physical infrastructure conditions (Kim, Lee, Spector & DeMeester, 2013). Therefore, these challenges can limit students' access to digital resources. Numerous barriers that prevent students from using digital technology to learn mathematics are mentioned in the literature. Nevertheless, very little is said about the reasons why digital technologies are not utilised more effectively in rural higher education institutions.

In their analysis of the intricate relationship between technology, mathematics, and education, Roberts, Leung, and Lin (2013) point out that this intricateness is inherent to the use of instruments in mathematics and is not a product of modern technology, but rather something that is seen every time someone uses these tools. The quick advancement of digital tools has led to the creation of new capabilities that were previously unthinkable. In mathematics education, the use of both digital and physical tools remains highly valuable, even with the advancements in technology (Maschietto & Trouche, 2010).

Cartile (2020), revealed that the barriers to accessing and utilizing digital technologies for mathematics education in higher education may be a lack of appropriate digital resources and tools for mathematics education at the college level, or the available resources may not be aligned with the curriculum or standards. Furthermore, other barriers may include cultural or

attitudinal barriers to the use of technology in mathematics education, such as a belief that traditional teaching methods are more effective or a fear of technology replacing faculty. There has been a lot of writing in the literature regarding potential obstacles to the use of digital technology; however, little has been spoken regarding these obstacles in rural higher education institutions.

Objectives

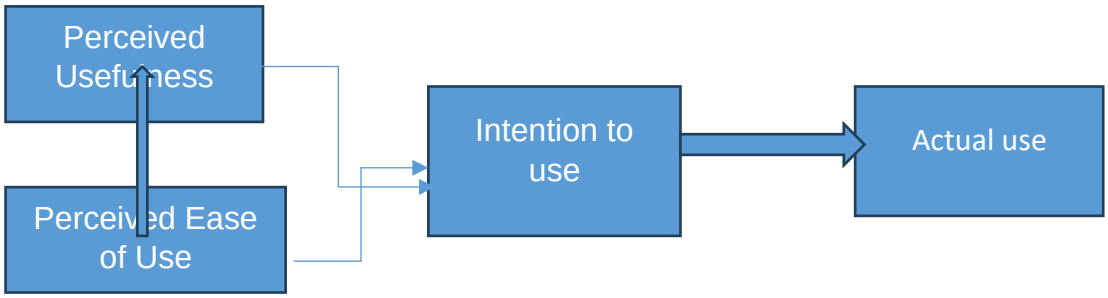
- To determine the extent to which digital technologies are currently being used for mathematics learning in rural higher education settings.
- To identify the barriers that rural students face when it comes to having access and using digital technology for mathematics education.

THEORETICAL FRAMEWORK

The Technology Acceptance Model (TAM) developed by Davis (1989) serves as the theoretical framework for the study. According to Davis (1989), the TAM serves as a lens through which data analysis and interpretation are conducted to explore the factors that impact secondary students' interest in online interactions via digital technology. When examining the impact of human factors on the adoption of new technologies, lecturers consider TAM to be among the most influential and frequently used to characterise an individual's acceptance of a given technology (Silva, 2015). TAM is used in the study to help researchers understand how students perceive and are willing to adopt digital technologies for mathematics learning. According to the concept, when consumers are introduced to new technology, several factors affect their choice of when and how to utilize it (Silva, 2015). TAM looks at people's intentions, beliefs, and use of technology. TAM uses perceived utility and ease of use to ascertain intention, which then influences use. Hence, the model can help identify the key factors influencing students' decisions to use or not use digital technologies for mathematics learning.

Figure 1.

Technology Acceptance Model by Davis (1989)



The anticipation of favourable behavioural consequences and the conviction that conduct won't require a lot of work are captured by perceived utility and simplicity of use (Davis, 1989). Per the model, there exists a positive correlation between an application's perceived simplicity of use and its perceived value for the user, as well as its ability to encourage technology adoption (Davis, 1989).

