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**Managing the uncertainty: How higher-education organizations will
adopt a blended learning after COVID 19.**

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To my mother

Abstract

Education professionals have been trying to experiment with digital technologies to discover new teaching-learning methods over the last few years. However, a worldwide pandemic caused by a SARS-CoV-2 virus led institutions worldwide to need to adapt to remote teaching urgently until the number of infections decreased, and some Universities could return to Face to Face classes, but with safety measures. This research aims to understand the challenges and benefits that lead professors and students to constrain and adopt blended learning in higher education in the COVID-19 pandemic. The study contributes with a framework proposal that provides the best experience for blended learning users, professors, and students.

Thirteen professors and fourteen students from 5 countries: Brazil, Portugal, France, Germany, and Poland, have participated in this research. Moreover, their experiences were divided into Pedagogical Challenges, Technological Challenges and Environmental Challenges, a division explained scientifically below to understand the challenges.

From this process, it was possible to identify challenges of the Blended Learning for the actors, such as the professor's loneliness for often being teaching to closed cameras and the lack of contact with students, which the continuation of the same methodology applied in Face-to-Face classes generates demotivation and other challenges, especially for a professor. However, with Blended Learning, gamification becomes easier, increases the communities of practice, and allows less time wasted with the non-motions, characteristics that make professors and students want to adhere even more to the model.

With this research it is possible to conclude that in the future, post-pandemic the Blended Learning will be more widespread in universities, that the Platforms may bring more functionalities such as the use of artificial intelligence. However, a factor that tends to generate more success in teaching-learning BL is the pre-selection and preparation for the model by professor and students.

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List of abbreviations

F2F – Face-to-face

EL – E-learning

BL – Blended Learning

WHO – World Health Organization

ICT- Communication Technologies

IT – Information Technologies

UX- User Experience

AI – Artificial Intelligence

OaC- Online and Campus

1 Introduction

According to Passos (2011), the history of civilisation at times adversities occurred related to the different aspects, whether natural disasters, epidemics, wars, among other impasses. Whether public or private, the organisations had to find solutions and adapt structurally, scientifically, and in human resources to remain active and stand out from these situations. Specifically in the educational system, these transformations needed to be planned and practised. In a world with global contingencies and increased displacement, this discussion needs to create solutions. Thus, new technologies have been adapted so that the educational process is not interrupted. New tools and environments are designed to support this other form of learning technologically in these teaching methods. This way creates e-learning environments that can be online or blended learning, constituting face-to-face (F2F) and online. (Bower, 2015). In this context of adversity and change, in December 2020, the world was faced with another epidemic in its history, in which many organisations, including higher education, had to immediately change the way they conduct their activities, mainly their teaching. To an online model and going back to Face-to-Face when the number of infections would decrease and consecutively the deaths caused by the virus et. el (Oliveira, 2021).

As a result, pedagogical institutions, nations, and organisations are researching ways to continue teaching in universities, even in times of such epidemic crises. Among so many issues that have emerged with the necessary shift to online education, one that has emerged and needs investigation is to understand the experience and usability of the users of this new teaching methodology. Some authors, such as (T Cheng, 2020; Passos, 2011; Crawford, 2020; Bower, 2015), contextualise and suggest in their research that learning tools are in constant need of improvement. Bower (2015) demonstrated in his research that educational technology to be substantiated with innovation needs to intensely explore the relationships between goals, practices, cultures, learning environments and experiences of the actors involved in its use.

In the studies conducted for Blended Learning (BL), Garrison (2004) and Williams (2002) bring a discussion on how blended learning can be used as a transformative tool for adversities encountered in higher education. Focusing on the pandemic of COVID -19, Crawford (2020) conducted a study that shows how the Universities of twenty countries around the globe carried out the mode of learning during the beginning of the pandemic and that many of them did not have the preparation and planning for an eventual change of teaching mode. Entering the sphere of user experience for virtual environments, Da Silva (2020) understands that it is necessary to investigate virtual classroom formats, and it is also necessary to include in this research a new understanding of how the actors involved in these processes generate knowledge.

This thesis aims to understand from the user experience the challenges and benefit conditions that restrict and lead to the adoption of blended learning in higher education in the pandemic of COVID-19. Furthermore, from the actors' experiences, create a structure with the characteristics that they believe will be the BL of the future and provide the best learning experience for users, professors, and students. To conduct this research, these aspects were explored and mapped with higher education professors and students from five countries, and with the experiences of these actors aim to develop the technological environment of the future. The specific research questions the following:

R1: What are the challenges that constrain the adoption of BL by professors and students in Higher Education?

R2: What are the potential benefits of facilitating the adoption of BL by professors and students in higher education?

R3: What are the common and different challenges and benefits of BL for professors and Students?

To answer the research questions, it was developed through the qualitative Methodology. The research was developed through cross-country interviews with actors from five countries with higher education classes during the COVID-19 pandemic. For this development, semi-structured interviews were conducted in English and Portuguese (according to the best language for the interviewees) in literal transcriptions and codifications using the N-VIVO software.

This research is structured as follows:

In Chapter 1, there is the introduction with a general overview of the problem, the research of the thesis, the research question and how it is organized.

In Chapter 2, an explanation of the literature, explaining what researchers have explained about user experience and learning experience, e-learning and its characteristics, blended learning, and an exploratory framework which are papers that were the basis for this thesis.

In Chapter 3, the scenario that is the background of this research is presented on the first step was to learn about User Experience and Learning Experience, as there are concepts from these areas that are often described in the results, the characteristics of the e-learning model and finally, what is the blended learning model.

