International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2024, Vol. 20, Issue 1, pp. 134-145

Edpuzzle for E-learning: A Study of Perceived Advantages and Limitations

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ABSTRACT

The need for online educational tools has increased significantly since the COVID-19 pandemic forced many students to embrace distance learning as a classroom alternative. While many instructors have used *Edpuzzle* to enhance distance learning, there has been little research that assesses and compares the views of teachers and students on the tool's advantages and disadvantages. To examine the perceived advantages and disadvantages of using *Edpuzzle* for classroom learning, we surveyed a sample of 152 professors and their students on their experience with the tool. The results reveal numerous advantages, including that *Edpuzzle* is a motivating, dynamic, and novel self-learning tool for students. Likewise, the professors point out that it is easy to use, focuses the attention of students, and is versatile. The disadvantages of the tool mostly had to do with technological challenges and potential boredom. Based on this evaluation, it was concluded that students have a preference for graphic and visual material to complement other learning tools to help them better understand the lessons. When weighing the advantages and disadvantages posed by the professors and their students, it was found that the unique combination of interactive teaching that *Edpuzzle* provides is promising for the future.

Keywords: *e-learning; higher education; interactive video; motivation; distance learning*

INTRODUCTION

The influence of new technologies worldwide has gradually transformed the traditional university context. The Internet is regularly introducing new programs and applications that facilitate learning, and ordinary face-to-face classes are increasingly developed to include the utilization of more digital elements. (Alarcia & Bravo, 2012; Asri et al., 2020; Comer & Lenaghan, 2013; Ellis & Bliuc, 2019; Marcelo et al., 2015). The social distancing that occurred as a result of the COVID-19 pandemic led to an accelerated need for the use of technologically mediated teaching processes around the world (Bao, 2020; Cerdas-Montano et al., 2020; Gaitán & Coraglia, 2021). The sudden onset of the pandemic quickly altered the classical forms employed to teach and learn. Many countries were thrown into immediate quarantine, leading teachers to urgently find effective ways to share lessons with their students electronically. The presence of the pandemic accelerated the transference of face-to-face classes to e-learning. (Odriozola-González et al., 2020; Pal & Patra, 2020; Sundarasen et al., 2020).

Previous research in didactics has shown that it is important to promote interaction in face-to-face university teaching because it enhances teacher-student relationships and leads to more effective teaching-learning processes based on dialogue, promoting participation, and favoring the involvement of students (Alarcia & Bravo, 2012; Burns et al., 2020; Comer & Lenaghan, 2013; Hernández & Álvarez-Álvarez, 2018; Vercellotti, 2018). Having interaction between teachers and students allows for shared meanings, and provides the opportunity for both parties to contribute experiences, clear doubts, weigh response alternatives, and verify the acquisition of knowledge (Comer & Lenaghan, 2013; Hernández & Álvarez-Álvarez, 2018; Vercellotti, 2018).

However, the sudden onset of the COVID-19 pandemic introduced new challenges on how to continue to include some sort of face-to-face component in teaching. Instructors quickly had to think about how they might transfer their face-to-face interaction to online models, both synchronous and asynchronous. Programs such as Zoom and Google Meet have provided mechanisms to make synchronous meetings easier, however, when teachers and students do not share the same space, relaying information and ensuring learning is more complicated, requiring additional technologies to facilitate them. The e-learning exchange is even more complicated with asynchronous classes where students and teachers share neither the same space nor the same time. Still, promoting interaction in e-learning environments is as necessary as doing it in traditional face-to-face teaching (Comer & Lenaghan, 2013).