METHODOLOGY

Research approach and design

The study used a qualitative research methodology. According to Creswell (2018), the researcher can gain a deeper understanding of a phenomenon by using a qualitative research approach. A case study was also employed as the design. According to Yin (2014), a case study is utilized to gain a thorough understanding of a real-life phenomenon (digital technologies).

Participants' selection

The population for the study were second-year mathematics students in the Faculty of Education of a rural university in South Africa. Purposive sampling was used to select the study's participants which included 20 second-year mathematics students. The participants were selected as the information-rich participants. The purposive sampling allowed the researcher to make a "judgment" and select criteria to identify the most appropriate participants (Pietersen & Maree, 2016).

Instruments for data collection

Semi-structured interviews were employed in the study to get insight into students' perspectives in relation with the application of digital technology in mathematics education in real-world context (Nieuwenhuis, 2016b). To address the specified objectives, probes were utilized as motivation to obtain clarity (Nieuwenhuis, 2016b). The study used an interview guide containing questions about the students' opinions regarding digital technology in mathematics education, which was the phenomenon under investigation (Creswell & Creswell, 2018). Data was gathered during the interviews using a recording tape and the participants were asked follow-up questions.

Data analysis

The collected data were analysed using thematic analysis by Creswell (2018), which divides data into segments and then proceeds to assign codes, categories, and themes to those segments. According to Creswell (2018), data were analysed using thematic analysis in the following three processes, which are as follows:

1. Organizing the data and defining the code is the first step.
2. Creating the categories and codes is step two.
3. The third step is creating themes and sub-themes.

Ethical considerations

The researchers made sure that every aspect of the participants' vulnerability, protection from harm, informed consent, and rights was taken care of.

FINDINGS

This part of the study examined how students perceive the use of digital technologies in their learning of mathematics. For confidentiality and anonymity, pseudonyms were used e.g., S1 for student 1, S10 for student 10, etc. Additionally, the results were organized into themes and sub-themes:

Theme 1: The extent to which digital technologies are currently being used for mathematics learning in rural higher education settings.

The results showed that students felt positively about using digital resources to learn math. Students claimed that digital technology has affected the manner in which they learn in the classroom. Additionally, they were motivated to bring computers to class as they were being taught digital proficiency.

Positive attitude towards embracing digital tools.

Most of the students showed a positive attitude toward using digital technologies.

S2*: "I think the reference materials (videos, PowerPoint files, articles) and assignments posted by my teacher in Edmodo or Quipper helped me to improve my learning and to understand the contents/ topics of the lesson better".*

S8: *"Technology is convenient to use, especially in submitting assignments. I think online activities and discussions in Edmodo or Quipper can motivate me to learn more about the lesson".*

Some students revealed that they not only listen to the mathematics lecture but also watch it on the screen which facilitates visual learning for youngsters. Additionally, the mathematics material in practical sessions in digital classrooms makes students pay greater attention to details through interactive online presentations.

Visual mathematics learners

S12: *"We don't only listen to the lecturer during mathematics class, but we also have access to visual representations of mathematical concepts through graphs, charts, and simulations. We are happy that these visual aids make abstract concepts more concrete and understandable".*

S10: *"We find digital tools for mathematics engaging and interesting. Interactive simulations, games, and visual representations make abstract mathematical concepts more accessible and enjoyable".*

S14: *"I am a visual learner so feeling like I was teaching myself by reading the textbook or just listening to my teacher proved to be very difficult for me".*

S16: *"Digital tools often help students visualize complex mathematical concepts. Graphs, diagrams, and interactive 3D models make it easier to grasp abstract ideas".*

S18: "*Using digital mathematics tools also helps them develop essential technology skills, which are increasingly valuable in the modern world".*

S19: *"Students use online resources, including video tutorials, forums, and educational websites, to supplement their math learning. They find these materials helpful for explanations and practice".*

Theme 2: Barriers that rural students face when it comes to accessing and utilizing digital technologies for mathematics education.