Chapter 4. the Methodology, the Methodology applied to this work is clarified, divided into two phases, the first 3.1. Reasons for having chosen this approach, which leads through scientific bases to the reason for using the Methodology chosen, in the second part 3. 2. The method used in this project, which shows the methodological step by step for this dissertation.

In chapter 5, the results obtained in this research are described by Venn diagrams that show the characteristics described by professors, students and the characteristics they have in common. These features are divided into Challenges and Benefits. Finally, it will describe the Framework with the solutions found for the future of Blended Learning. All this is described in detail in the following topics.

In chapter 6 is characterized by Discursion, in which the main results are discussed with scientific citations and grounded with the scripts obtained from the investigation.

In chapter 7, Finally, the Conclusion brings together the main contributions of this research and suggestions for future research.

2 Literature Review

2.1 User Experience and Learning Experience

Referring to User Experience - UX, according to Garret (2010), determines that it is the experience that a product or service generates when it contacts its users. When developing a project that analyses and wants to improve the user experience, the main objectives are mainly connected with satisfying the needs of this user, decreasing the rework of the actors involved and creating a good relationship with the users of the service and product (Hassenzahl, M., 2013).

Regarding the learning experience, (Bower, 2015; Kolb, D. A., 2014; Rahiem, 2020; Bolliger 2019; Salovaara-Hiltunen, 2019) summarise that it is the user experience of the acts involved in the teaching-learning process, that is to mean, the feelings and perceptions that a user has when in the learning process. Different universities endeavour strategies to provide a better learning experience. According to Bolliger (2020), different tactics are applied, using counselling, cohorts, synchronous communication, and social media to make the learning experience more efficient. In this learning experience, several challenges can interrupt the knowledge process, causing its actors to have negative experiences. These problems can be associated with technological, pedagogical, and environmental characteristics in which the actors find themselves (Rasheed Kamsin Abdullah, 2020; Bouilheres, 2019). About how the environment can also impact the user experience, Benyon (2005, p.36) describes: "Activities always happen in a context, so there is a need to analyse the two together... Context can be a difficult term. Sometimes it is useful to see context as surrounding an activity. At other times it can be seen as the features that glue some activities together into a coherent whole".

Still, according to Benyon (2005), in this physical environment, examples include the environment can be noisy, humid, and dirty. The internet connection in each environment can be harmful and slow it down, making the best experience impossible.

To evaluate a good user experience, Morville (2014) developed the beehive model, in which the objective of this framework is to assist in evaluating essential characteristics that a system must-have, so that user satisfaction exists. This model of Morville's "honeycomb" may be possible for the evaluation of the user experience in digital environments, each space described in the diagram works as a mirror, in which one can evaluate an experience and transform its design, this way exploring and adding even more quality to the service/product being created or improved (Ferreira, 2018). According to Morville (2014), these elements are used as a guide for creating, measuring, investigating, or testing the experience of products/services by users. Each can be characterised as follows by the authors:

- a. Useful - When analysing a project's user experience, it is vital to understand how useful it will be when completed. In a good UX, the user is always the centre of any decision if he does not feel the need to use this product/service or its added features and functionalities. It is because the purpose for which it was created is not sufficient for the satisfaction of customers.
- b. Usable - Usability is how the user must use the product/service that encounters the user. Usability is often confused with UX, but this is only one of the parts that are part of

the user experience. Usability focuses only on the moment of use, while the user's experience also involves the before and after contact.

- c. Desirable - One of the premises for developing a User Experience project is to arouse good emotions and make sure that want the brand in question when need this type of service/product.
- d. Valuable - Making the user feel indispensable, valuable to the service is one of the characteristics that a UX Design project seeks. Borba (2018, p 33) reports, "It is important that people feel that the product is valuable and that, when they are" facing it, they do not resist having it, as it can contribute to their personal or professional daily life."
- e. Findable- One of the characteristics that make the user have a great user experience is to make it easy for it to find what he is looking for easily. Realizing a project on digital systems whose interface and the distribution of information is easy to navigate is a crucial milestone in a UX project.
- f. Accessible- An accessible user experience project needs to include the functionalities to have easy access to all users of the products/services under study.
- g. Credible- A user experience project to have good credibility needs its users to feel confident in using the service on which it was designed.

2.2 E-learning model and characteristics

The E-learning model is characterized as a teaching process that takes place online and uses technological resources as support. Many higher education institutions and business organizations are adopting e-learning to deliver learning and increase the efficiency of training (Ruhe, 2008). In e-learning, the Professor is also characterized as a tutor, because besides the exposition of contents and clarifications, he/she becomes a facilitator, who helps the students through a distance tutor, presenting new materials, helping in the usability of the platforms, among other characteristics (Graham, 2006).

The e-learning model has two categories of approaches for its development: synchronous and asynchronous (Graham, 2006). Synchronous classes occur in real-time. Students and professors interact at the same time using virtual media to support (Zydney, 2019). The advantages of this approach show factors such as simultaneous monitoring because students and professors interact simultaneously, direct contact and more significant interaction compared to the other approaches (Zydney, 2019). The disadvantage of this approach is the lack of flexibility and less learner autonomy, characteristics that e-learning possesses but are minimized in the synchronous approach (Thomas I, 2021).