Facilitating online learning for students has increasingly necessitated the diversification of learning tools. Providing the usual study materials is no longer sufficient, leading instructors to employ a variety of learning platforms (Asri et al., 2020). In college, students often need quality audiovisual resources in order to understand the lesson contents (Arnone & Grabowski, 1992; Mischel, 2019; Pal & Patra, 2020; Roberts, 2019; Silverajah & Govindaraj, 2018). To achieve quality e-learning processes in the traditional face-to-face university, it is essential to have technologies that simultaneously allow the use of audiovisual material and enhance interaction (De la Fuente Sánchez et al., 2017; Pal & Patra, 2020). There are at least two technologies available that serve these functions: *Edpuzzle* and H5P. *Edpuzzle* is the more widely used of the two resources. It is a free online tool that allows the instructor to find videos on the web or create their own and insert comments, voice notes, and open and closed questions. Users access the system either as a teacher (who is able to create materials) or as a student (who is able to engage with materials). H5P is a free and open interactive content creation platform for free software in education. Its great advantage is that it can be integrated into Moodle or WordPress and allows the creation, sharing, and reuse of interactive videos and other diverse interactive work proposals (Santos et al., 2019). Both applications are easy to use, allow monitoring and evaluation, and promote learning outside of class (Mischel, 2019). In addition, they can aid in developing flipped classroom methodology at any educational level, which has shown positive results in evaluations (Awidi & Paynter, 2019; Foldnes, 2016; Låg & Sæle, 2019; Lai & Hwang, 2016).

Because *Edpuzzle* is more widely used and more studies have examined its effectiveness, our study will focus more on this program. A study that was carried out with 18 chemistry students in Malaysia concluded that *Edpuzzle* technology helps to self-regulate learning and contributes to the improvement of learning. However, students who are at higher risk of abandonment or who have difficulties may need more time, they may need to watch the video multiple times and they may find it more difficult to assimilate information (Silverajah & Govindaraj, 2018). Another study of students in the United States emphasized the potential for learning biochemistry and other related subjects such as thermodynamics, kinetics and enzymology (Pulukuri & Abrams, 2020). Campos-Gutiérrez et al., (2019), in study of a Physical Education class of Compulsory Secondary Education in Spain, found similar learning and motivation results when comparing a traditional methodology and a flipped classroom in which *Edpuzzle* was used (among other flipped learning practices). They also revealed that the use of *Edpuzzle* led to improvements in the optimal use of class time by reducing teacher explanation times.

Using *Edpuzzle* in the classroom offers several advantages. It stands out that the instructor can know if the student watches the video, and can incorporate their own voice and questions to emphasize content and personalize any video. The use of *Edpuzzle* also allows students to pace their own learning. Teachers can track students' progress and create teaching material that can be shared in the virtual community with all users (Mischel, 2019). In addition, *Edpuzzle* allows reflection by allowing a gap between the time a student views a lesson and the time they respond to incorporated responses, which is much more difficult in the face-to-face class (Comer & Lenaghan, 2013).

Among the disadvantages of *Edpuzzle*, it can be highlighted that the student does not have the possibility of communicating with his/her teacher during the lesson. Instead, the student must communicate through another tool or email. Limitations in the video editing itself include the inability to join two different videos and the impossibility of their integration with some Learning Management Systems (Mischel, 2019). While studies have begun to examine the impact of *Edpuzzle* in the classroom, there have been no studies that gather feedback from students and instructors about the advantages and limitations of their experience. To expand the knowledge regarding the reception of *Edpuzzle*, we will examine how new users value the tool and determine, through the analysis of the users' opinions in a university setting, *Edpuzzle*'s perceived main advantages and limitations.

RESEARCH METHODOLOGY

Our general objective was to carry out an exploratory study to know the advantages and limitations of using *Edpuzzle* as a technology for interaction in asynchronous teaching through video as perceived by students and teachers. We gathered first impressions from professors as well as undergraduate and graduate students who were studying to be teachers in Spain. We hypothesized that these technologies are still largely unknown and are, therefore, little used, but are very interesting and have enormous potential for teaching and learning in e-learning contexts.