While many students find digital tools in mathematics learning beneficial, several challenges and concerns can influence their perspectives on using such tools. Here are some common challenges that students may face when using digital tools for mathematics learning.

Lack of access to digital gadgets and internet connections

S2: *"We experience the challenges of technical problems, such as slow internet connections, device compatibility issues, and software glitches which disrupt the learning process of our mathematics and frustrate us".*

S7: *"Not all of us have equal access to digital gadgets and the internet and this creates disparities in our learning opportunities and those without reliable access may feel left behind".*

S9: "*We are not the same and students from economically disadvantaged backgrounds have limited access to digital gadgets and, as a result, face a challenge in their mathematics learning"*

Lack of Digital Literacy

The findings of the study revealed that some students may lack the necessary digital literacy skills to effectively navigate and use digital math tools, leading to frustration and inefficiency. Furthermore, students who lack digital literacy skills may struggle to access and utilize online educational resources, including textbooks, interactive learning platforms, and research databases. This is worrisome as it might hinder their ability to engage with modern educational materials and activities. These are the student's responses:

Loss of traditional skills

S6: *"Some students may still prefer traditional pen-and-paper methods for certain mathematical tasks and find digital tools less effective for these tasks".*

S11: *"Students may become overly reliant on digital tools for mathematical tasks, potentially neglecting the development of problem-solving and critical-thinking skills".*

S14: *Some students prefer tactile learning experiences and believe that digital tools lack the physical engagement and sensory feedback that paper-and-pencil methods provide".*

S10: *Some students worry that heavy reliance on digital tools might lead to the loss of essential skills like mental math and paper-based calculations".*

Some students believed that traditional paper-and-pencil mathematics allows tactile engagement, which some students find beneficial. Digital tools may lack this physical dimension.

DISCUSSION OF THE FINDINGS

Digital tools have enabled higher education through various Learning Management Systems (LMS). The study's conclusions demonstrated how LSMs have supported online learning environments in which instructors may communicate with students face-to-face, exchange resources, give lectures, evaluate their progress, get feedback, and address any questions they may have. Gqoli (2022) further states that integrating interactive technology, such as math apps, into a play-based learning environment for mathematics will be beneficial. Moreover, the findings also revealed that most students were happy about the use of digital technology in their mathematics teaching and learning. As a result, lecturers at HEIs are now using digital technology as a persuasive tactic to enhance their educational strategies to mathematics and the learning of their students (Casey et al., 2016; Casey & Jones, 2011). Technology can also make it easier for students to understand how mathematics is used in real-world situations,

which can boost their enthusiasm and interest in the subject as they realize how applicable it is to a variety of situations.

The majority of students believe that since digital technologies will eventually replace physical labour and classes, they will offer them numerous learning opportunities and boost their academic achievement. In a similar vein, Silva (2015) found that the TAM implies that variety factors influence users' decisions regarding when and how to employ new technologies that are introduced to them. According to the data, a greater proportion of pupils believe that using digital technology in mathematics would enable them to study more efficiently. Students can complete assignments, communicate with classmates, access study materials, and communicate with teachers virtually from any location with an internet connection.

The outcome of the study on digital literacy showed that the digital intervention enhanced students' perspectives of their roles and future prospects by directly improving math proficiency and indirectly raising mathematics self-efficacy. Belshaw (2014) mentions that digital literacy is about the individual's capability to interpret and manage information and content in digital, online spaces. The literature provides great mention of the effects that digital literacy has on students' learning of mathematics. Nevertheless, there is little to no mention of how vital it is to develop digital student-directed educational technology with a purpose and coherence, particulary for students who might have specific learning needs. Digital mathematics intervention is necessary to incorporate instruction and other research-based tactics into a mathematics curriculum because mathematics is a comprehensive. Therefore, it is crucial to remember that utilizing technology for purposes other than learning facilitation will not enhance the educational process Bodsworth and Goodyear (2017).