As for asynchronous classes, Graham (2006) shows that they occur without the interaction between professors and students in real-time. In education, this approach allows lessons to be followed without setting a place or time. Positive features of asynchronous classes have flexibility and accessibility because they can access their material and shape the learning in the best way they prefer. The disadvantages are isolation, because it is a more individualized study, and self-discipline because without the guidance of the Professor, the student needs to regulate themselves so that they do not generate one of the major problems of the asynchronous approach, which is procrastination (Ruhe, 2018)

In e-learning in general, the challenges related to e-learning methodology are the misuse of the procedure as many professors still use the same methods used in F2F classrooms. The technological structure challenges the professors and learners, such as solitude challenges, ergonomic challenges, and tool functionality challenges (Dhawan, S., 2020; Tîrziu and Vrabie, 2015; Rasheed, R. A., 2020).

As demonstrated by Gherardi, S. (2009) e Ekici, D. I. (2017), an innovative factor that grows in online environments is communities of practice, as with the spread of the use of virtual tools for teaching, they engage the academic community to share and form innovation groups in different locations.

In another innovation in the e-learning learning process Salovaara-Hiltunen (2019) develops research that shows how gamification, mainly simulation reality, can enhance learning and make the learning experience much better. The study brings the concept of gamification as the use of dynamic games used to engage people and make the learning experience even more motivating.

According to Selim (2007) defined eight conditions that are very important for e-learning teaching to be successfully implemented in universities, they are:

1. Style of the methodology applied by the instructor / Professor.
2. Students' Motivational Technological Skills.
3. Positioning of the Professor and mastery of technologies.
4. Content structure organization.
5. Ease and the incredible power of the Internet on campus.
6. Effectiveness and Effectiveness in University Information Technology.
7. University with structure and support for e-learning technologies.
8. Collaborative student interaction.

2.3 Blended Learning Model

As a learning model that combines diverse learning methodologies, BL is an approach that combines the benefits of the F2F classroom learning experience with components of the online classroom (Rasheed, 2020). Still, (Okaz, 2015) describes how the instruments help deliver this style to learning, using different tools such as live-chats, forums, blogs, social networking, webinars, all to generate a motivating environment and a good teaching experience for everyone involved.

As for the relevance of BL for teaching, Neto (2017) gave highlights that it is a form of teaching relevant to education, especially in the context of social transformations about the teaching process; this transformation occurs because professors and students need to innovate in the process of the learning experience, the Professor, in addition to playing the role of transmitting knowledge, becoming a facilitator of blended learning.

Another advantage of using BL in higher education is the use of technology in the teaching-learning method, and this feature makes the learning system more inclusive. According to Garrison & Kanuka (2004) suggest that the method facilitates the experience of learning in a team and alone, building a platform for an independent investigation by the student and encouraging interactivity in the group using it, the later especially when the teaching method

is used in an appropriate way for BL. Second (Okaz, A.A, 2015, p.601) "Diversity is one of the main features of Higher Education as classes consist of different genders, cultures, backgrounds, learning preferences and language proficiency. Technology supports differentiation as there is a wide range of features that can serve different types of students."

Researchers' opinions diverge concerning BL benefits, and this model is often not explored in the best way by actors. These professors do not use the correct methodologies for the design of the classes, students with the cameras and microphones closed that perform other activities, and the environment that students are not the most appropriate for learning (Oliveira et al.,2021; Suartama, 2019; Mugenyi,2017). Still, some of the researchers in the area demonstrate that BL there are still many gaps that need to be developed, such as technical support from universities, the interest of the actors in the development of the model, and preparation of professors and students to use this type of methodology (Petrozzini, 2020; Adebola, 2017; Bolliger,2019). Based on these difficulties, Rasheed (2020) carried out an inductive study with over 591 articles to find out the main challenges students, professors, and the Institution faced concerning blended learning. In the results, the main difficulties that students found were: Self-regulation Challenges (SRC), Technological Literacy and Competency Challenges (TLCC), Students Isolation Challenges (SIC), Technological Sufficiency Challenges (TSC).

The learning experience of BL Mugenyi (2017) investigated the factors that provided the best experiences for professors and students. One of the study's main conclusions is how the design of the platform and the tools it has directly interfered in the performance of teaching and learning. According to Bower (2015), designing a better experience of synchronous BL teaching is necessary to design active learning, prepare those involved for the BL learning methodology, and select the technologies that best develop representation and communication. In addition, Bower (2015) believes that future technologies will develop multimedia collaboration in such an innovative way that professors and students do not realize that they are in diverse environments.

According to Scharpe (2006), defined dimensions that incorporate BL are:

1. Delivery mode: F2F and distance learning.
2. Type of technology: A mix of web-based technologies.
3. Chronology: synchronous and asynchronous interventions.
4. Locus: 'authentic' work or practice-based vs. classroom-based learning.
5. Actions: Multi-disciplinary or professional groupings of learners and professors.
6. Pedagogy: Different pedagogical approaches.
7. Management Direction: Learning that is coordinated by the Professor and learning that the student/apprentice coordinates.

Appendix D - Present a table of articles that summarizes the literature collection of current scientific articles that were the basis for this research.

3 Covid-19 Pandemic

In December 2019 Chinese researchers reported to the World Health Organization (WHO) that a new virus called covid-19 was causing infections in China. (WHO, 2020b). As a virus that spreads through person-to-person contact, the WHO recommended to physically distance anyone who could be infected by the new disease. Thus, several countries have adopted the measure, closing borders, public spaces and even the University. (World Health Organization, 2020b)

Starting in March of 2020, universities across the globe began to move the development of classes and their main services to online (UNESCO,2020). In a UNESCO report (2020), nearly 1.5 billion students in 194 territories were harmed by the COVID-19 pandemic. These are extremely high levels, and the education sector in the world did not face a crisis of this magnitude for many years, and it needed to prepare and implement solutions as soon as possible.