We designed a qualitative study asking university professors and students about the impression the use of *Edpuzzle* makes on them. A short video (8.13 minutes) hosted on the YouTube Platform was selected (https://www.youtube.com/watch?v=ixO_c6Lki1U) entitled "Being a teacher online: How to connect with students in online classes" developed by Professor Elena Prieto. All participants in the study were asked to watch the video which was edited with *Edpuzzle* to contain open questions, closed questions, and a voice note. The professors and students were asked to freely express their perceptions and evaluations and openly comment on what utility or potential they saw in *Edpuzzle.*

Collaboration was requested from different professors involved in permanent training courses related to the use of new technologies for teaching and from second-year students of the Faculty of Education of a Spanish university. The final sample included 152 individuals: 23 practicing university professors (7 have employed it on some occasion and 16 have not), 37 future Secondary Education teachers, and 92 future teachers of Primary Education. All but five of the students (future teachers of Primary and Secondary Education) were unaware of the technologies for interaction in e-learning through video. The 152 respondents were asked to watch the aforementioned video edited with *Edpuzzle* and openly express their impressions about it. The video, questions, and reactions were all recorded in Spanish. All information collected was qualitative and analyzed using a content analysis system organized around two broad categories: advantages and limitations. The analysis was carried out manually, with keywords as the basic unit of analysis (e.g., motivation, ease, attention).

The data, as we assumed, fit well into the two large categories (advantages and limitations) and it was possible to organize them according to the convergences and divergences between teachers and students. Since many answers were repeated, we decided to first find the words/phrases that raised the most agreement among the participants, making it possible to construct a narrative (Huber et al., 2013) regarding participants' experiences using *Edpuzzle*. The results were given to three people participating in the study (a teacher, and two future teachers) to triangulate the categorizations. Each of the three consulted individuals read the results separately, not being aware of who the other two consulted participants would be. The three participants reviewed the data and agreed that the results constitute a realistic and current synthesis, giving their approval to the factors identified in the data analysis.

At all times, the ethical considerations necessary in qualitative research have been taken into consideration including anonymity of the participants (pseudonyms are used), anonymous and disinterested collaboration (informed consent), confidential treatment of the data, and non-dissemination of the same, no conflict of interests and independence of the researcher. The pseudonyms to be used were established to include three aspects: category (teacher or Master/Graduate student), gender of the person, and number.

RESULTS

The results were organized into two broad categories: (1) Advantages and (2) Limitations. The advantages are ideas that show the value of this technology for interaction in e-learning processes through video. Likewise, the participants have pointed out the limitations they see in it. Both the advantages and the limitations were organized according to three subcategories: (a) specific contributions from students; (b) specific contributions from teachers; and (c) convergences between teachers and students.

Advantages

The advantages listed by the participants were numerous, revealing a notable interest on the part of all the people consulted in this regard. To account for them, samples of the statements made by the study participants are provided below to illustrate.

Advantages highlighted by students:

It is a visual material. The students value very positively that it is visual, graphic material, beyond the also necessary use of texts and written material.

> *"I find it very interesting to use audiovisual resources to teach a certain topic. The visual is better understood than reading books or making index cards*" (Student 1, 9th Grade).

Review of the video. For some students, it is also positive to be able to revisit the video if you do not know the answer at first.

> *"The fact that - the video progresses is very good, it suddenly stops to ask a question, where if you have not been attentive you have the option of watching that part of the video again"* (Alumna 4, Master).

Integrate ICT tools in teaching. Students value knowing and experiencing the use of technological educational resources in their university training.

> *"New technologies and platforms in an information society like the one we live in can allow us to bring the content to be taught to students"* (Alumna 2, 3rd Grade).

Reference material. The students identify that, after a while, the video can still be revisited as many times as required, constituting a review and consultation material.

> *"In a moment of doubt, having a reference to consult is always satisfactory"* (Student 1, Master).

Immediacy. Students value having the questions in the video when the material is covered, achieving an immediate response.

> *"It seems very useful to me because it allows questions to be asked as the content in the video comes out, to highlight a point that seems relevant to us. In addition, viewing videos seems quite enjoyable for the students"* (Student 3, Master).

Student understanding is verified. In the students' responses to the questions asked, they demonstrate their understanding of the topics as they approach them, which allows teachers to reinforce those aspects that generate more comprehension problems.