Although the students supported the use of digital technologies in their teaching and learning, they encountered some difficulties as they were learning mathematics using digital tools. The findings revealed that access to technology and internet connectivity can be barriers for some students, which may lead to feelings of frustration and inequality. Furthermore, Umoh and Akpan (2014) discuss the difficulties with integrated e-learning tools in mathematics, noting a notable variation in students' assessments of these difficulties. Classrooms are being redesigned and recreated in many ways consequently technological advancements in order to satisfy the rising demands of contemporary digital learners.

Thus, the issue goes beyond how technology is used at universities to include how students from diverse backgrounds accept, perceive, and use it as well as how the technocratic "mindset" of higher education impacts their experiences. Addressing these barriers through a multi-faceted approach that includes providing access to technology, offering professional development opportunities, developing appropriate digital resources and tools, and addressing cultural and attitudinal barriers can help to improve digital literacy in higher education Cartile (2020).

CONCLUSION

In conclusion, the integration of digital technologies in mathematics education generally aligns with positive student perspectives. The advantages include increased engagement, flexibility, and collaborative learning opportunities. However, addressing challenges related to technology access and ensuring an inclusive learning environment remain important considerations for educators and policymakers. As the landscape of digital education continues to evolve, ongoing research and feedback from students will be essential to inform effective and inclusive educational practices.

Limitations

The study's focus was solely on rural university students as units of analysis, and the results are only applicable to the sample of twenty mathematics students in the Faculty of Education. Hence the study used a small sample, generalizations to the entire population are difficult to establish. As a result, future research should use a combination of methods to give population-level evidence.

REFERENCES

Agustina, P. Z. R., & Cheng, T. H. (2020). How are students' perspectives on online learning amid the COVID-19 pandemic? *Studies in Learning and Teaching*, *1*(3), 133-139. DOI: https://doi.org/10.46627/silet.v1i3.46

Ariza, L. (2011). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education*, *56*(3), 818-826. https://doi.org/10.1016/j.compedu.2010.10.023

Arthur-Nyarko, E., Agyei, D. D., & Armah, J. K. (2020). Digitizing distance learning materials: Measuring students' readiness and intended challenges. *Education and Information Technologies*, *25*, 2987-3002. https://doi.org/10.1007/s10639-019-10060-y

Becker, S. A., Cummins, M., Davis, A., Freeman, A., Hall, C. G., & Ananthanarayanan, V. (2017). *NMC horizon report: 2017 higher education edition* (pp. 1-60). The New Media Consortium. *Web site: http://www.nmc.org*

Belshaw, C. (2014). *Environmental philosophy: reason, nature and human concern*. Routledge. https://doi.org/10.4324/9781315710808

Belshaw, D. A. J. (2011). What is digital literacy? A pragmatic investigation. (Doctor Dissertation) Durham University. Retrieved from http://neverendingthesis.com/doug-belshaw-edd-thesis-final.pdf. https://etheses.dur.ac.uk/3446/

Bullen, M., & Morgan, T. (2015). Digital learners in higher education: Implications for teaching, learning & Crompton, H., Burke, D., & Gregory, K. H. (2017). The use of mobile learning in PK-12 education: A systematic review. *Computers & Education*, *110*, 51-63. technology. *Teaching and learning in digital worlds: Strategies and issues in higher education*, 11-19 https://doi.org/10.32870/cys.v0i33.7029

Cartile, A. (2020). Barriers to digital literacy: learning to program. *Proceedings of the Canadian Engineering Education Association (CEEA)*. DOI: https://doi.org/10.24908/pceea.vi0.14177

Casey, A., Goodyear, V. A., & Armour, K. M. (Eds.). (2016). *Digital technologies and learning in physical education: Pedagogical cases*. Taylor & Francis. Doi: 10.1080/09650792.2013.789704