According to Marinoni et al. (2020) the impacts generated on higher education by COVID-19 until the first months of 2020 were:

- Almost 70% of institutions on 5 continents reported having changed their F2F teaching modality to remote teaching.
- 7% reported that they were unable to change, and the teaching was canceled.
- Almost 25% reported that their activities with students were suspended but the University is developing solutions through digital or self-taught.

This situation has several challenges for the academic community, especially when it is of an emergency nature, as it happened in the Institutions, the main challenges according to Marinoni et al. (2020) are:

- i. Accessibility and technological structure - Ensuring that all students have an adequate technological structure to carry out the classes, in developing countries this situation worsens.
- ii. Pedagogical competence for e-learning classes – The distance class requires a different methodology and preparation, mainly to keep students in focus.

According to Oliveira et al. (2021), the progress that has been taking place with Information and Communication Technologies (ICT) in universities was of great support for the change from F2F to distance learning, which minimized the impacts on learning throughout the world.

4 Methodology

4.1 Method used in the project.

For the development of this work, the methodology defined is exploratory, qualitative research. The exploratory research was at first for the literary study of the concepts and tools that would be used. The qualitative method according to Stake (2011) "means that its reasoning is based primarily on human perception and understanding".

In the first phase of the research, it was performed the theoretical background, for understanding of the subject it was required to understand through books, journals and articles what is being discussed in the scientific community about is learning experience, blended learning, the relevance, the main aspects of it for higher education and finally, the pandemic Covid-19, scenario in which it took as a starting point the investigation of the subject under study.

Semi-structured interviews were conducted to understand the challenges, the benefits and how these actors believed it would be a model for the future. As the actors were in different countries and the pandemic was still occurring during the research, all interviews were conducted remotely. For the design of the interviews, the method chosen was In-Depth Interview. According to Boyce (2006) this qualitative interview method is developed when a small but intensive number of interviews are conducted and their ideas and perspectives on a particular subject are explored.

To compose the design process of these interview scripts, the following processes must be carried out: (i) determine the actors; (ii) list the information that I am seeking through the interviews; (iii) list the actors and their groups, in other words, determine the sample; (iv) ensure that the research is in accordance with scientific rigour and the ethical standards of research. Boyce (2006). The script for the interviews was based on the work of Bower (2019), Oliveira (2020) and Abdullan (2020), all of whom have done research in BL and whose research question was to understand or create frameworks as a solution to BL challenges. Thus, two scripts were developed, one for students and the other for higher education Professor (see Appendix A and Appendix B). The interviews were conducted in Portuguese and English, according to the best suitability for the interviewee.

4.2 Application Details and Procedures

The criteria for the selection of interviewees were that they participated in remote classes during the covid-19 pandemic and that these classes were of a higher education nature. Of the 28 interviews conducted, 15 were students and 13 were Professor from different institutions located in Brazil, Portugal, France, Spain, and Germany. Each interview lasted around 15-20 minutes, and all were recorded for the best analysis of the objectives of this research, for all of them the Zoom application was used. The interview period was from 1st March to 11th June.

In the table below, Table 1 - Sample distribution, we have the distribution of the sample that was studied, the table shows the distribution of the sample by country, age, gender, field of study or profession of each respondent and finally, the platforms described.

Tabela 1 - Sample distribution

	Professor	Student
	13	15
Country		
Brazil	11	1
France		1
Germany		6
Portugal	2	4
Spain		2
Age		
23-30	2	12
31-34	2	2
35-40	2	1
40-45	2	
46-50	3	
50-65	2	
Gender		
Female	5	8
Male	8	7
Field		
Arqueologic		2
Architecture	2	1
Education	2	
Engineering and Management	7	10
Health		2
Music	1	
Psicologic	1	
Platform		
Blackboard		1
E-Proif	1	
Google Meet	7	3
Moodle	1	1

Send pdf		1
VLE	6	2
Whatsapp	5	3
Zoom	1	12

After the recording, all the interviews were entered into the Nvivo software for cataloguing and data analysis. The methodology used was the one recommended by Gioia. The Gioia methodology is characterized through an analysis that occurs in two orders. The first is centered on the respondent who informs aspects of the study and the second, using concepts centered on the researcher. (Gioia, Corley, & Hamilton, 2013).

The content was first divided into 152 codes, which underwent a second analysis, leaving only 93 codes. Figure 1 - Methodology Codification, verifies the coding process described above; the figure shows only an example with the main codes generated. After the codification, realized that many of the codes generated were characteristics that Professor and students had in common and others that only both had. Thus, developing diagrams that show in a more panoramic and intelligent way these connections, this part will be better demonstrated and emphasized in the next chapter.