> *"It allows the student to elaborate on the explanations and thus the teacher can obtain more feedback on the understanding and listening skills of the students*" (Student, 10th Grade).

The video stops if you change the screen. (This option could be disabled and students could freely browse the video). Students who have tried *Edpuzzle* have tried to switch screens while watching their videos and realized that it is not possible. They have made a positive reading of this aspect.

> *"I think it is an excellent tool for online teaching. It should be noted that when you open another page or minimize the page on which Edpuzzle is playing, the video stops, so it forces us to see the teacher with their explanation, which I think is very positive to avoid distractions. In addition, asking questions or making explanations about the video is very useful and effective for me*" (Student 15, Master).

Versatility in the treatment of content. The students have appreciated that these technologies can be used at the beginning, middle and end of a topic.

> *"These types of activities serve as support to present a topic and find out what your students know; to conclude a topic and discover how much they have learned; to work on listening comprehension; to work on any class content adapting the video to that content; etc."* (Student 17, Master).

Training supplement in specific cases. A student has considered that these technologies can be used when the student's circumstances do not facilitate their evaluation with the group's standards.

> *"I am from Physical Education and I find it very interesting to be able to show content or explanations of the subject in videos to my future students. For example, in my classes, there are usually injured students or some illness that prevents them from taking certain or all classes, so I think this platform can be useful to be able to evaluate them. I also think that it will be useful for all the other students, since, for example, there are techniques of some individual or collective sport that are difficult to explain and through this platform, I could teach those contents of the subject*" (Student 18, Master).

It can be used with hearing-impaired students. Deaf students can activate the video subtitles and follow the class.

> *"It can also be an adaptation for some people since the videos can have subtitles and they can be useful for people with hearing disabilities, for example"* (Alumno 6, 6th Grade).

Advantages highlighted by professors/teachers:

Easy for teachers. The teachers appreciate that it is easy to learn to handle and use on a daily basis.

> *"For me, the biggest advantage is that it is very easy to use. If I learned, anyone can, since it is intuitive*" (Teacher 10).

Plurality of questions. These technologies allow you to ask different types of questions.

> *"I like that I can formulate multiple choice questions that correct themselves, although it is not convenient to abuse them because students can pass the answers; open questions of a reproductive nature (what the video says) and of a productive nature (a reflection, an example, etc.). Altogether, a lot of information can be extracted from the students' understanding from the videos"* (Teacher 1).

Advantages highlighted by both professors/teachers and students:

Self-learning tool. Students and teachers point out that this technology has great potential as a self-learning tool.

> *"I have thought to make some videos with the resolution of exercises in Excel and, as they progress, I will embed questions. These questions will be answered in later sections of the video, then the student will be able to self-evaluate. I see a lot of potential for it as a tool for self-learning and self-assessment"* (Teacher 16).

A pleasant and dynamic tool. Likewise, students and teachers agree that it is a dynamic tool, which favors learning in a more enjoyable way.

> *"Since you can edit the videos and add questions, it makes the viewing process more enjoyable and dynamic. For example, the insertion of specific voice notes from the teacher throughout the video is similar to the comments that a teacher would make in a face-to-face class and helps to draw attention to the topics that the teacher wants to emphasize"* (Student 15, Master).

Motivation. This technology engages students and motivates them in their learning.

> *"Using such a platform can in itself be a form of motivation. Plus, it's easy to use and entertaining. As I said in the video, when you work on what you like, you learn better"* (Alumna 6, 8th Grade).

Attractive and playful tool. It is an attractive tool and there are those who value it as playful.

> *"My daughter is using it in high school and she likes it a lot, she lives it almost as if it were a video game. The first time she used it, she showed it to me to see and said it was very attractive to her. She was watching a video of History and stressed that when he asked her questions after watching the video clip, she did not forget what she was seeing. I was hooked*" (Teacher 2).

Novel tool. For students and teachers, it has also been considered a tool of interest due to its novelty for all, as it allows them to develop in an asynchronous way the posing of questions and offering them answers.

> *"I believe that may be a novel way to convey information, maintain feedback, reflect a learning"* (Alumna 11, Master).