Casey, A., & Jones, B. (2011). Using digital technology to enhance student engagement in physical education. *Asia-Pacific Journal of Health, Sport and Physical Education*, *2*(2), 51-66. doi: 10.1177/1356336X20902487

Bodsworth, H., & Goodyear, V. A. (2017). Barriers and facilitators to using digital technologies in the Cooperative Learning model in physical education. *Physical Education and Sport Pedagogy*, *22*(6), 563-579.t in physical education. *Asia-Pacific Journal of Health, Sport and Physical Education*, *2*(2), 51-66. https://doi.org/10.1080/17408989.2017.1294672

Creswell, J.W. 2018. *Research design: Qualitative, quantitative and mixed methods approaches.* 4th ed.London:Sage. https://www.ucg.ac.me/skladiste/blog_609332/objava_105202/fajlovi/Creswell.pdf

Czerniewicz, L. 2012. ICT Access-user-use Relationships in Teaching/Learning in Higher Education in South Africa: Final Project Report. Cape Town: Centre for Educational Technology, University of Cape Town. https://idl_bncidrc.dspacedirect.org/bitstream/handle/10625/50286/IDL-50286.pdf.

Czerniewicz, L., and C. Brown. 2012. "Objectified Cultural Capital and the Tale of Two Students." In Exploring the Theory, Pedagogy and Practice of Networked Learning, edited by L. Dirckinck-Holmfeld, V. Hodgson, and D. McConnell, 209–219. New York: Springer. DOI: 10.1111/bjet.12736

Department of Education and Skills. (2015). Digital strategy for school 2015–-2020: Enhancing teaching, learning and assessment. Department of Education and Skills. https://assets.gov.ie/24382/7b035ddc424946fd87858275e1f9c50e.pdf

Fawns, T. (2021). An entangled pedagogy: Views of the relationship between technology and pedagogy. Retrieved April 10, 2022, from https://open.ed.ac.uk/an-entangled-pedagogy-views-of-therelationship-between-technology-and-pedagogy/. CC BY SA, Tim Fawns, University of Edinburgh. https://doi.org/10.1007/s42438-022-00302-7

Freeman, B. (2012). Using digital technologies to redress inequities for English language learners in the English-speaking mathematics classroom. Computers & Education, 59(1), 50-62. Doi:10.1016/j.compedu.2011.11.003

Gilster, Paul, and Paul Glister. *Digital literacy*. New York: Wiley Computer Pub., 1997. http://www.ncsu.edu/meridian/jul99/diglit/index.html

Gqoli, N. (2022). INTEGRATING TECHNOLOGY INTO MATHEMATICS TEACHING AND LEARNING IN EARLY CHILDHOOD DEVELOPMENT. In *SOUTH AFRICA INTERNATIONAL CONFERENCE ON EDUCATION* (p. 116). https://www.researchgate.net/profile/Samuel-Uchenna-

Haleem, A., Javaid, M., Qadri, M.A. and Suman, R., 2022. Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, pp.275-285. https://doi.org/10.1016/j.susoc.2022.05.004

Hamakali, H., & Josua, L. (2023). Engendering Technology-Assisted Pedagogy for Effective Instructional Strategy in the University of Namibia Language Centre. *Research in Educational Policy and Management, 5(*1), 18-32. https://doi.org/10.46303/repam.2023.3

Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of 'useful ' digital technology in university teaching and learning. *Studies in higher education*, *42*(8), 1567-1579. https://doi.org/10.1080/03075079.2015.1007946

Howard, S. K., Chan, A., Mozejko, A., & Caputi, P. (2015). Technology practices: Confirmatory factor analysis and exploration of teachers' technology integration in subject areas. *Computers & Education*, *90*, 24-35. https://doi.org/10.1016/j.compedu.2015.09.008

Kilinc, E., Tarman, B., & Yussupova, S. (2023). The Association Between College Students` Participation Behavior and Social Media Use. Research in Social Sciences and Technology, 8(2), 55-67. https://doi.org/10.46303/ressat.2023.11