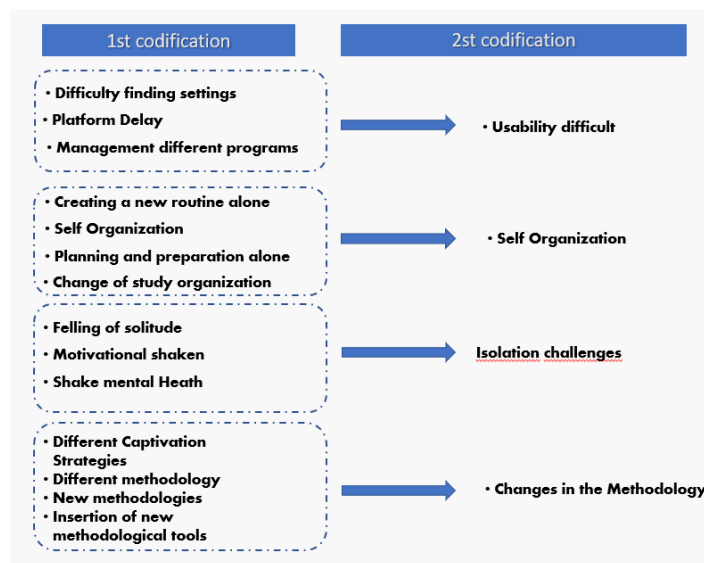


Figura 1 -Methodology Codification

Subsequently, the challenges and benefits were classified according to the dimension in which they are located, these spheres were called Technological Challenges and Benefits, Pedagogical Challenges and Benefits and finally, Environmental Challenges and Benefits and Setup. Technological Challenges and Benefits in Blended Learning are all the challenges and benefits that arise with the use of technological systems. Pedagogical Challenges and Benefits are those originating from pedagogical practices at the time of the process. And Challenges and Benefits of Environment and Setup are challenges caused by the environment in which the actors are or the preparation to start the teaching process Abdullah (2020), Bower (2015).

For a more analytical visualization Veen Diagram was developed. According to Cai (2013) this style of diagram is very interesting when you want to develop studies that need to analyze common characteristics, because it has overlaps that highlight these parts. Thus, the Veen

Diagram was chosen to highlight the Challenges and Benefits described by professors and students, and when these actors had the same description of some of these dimensions, these were disposed in overlap. This way developing a better analysis in the research.

After the coding analysis, the part of the research that integrates the creation of the framework began, in this phase the Framework of Bower (2015) and Szeto (2016) was used as a basis. Both frameworks used in their creations criteria for improvements and challenges arising from blended learning and that generate improvements in parts of the Design and in outcomes.

The next section details all the results that were derived in the description of this methodology.

5 Findings

This chapter will present the findings found during the interviews, based on the scientific rigour described in the methodology. To give answers to the objectives of this investigation, which seeks to understand the benefits that generate adoption, the challenges that restrict the use of BL and the creation of a Framework that enables the best experience for these acts and, consequently, the answers to the Research Questions. As described in the methodology, diagrams were developed that show the Challenges and Adoptions in three dimensions: In the Technological, Pedagogical and Environment-Setup segments.

These diagrams were developed through Veen Diagrams. Thus, allowing an easier way to perceive the characteristics described only by professors, the characteristics reported only by the students and those described by both.

5.1 Challenges

Technological challenges

This section presents the challenges of BL described by students and the Professor. After analysing all the interviews, students and professors had many challenges in common, perceptions that were often described by both. For a better understanding of these challenges in ordinary and those described only by a part of the groups, in figure 2 - Technological Challenges, two sets were drawn up, the set-in blue with the perceptions of Professor only and the green set with students' perceptions. However, there is a part in which the sets overlap. This part is the technological challenges that both actors described, thus making it a common challenge.

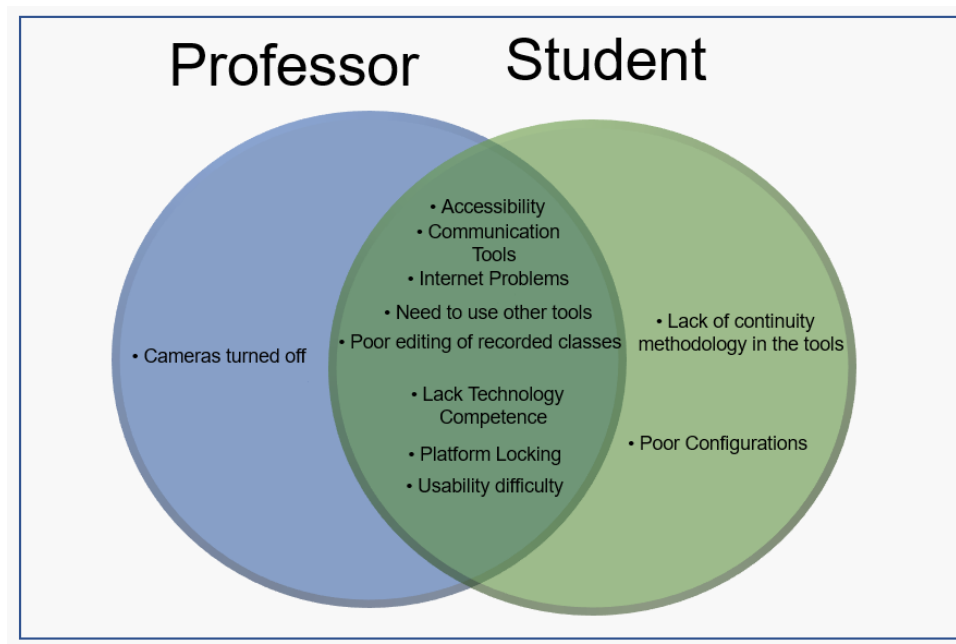


Figura 2 -Technological Challenges

The challenges of BL will be described below:

Professor' Challenges

Cameras Turned Off - Many of the platforms used not being specific for many members due to low internet connectivity, or as many professors reported, due to an invasion of the student's privacy. The cameras were turned off, which was seen as an awful experience for all involved, especially by the Professor who could not follow the development and understanding of students.

Students' Challenges

Poor Configuration - This characteristic described by the students was that the platforms used had poor configuration to the service they were using. Lack of features such as notepads, sending audios, sound, and image settings. Students described that if the tools could have more advanced settings and easy usability, a better classroom experience could happen.