Immediate feedback. This technology, by allowing you to give feedback easily and in an agile way, facilitates the evaluation by the teacher.

> "*What I like the most is that it facilitates immediate feedback, but hey, I've been using it for a long time for many reasons. I consider it an indispensable tool, so I am already convinced of the cause*" (Teacher 6).

Focus attention. This tool, with the involvement, requires the student to answer the questions posed and favors attention and active listening, as emphasized by many teachers and students.

> *" L and I paid attention differently to that and have lent to other videos of content that we can send in the subject, as will asking questions, making you be attentive to what he tells you. I feel that, with the questions, you explain what you have understood and retain the information much better"* (Student 7, 9th Grade).

Students' work. Participants emphasize that this technology motivates them to work on the content of the subject.

> *"Every week I show my students several videos and several readings. They always make the videos, even the ones for future classes. They like it a lot and they are learning a lot too"* (Teacher 2).

All students participate. When a question is asked in class, it is not feasible to retrieve the answer from all students, but these tools allow it.

> *"It seems like a good idea to me because it is a way that all students can participate without the class being chaotic"* (Student 5, Master).

Versatile for synchronous and asynchronous teaching. It can be used for both asynchronous and synchronous teaching.

> *"In case the classes are blended, it is a good method for my students to work on subject content when they do not have a class with me. But if they were 100% face-to-face classes, I would use it simply as one more tool for them to carry out activities related to the different subjects in a less traditional way than homework"* (3rd Grade Student).

Promotes flipped learning. Another observed advantage is that it facilitates innovation through the successful implementation of flipped learning practices.

> *"It is an excellent tool to use in a" Flipped Classroom," the model that we are currently studying, which consists of blended or mixed learning, since it is a pedagogical model that transfers the work of certain learning processes outside the classroom and uses class time facilitating learning and also seeking to enhance other knowledge already seen in the classroom. It can be very useful and enriching because it enables students to play an active role in learning"* (Student 2, 8th Grade).

Shyness is no excuse for not participating. It facilitates the participation of timid, introverted, students with fewer social skills in a classroom.

> *" Normally, there are several students in the class who are more shy and introverted, and therefore when giving thoughtful answers on a topic they are more self-conscious than if they can give them through an online platform "* (Student 3, 1st Grade).

LIMITATIONS

Just as the participants have shown the advantages of this technology for interaction in asynchronous teaching through video, a few have appreciated some specific limitations that are listed below.

Limitations highlighted by students:

Concentration problems. One student said that she finds it boring and has trouble keeping her attention by watching the videos and answering the questions asked.

> *"I think it's interesting, but it can make students get overwhelmed because it can become boring if it consists of several videos and even more if it is children. It's hard to stay focused in videos. I believe my future students may feel like me"* (Alumna 3, 5th Grade).

Problems with the use on a smartphone. A student highlighted problems when using *Edpuzzle* from her mobile phone.

> *"I, who have used the mobile application have had some problems. With audio, for example, when the teacher intervened with the recording, the sound was bad. Sometimes he would get stuck, other times, I would stop hearing him, but when he returned a minute later, I did hear what he was saying..."* (Student 1, Master).

Limitations highlighted by professors/teachers:

***Edpuzzle* does not belong to Moodle**. For two teachers the main limitation is that it is not integrated into Moodle. The following comment illustrates.

> *"The main drawback that I put to Edpuzzle is that it is its own platform and that it is outside of Moodle, which is the tool we use at the university. Students have to register outside. H5P is integrated into Moodle and offers practically the same functionalities*" (Teacher 3).

Limitations highlighted by both professors/teachers and students:

Technical difficulties. Some people have expressed that they have small technical difficulties in use: not knowing how to look at the qualifications, forgetting the password, etc.

> *"I have had technical problems because some students could not see the grades that I assigned them. I don't know why it happened"* (Teacher 2).

There could be copying practices between students. Students could share their answers to try to overcome the questions posed without watching the videos.

> *"You do not make sure that students do not look for a summary or copy each other"* (Alumno 4, 4th Grade).