Kim, ChanMin, Min Kyu Kim, Chiajung Lee, J. Michael Spector, and Karen DeMeester. "Teacher beliefs and technology integration." *Teaching and teacher education* 29 (2013): 76-85. https://doi.org/10.1016/j.tate.2012.08.005

López-Pérez, M. V., Pérez-López, M. C., & Rodríguez-Ariza, L. (2011). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education*, *56*(3), 818-826. https://doi.org/10.1016/j.compedu.2010.10.023

Maschietto, M., & Trouche, L. (2010). Mathematics learning and tools from theoretical, historical and practical points of view: the productive notion of mathematics laboratories. *ZDM*, *42*, 33-47. DOI 10.1007/s11858-009-0215-3

Moyo, R., Ngidi, S., Koai, M., & Lemeko, P. (2022). Online Teaching and Learning Experiences of Higher Education Lecturers and Students in the COVID-19 Era: A Leap to Digital Pedagogies?. *Journal of Culture and Values in Education, 5*(1), 23-42. https://doi.org/10.46303/jcve.2022.4

Nieuwenhuis, J. 2016. *Analysing qualitative data.* In Maree, K (ed.). *First steps in research*. 2nd ed. Pretoria: Van Schaik. **ISBN:** 9780627037085

Norman, H., Din, R., Nordin, N., & Ryberg, T. (2014). A review on the use and perceived effects of mobile blogs on learning in higher educational settings. *Asian Social Science*, *10*(1), 209-222. https://doi.org/10.5539/ass.v10n1p209

Patrícia Silva (2015) Information Seeking Behavior and Technology Adoption: Theories and Trends. DOI: 10.4018/978-1-4666-8156-9.ch013

Pietersen, J., & Maree, K. (2016). Overview of some of the most popular statistical techniques. First steps in research, 249-304. **ISBN:** 9780627037085

Pinto, M., & Leite, C. (2020). Digital technologies in support of students learning in Higher Education: literature review. Digital education review, (37), 343-360. http://greav.ub.edu/der/

Redecker, C., & Punie, Y. (2017). Digital Competence of Educators. *Edited by Yves Punie*. Doi: 10.2760/159770

Roberts, D., Leung, A., & Lin, B. (2013). From the slate to the web: Technology in the mathematics curriculum. In A. Bishop, M. A. Clements, C. Keitel, J. Kilpatrick, & F. Leung (Eds.), Third international handbook of mathematics education (pp. 525–547). Berlin: Springer: DOI 10.1007/978-1-4614-4684-2_17,

Silva, P. (2015). Davis' technology acceptance model (TAM) (1989). *Information* DOI: 10.4018/978-1-4666-8156-9.ch013

Sleeman, J., Lang, C., & Lemon, N. (2016). Social media challenges and affordances for international students: Bridges, boundaries, and hybrid spaces. *Journal of Studies in International Education*, *20*(5), 391-415. https://doi/abs/10.1177/1028315316662975

Sosa Neira, E. A., Salinas Ibáñez, J., & de Benito Crosetti, B. (2018). Factors That Facilitate or Limit the Incorporation of Emerging Technologies in the Classroom. *International Online Journal of Education and Teaching*, *5*(1), 38-59. Web Site: https://iojet.org/index.php/IOJET

Taber, K. S. (2017). Knowledge, beliefs and pedagogy: how the nature of science should inform the aims of science education (and not just when teaching evolution). *Cultural Studies of Science Education*, *12*, 81-91. DOI 10.1007/s11422-016-9750-8

Umoh, J. B., & Akpan, E. T. (2014). Challenges of Blended E-Learning Tools in Mathematics: Students' Perspectives University of Uyo. *Journal of Education and Learning*, *3*(4), 60-70. Doi: 10.5539/jel.v3n4p60

Yin, R. K. (2018). *Case study research and applications* (Vol. 6). Thousand Oaks, CA: Sage. DOI: 10.4236/eng.2021.137028