Technological Challenges for both Professor and Students

Accessibility complex - Working with tools in which the functionalities were not accessible, such as difficult sharing or difficult access to login, the non-accessibility of the platforms was a problem frequently mentioned among both classes of interviewees.

Internet Problems - Due to the internet being something that was not unified amongst all classroom members, it varied according to each person's location, connection, and resource power. According to those interviewed, many times, classes were interrupted, or students missed important explanations, or the Professor's explanation was interrupted due to this frequent problem.

Poor editing of recorded classes - Most of the interviewees said that their classes were recorded so that the student could recheck them if necessary or when the classes were in asynchronous modality. However, the video and audio quality were often poor, or sometimes it was necessary to stop the recordings, which generated content that was not usable.

Communication Tools - The communication part and especially the definition of a communication channel was a challenge for Professor and students, often or due to internet connection problems, or non-definition or non-integration of a platform only, made that communication suffered interruptions and impaired the development of classes.

Usability difficulty - The usability of the tools often left something to be desired, not having incomplete functionalities, easy to memorize, or intuitive navigation, generated inconveniences such as anxiety, delays in the programs and break of reasoning in the interviewees.

Need to use other tools (no integralization) - Having to use more than two tools, without easy access between both, was something that, according to the interviewees, was a challenge for the development of the classroom. They were often migrating between platforms, causing delays, loss of attention and loss of classroom content.

Pedagogical Challenges

As described in the Methodology in this work, one of the characterizations is the pedagogical challenges. These challenges are characterized as challenges directly related to the learning and teaching methodology used by actors in this teaching model. As with the technological challenges, the diagram shown in Figure 3- Pedagogical Challenges was created. The diagram shows the professors' pedagogical challenges, the challenges only by the students, and the everyday challenges of professors and students.

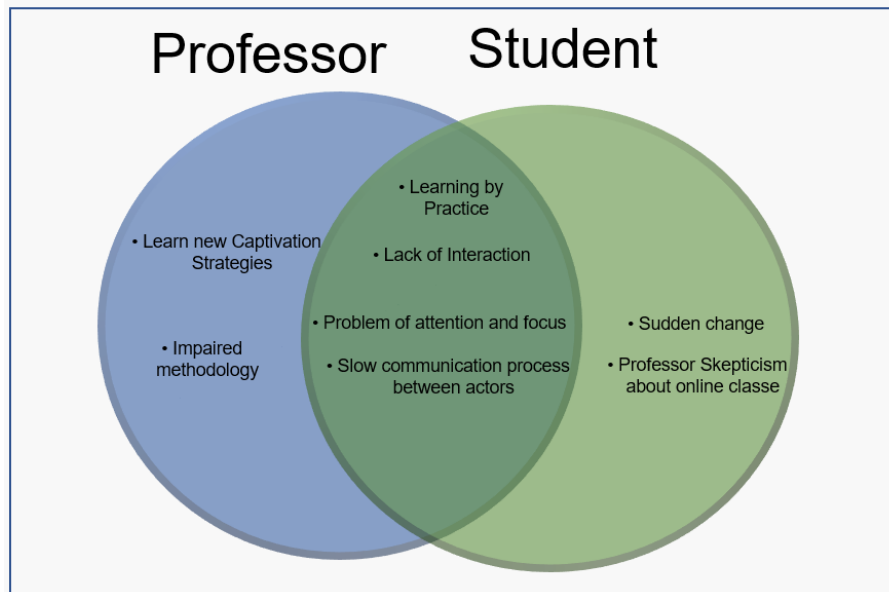


Figura 3 - Pedagogical Challenges

Learn New Captivation Strategies - E-learning requires a new teaching methodology, and this also integrates how the Professor will retain the student's attention. Holding the student's attention through an online classroom requires strategies and changes in teaching method, something that many Professors reported not being successful and ended up being significantly challenging compared to the F2F classroom method.

Impaired methodology- A teaching methodology is built through many studies and even years of feedback to know how best to approach a particular subject. Many interviewees reported that years of planning, approach.

Pedagogical Challenge for Students

Professor Skepticism about online class - This challenge was characterized by the students interviewed when they felt and visualized that the poor efficiency of learning in e-learning was also because the Professor had insufficient knowledge about the usability of the platform, practised methodologies not appropriate for that model of classroom or did not demonstrate dislike for this form of teaching.

Sudden Change - The sudden change to the new blended modality was something that impacted their learning, according to the students. Many of the students had not chosen a blended learning course, but they were forced to use them due to the pandemic. This sudden change and without being the chosen one generated discontent and frustration in the students before the methodology and new form of learning.

Professor not using their methodology for BL- Many students interviewed reported that the classes taught by Professor online did not have the same use or that the same methodology used in the face-to-face class was practised online. Either because the Professor uses the same methodologies applied in the face-to-face classroom or lacks knowledge of the best platform usability. This leads to tiring, boring classes and many times without the perception of learning the taught content.

Pedagogical Challenges for both Professors and Students

Learning by Practice - Both classes interviewed reported realizing that the knowledge of the best approach for e-learning classes was known only in practice. With that, the process of realising the best use of the tools and methods was much slower and more porous, generating many discontents until reaching the best practice. According to both, if there were a better methodological preparation of Professors and students to teach and attend classes, the learning experience would be much more pleasant and efficient.

Lack of Interaction - The lack of interaction was described by professors and students as frequently occurring in e-learning classrooms. Whether the cameras turned off, the development of a better methodology appropriate for this teaching, or the response time in the online model is slower than the F2F, the obstacle of lack of interaction always needed to be improved.