CONCLUSION

The previous results allow us to establish some conclusions. First, given that only a small number of the participants had ever used *Edpuzzle* (12 out of 152), many were ignorant of the program's existence. More efforts are needed to motivate the use of technology in university teaching,

especially now that the traditional face-to-face university has been shaken by urgent security measures implemented around the world that have forced teachers to develop e-learning and teaching and learning processes (Alarcia & Bravo, 2012; Asri et al., 2020; Marcelo et al., 2015).

Second, the positive reception of these technologies by teachers and students who are preparing to become teachers stands out, as was already seen in previous studies (Awidi & Paynter, 2019; Comer & Lenaghan, 2013; Foldnes, 2016; Låg & Sæle, 2019; Lai & Hwang, 2016; Mischel, 2019; Pulukuri & Abrams, 2020; Santos et al., 2019; Silverajah & Govindaraj, 2018). Based on this evaluation carried out by 152 different individuals, it can be concluded that *Edpuzzle* allows the teacher to interact with students when they carry out learning alone, providing added value to their own or other people's graphic material to be used (Burns et al., 2020; Comer & Lenaghan, 2013; Mischel, 2019; Vercellotti, 2018). Likewise, the preference of students for graphic and visual material to complement other learning tools and help students to better understand the knowledge to be acquired was also verified (Arnone & Grabowski, 1992; Mischel, 2019; Pal & Patra, 2020; Roberts, 2019; Silverajah & Govindaraj, 2018). This unique combination of interactive teaching through video is promising for the future (De la Fuente Sánchez et al., 2017).

Third, the different evaluations from the 152 participants allowed us to build a narrative assessment (Huber et al, 2013.) The advantages and limitations of *Edpuzzle* conferred by our sample resulted in 24 advantages for use in the process of teaching-learning and five limitations. In summary, these are as follows:

Advantages

- From the point of view of the students, *Edpuzzle* facilitates the integration of technology in teaching, offers audiovisual work material, allows students to revisit information as many times as necessary, the answers are given immediately, generates reference material, students are not allowed to change screen, they can activate hearing-impaired subtitles, allows a versatile treatment of topics, to verify the understanding of themselves and can be used as a training supplement.
- From an educational perspective, *Edpuzzle* is an intuitive and easy-to-use tool that allows you to ask a plurality of questions.
- From the point of view of teachers and students, *Edpuzzle* constitutes a novel, entertaining, dynamic, attractive, and playful self-learning tool that favors motivation, immediate feedback, and that all students participate and work. It focuses attention, promotes flipped learning, and makes it easier for shy students to contribute their perspectives.

These advantages allow us to verify the starting hypothesis that these technologies have great potential for teaching and learning in e-learning contexts.

Limitations:

- The teachers have highlighted as negative that *Edpuzzle* is not easily integrated into Moodle.
- One student has claimed that it is hard for him to concentrate at home with videos and another has pointed out difficulties in using a Smartphone.
- Some students and teachers have had some technical difficulties and believe it would be possible to copy between peers.

We were able to achieve wide triangulation, saturation, and contrast of perspectives thanks to the high participation of teachers and students, by having the point of view of 152 people, contributing to filling a gap in research on technologies through video for interaction. However, in the future other technologies which allow common functionalities with *Edpuzzle*, such as H5P and others, should be evaluated and compared. As a future line of research, it is suggested to have

studies on the impact of the continued use of these technologies in the university environment, since previous studies have focused on the Secondary and Vocational Training stage (Campos-Gutiérrez et al., 2019; Santos et al., 2019; Silverajah & Govindaraj, 2018). It would be relevant to analyze subjects from different fields of knowledge during an academic year or a semester to evaluate: (1) the satisfaction of teachers and students, (2) their impact on training and motivation, (3) to compare satisfaction and effectiveness at different levels of education, and (4) try to establish guidelines for the development of good practices in the use of these technologies.