The slow communication process between actors - The communication between the actors was described many times as a challenge for both parts, often caused by oscillations in the internet network that impacted communication and consequently in the learning experience.

Environment and Organization/setup Challenges

As a final classification of the categorization of challenges, it is explained the challenges and character of the environment and the organization of the teaching learning process that is shown in Figure 4 - Environment Challenges. These challenges were listed to this category because they are challenges aroused by the environment or the poor organization of the setup for conducting the teaching learning process.

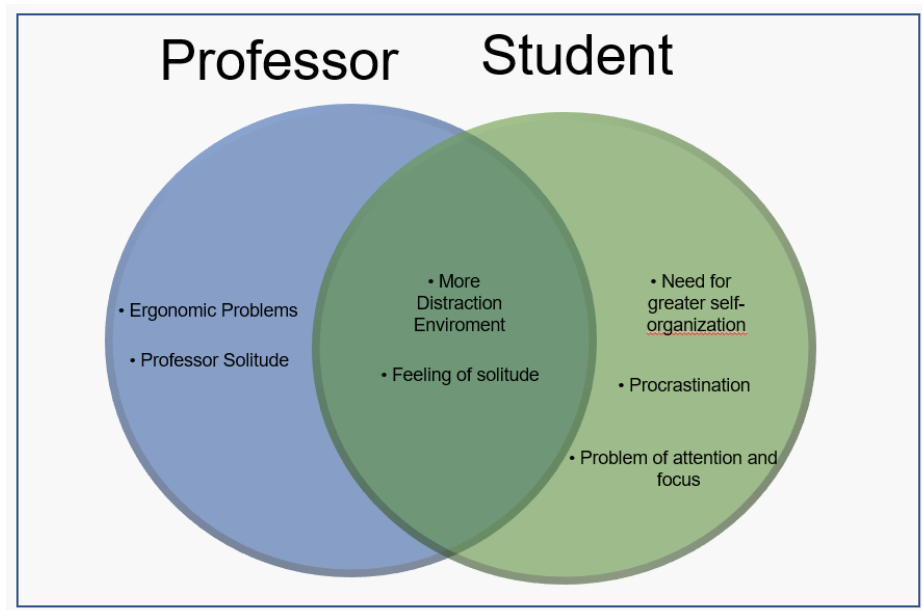


Figura 4 -Environment Challenges

Environment Challenges to Professors

Ergonomic Problems- Many professors during the interviews expressed that they felt or developed ergonomic problems in sitting in the same position, watching a screen for many hours, or having an ergonomic structure for the best development of the classes.

Professor Solitude - Much is addressed about the solitude of the student in e-learning learning models. However, something that also exists in the solitude of the Professor. Many professors

reported missing the direct contact of students and the feeling of loneliness towards their profession. According to them, this generated feelings of being tired, more anxious, and often demotivated. The pandemic scenario in which this study is also conducted further aggravates these feelings.

Environment Challenges to Student

Need Great for a Great Self Organisation - Many students mentioned having to organise more the environment they found themselves in to have classes and organise much more material for their follow-up.

Procrastination - One of the most debated issues is the students' procrastination concerning the e-learning modality. Not being in an environment where everyone has the same purpose, the physical lack of a professor, lack of scheduling, absence of discipline are characteristics mentioned by the interviewees that directly affect the development and completion of the learning stages through e-learning modalities.

The problem of attention and focus - Lack of concentration and focus on the content passed in the online classes were recurrently felt according to the Professor and students. Mainly due to not being in an appropriate location, having distractions around them or methodologies that instigate the interaction between both were cited as the leading causes.

Environment Challenges for both Professor and Students

More Distraction Environment - Students and Professors reported that in the place where they attend classes, several other interactions, whether online or physical, take place that causes their distraction from learning.

Feeling of solitude - Being alone with only a screen in front of them was a characteristic that is very challenging for both Professor and students. Besides the fact that many of them felt their emotions were shaken or went through difficult personal situations during the Covid-19 pandemic, which only exacerbated the feeling of loneliness in using the BL model.

5.2 Benefits

Unlike the challenges, the benefits are perceptions that students and professors report using the Blended Learning methodology and making them adopt and want to use the methodology.

Technological Benefits

As illustrated in Figure 5- Technological Benefits, the technological benefits those technological features described by professors and students provided them with a good experience when using the BL in their learning. Below is a description of each of these characteristics.

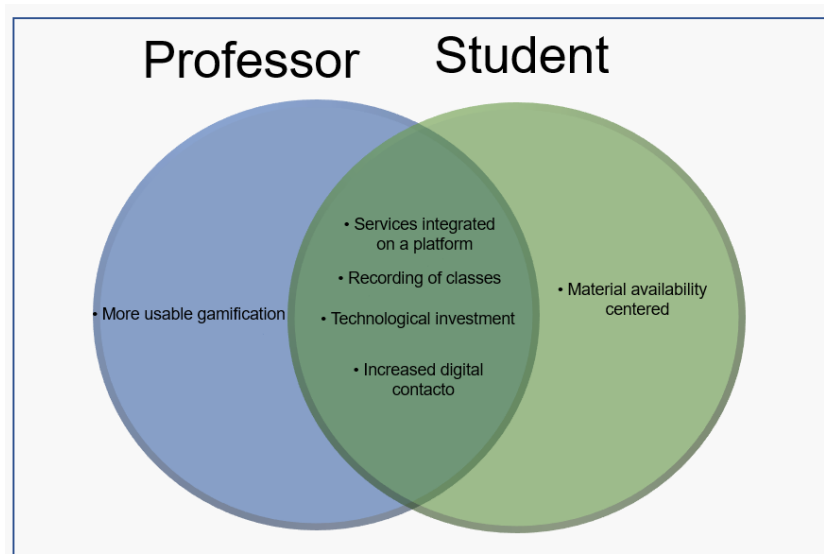


Figura 5 - Technological Benefits

Gamification - The professor said that gamification as part of the classroom methodology became more accessible and usable, as everything was already in the system, and he did not have to resort to setting up another structure to carry out the methodology. In addition, as discussed in the literature review, gamification makes students' learning experience much better and motivational.