Finally, taking into account the results of the COVID health crisis on education and the notable existing technological developments, it is worth considering the need for greater dissemination of *Edpuzzle* and similar technologies among teachers to increase their use and thus enhance blended, online, synchronous, or asynchronous training. These actions would help to ensure that distance learning is more attractive, motivating, successful, and interactive (Alarcia & Bravo, 2012; Asri et al., 2020; Bao, 2020; Cerdas-Montano et al., 2020; Comer & Lenaghan, 2013; Ellis & Bliuc, 2019; Marcelo et al., 2015; Pal & Patra, 2020).

REFERENCES

Alarcia, Ò. F., & Bravo, I. de A. (2012). The influence of ICT on teacher and student interaction in university training processes. *RUSC Universities and Knowledge Society Journal*, vol. 9, no. 2, pp. 213–228. https://doi.org/10.7238/rusc.v9i2.1243

Arnone, M.P, and Grabowski, B.L. (1992). Effects on children's achievement and curiosity of variations in learner control over an interactive video lesson. *Educational Technology Research and Development*, vol. 40, no. 1, pp.15 - 27. https://doi.org/10.1007/BF02296702

Asri, T.M., Kurnia Irmawati, D., & Novita Dewi, D. (2020). Investigating the Use of Internet Applications for Teaching at Higher Educational Level in the Indonesian Context. *Arab World English Journal*, vol. 11, no. 2, pp. 37–48. https://doi.org/10.24093/awej/vol11no2.3

Awidi, I.T., & Paynter, M. (2019). The impact of a flipped classroom approach on student learning experience. *Computers and Education*, vol. 128, pp. 269–283. https://doi.org/10.1016/j.compedu.2018.09.013

Bao, W. (2020). COVID -19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, vol. 2, no. 2, pp.113–115. https://doi.org/10.1002/hbe2.191

Burns, A., Holford, P., & Andronicos, N. (2020). Enhancing understanding of foundation concepts in first year university STEM: evaluation of an asynchronous online interactive lesson. *Interactive Learning Environments*, *pp.* 1–13. https://doi.org/10.1080/10494820.2020.1712426

Campos-Gutiérrez, L.M., Sellés-Pérez, S.G.-J., García-Jaén, M., & Ferriz-Valero, A. (2019). Inverted Classroom in Physical Education: Learning, Motivation and Motor Practice Time. *International Journal of Medicine and Sciences of Physical Activity and Sport*, vol. 21, no. 81, pp. 63–81.

Cerdas-Montano, V., Mora-Espinoza, Á., & Salas-Soto, S.E. (2020). Remote education in the university context: need for collaborative work for teacher pedagogical mediation in times of COVID. *Educare Electronic Magazine*, vol. 24 (Supplement), pp.1–4. https://doi.org/10.15359/ree.24-s.9

Comer, D.R., & Lenaghan, J.A. (2013). Enhancing Discussions in the Asynchronous Online Classroom: The Lack of Face-to-Face Interaction Does Not Lessen the Lesson. *Journal of Management Education*, vol. 37, no. 2, pp. 261–294. https://doi.org/10.1177/1052562912442384

De la Fuente Sánchez, D., Hernández Solís, M., & Pra Martos, I. (2017). Educational video and academic performance in distance higher education. *RIED. Ibero-American Journal of Distance Education*, vol. 21, no. 1, p. 323. https://doi.org/10.5944/ried.21.1.18326

Ellis, R.A., & Bliuc, A.M. (2019). Exploring new elements of the student approaches to learning framework: The role of online learning technologies in student learning. *Active Learning in Higher Education*, vol. 20, no. 1, pp.11–24. https://doi.org/10.1177/1469787417721384

Foldnes, N. (2016). The flipped classroom and cooperative learning: Evidence from a randomized experiment. *Active Learning in Higher Education*, vol. 17, no. 1, pp. 39 - 49. https://doi.org/10.1177/1469787415616726

Gaitán, A., & Coraglia, M.I. (2021). Argentine university libraries and online education in the face of the COVID 19 pandemic. *Anales de Documentation*, vol. 24, pp. 3–12.

Hernández, G., & Álvarez-Álvarez, C. (2018). Improving interaction in the classroom through collaborative action research. *Bordon, Revista de Pedagogia* , vol. 70, no. 4, pp. 73–87. https://doi.org/10.13042/Bordon.2018.60079

Huber, J., Caine, V., Huber, M., & Steeves, P. (2013). Narrative Inquiry as Pedagogy in Education: The Extraordinary Potential of Living, Telling, Retelling, and Reliving Stories of Experience. *Review of Research in Education*, vol. 37, no. 1, pp. 212–242. https://doi.org/10.3102/0091732X12458885

Låg, T., & Sæle, R.G. (2019). Does the Flipped Classroom Improve Student Learning and Satisfaction? A Systematic Review and Meta-Analysis. *AERA Open*, vol. 5, no. 3, 233285841987048. https://doi.org/10.1177/2332858419870489

Lai, C.L., & Hwang, G.J. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers and Education*, vol. 100, pp. 126–140. https://doi.org/10.1016/j.compedu.2016.05.006

López, J.M., Romero, E., & Ropero, E. (2010). Use of Moodle for the development and evaluation of competences in Students. *University Training*, vol. 3, no. 3, pp. 45–52. https://doi.org/10.4067/s0718-50062010000300006

Marcelo, C., Yot, C., & Mayor, C. (2015). Teach with digital technologies at the university. *Communicate: Scientific Journal of Communication and Education*, vol. 22, no. 45, pp. 117–124. https://doi.org/10.3916/C45-2015-12

Mischel, L.J. (2019). Watch and Learn? Using Edpuzzle to Enhance the Use of Online Videos. *Management Teaching Review*, vol. 4, no. 3, pp. 283-289. https://doi.org/10.1177/2379298118773418

Odriozola-González, P., Planchuelo-Gómez, Á., Irurtia, M.J., & de Luis-García, R. (2020). Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. *Psychiatry Research*, vol. *290* (May), 113108. https://doi.org/10.1016/j.psychres.2020.113108

Pal, D., & Patra, S. (2020). University Students' Perception of Video-Based Learning in Times of COVID-19: A TAM / TTF Perspective. *International Journal of Human-Computer Interaction*, pp. 1–19. https://doi.org/10.1080/10447318.2020.1848164

Pulukuri, S., & Abrams, B. (2020). Step back, translate, extend: Addressing misconceptions relating to energy and free energy in cellular reactions via active-learning videos. *Biochemistry and Molecular Biology Education*, *August*, pp. 1–3. https://doi.org/10.1002/bmb.21461

Roberts, D. (2019). Higher education lectures: From passive to active learning via imagery? *Active Learning in Higher Education*, vol. 20, no. 1, pp. 63–77. https://doi.org/10.1177/1469787417731198

Santos, D.R., Cordon, C.R., & Palomo-Duarte, M. (2019). Extending H5P Branching Scenario with 360 ° scenes and xAPI capabilities: A case study in a local networks course. *2019 International Symposium on Computers in Education, SIIE 2019*, https://doi.org/10.1109/SIIE48397.2019.8970117

Silverajah, V.S.G., & Govindaraj, A. (2018). The use of Edpuzzle to support low-achiever's development of self-regulated learning and their learning of chemistry. *ACM International Conference Proceeding Series*, pp. 259–263. https://doi.org/10.1145/3290511.3290582

Sundarasen, S., Chinna, K., Kamaludin, K., Nurunnabi, M., Baloch, G.M., Khoshaim, H.B., Hossain, S.F.A., & Sukayt, A. (2020). Psychological impact of covid-19 and lockdown among university students in Malaysia: Implications and policy recommendations. *International Journal of Environmental Research and Public Health*, vol. 17, no. 17, pp.1–13. https://doi.org/10.3390/ijerph17176206

Vercellotti, M. Lou. (2018). Do interactive learning spaces increase student achievement? A comparison of classroom context. *Active Learning in Higher Education*, vol. 19, no. 3, pp. 197 -210. https://doi.org/10.1177/1469787417735606