Technological Benefits to Students

Material Availability Centered- Having the material centralized in a single tool was one of the benefits and advantages described by the students, the material centred became more localizable and disabled the learning experience.

Technological Benefits to both Students and Professor

Services integrated with one platform- Platforms that integrated services into a single platform gave the perception more straightforward to locate and more desirable to continue studies through this methodology.

Recording Classes - A benefit perceived by both is the recording of classes across platforms. Recorded classes made it possible for the students at the time of their classes alone to review the content and the professor being able to re-evaluate their performance and improvements in the teaching methodology.

Technological Investment - Some actors from both parties reported that investments in platforms, improvement of information systems, and calls for tender with the availability of technological equipment took place in their universities. In their perception, it is a benefit not only for the academic community but also for the academic community society.

Increased digital contact - Students and professors reported that they used technologies and educational tools that they had never used before during the online period. They reported that these technologies assisted in increased technological contact, increasing the usability of digital tools.

Pedagogical Benefits

The technological benefits of pedagogical derivation were described in figure 5- Technological Benefits. The features contained in the diagram are described in detail below.

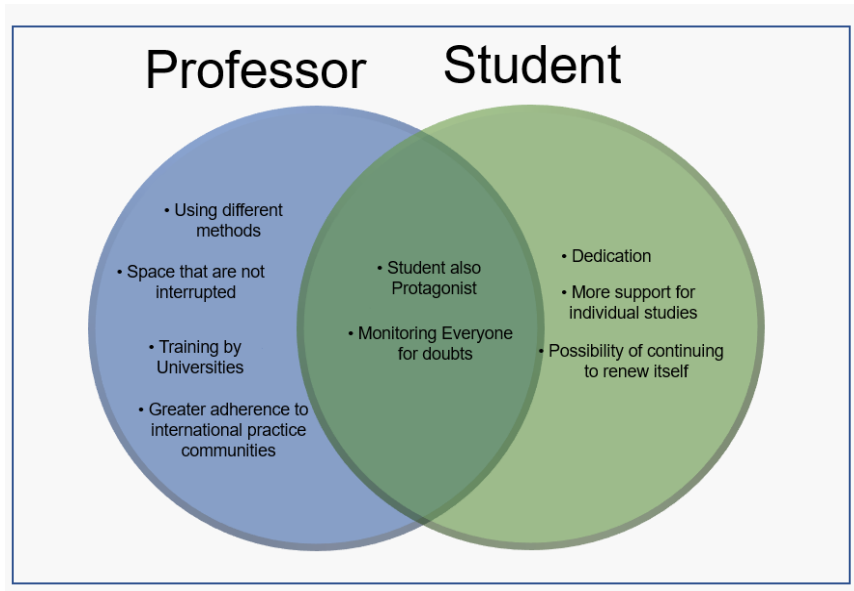


Figura 6 - Pedagogical Benefits

Professor's Pedagogical Benefits

Use of different methodologies - With access to more digital tools at their fingertips, the Professor reported that they were able to apply and share new methodologies with their students more easily.

Private Space (that is not interrupted)- This benefit was reported by the Professor who conducts Thesis orientations. During face-to-face orientations they were often interrupted by other matters, or a place shared with other activities. In the online rooms they noticed that the orientation proceeded better and without interruptions of the environment.

Training by Universities - One of the great benefits described by the Professor is the training given by universities for the application of new methodologies. Many said that with these training they felt more satisfied and better prepared for the market.

Greater adherence to practice communities- Professor ported that with the knowledge of the value of digital platforms for learning and with the common challenge of teaching in the Pandemic, they could be more active and notice the increase of the national and international communities of practice also by their professional colleagues. Creating a greater network of contact and sharing best practices to be applied in teaching.

Student's Pedagogical Benefits

Dedication - With easier access to content and the need to study more on their own, students said that increased dedication to studying had positive impacts and made them more focused with classroom content.

More support for individual studies - Students expressed that during their individual studies, they noticed that there was more centralized material which increased the support in these moments, thus making learning more efficient.

Possibility of continuing to renew themselves- Many students in this research are already in the job market or have children. When the classes became online, and with recorded material available, many of them said they could continue their courses and renew themselves academically, and many professors realized that bringing this student from the market was a great value, because new perspectives were possible to discuss in class.

Pedagogical Benefits to both students and Professor

Student also protagonist - Many of the actors reported that in this learning model they understand that the student takes a more protagonist position, that is, the student is more ahead and takes more responsibility for his/her learning. Actors also said that this characteristic is positive when the student is the one who chooses this methodology BL, otherwise, the characteristic becomes a challenge.

Monitoring Everyone for doubts - Some Professors and students realized the BL methodology with the applicability of forums, chats, among other pedagogical tools the doubts could be solved and analyzed by everyone, and not only in the synchronous classroom. Environment and Setup Adoption.

Environment and Setup Benefits

Finally, the environmental benefits explained of Figure 7 - Environment and Setup Benefits as described in the methodology, are original benefits due to the influence of the environment or its organization on the development of the BL lessons.

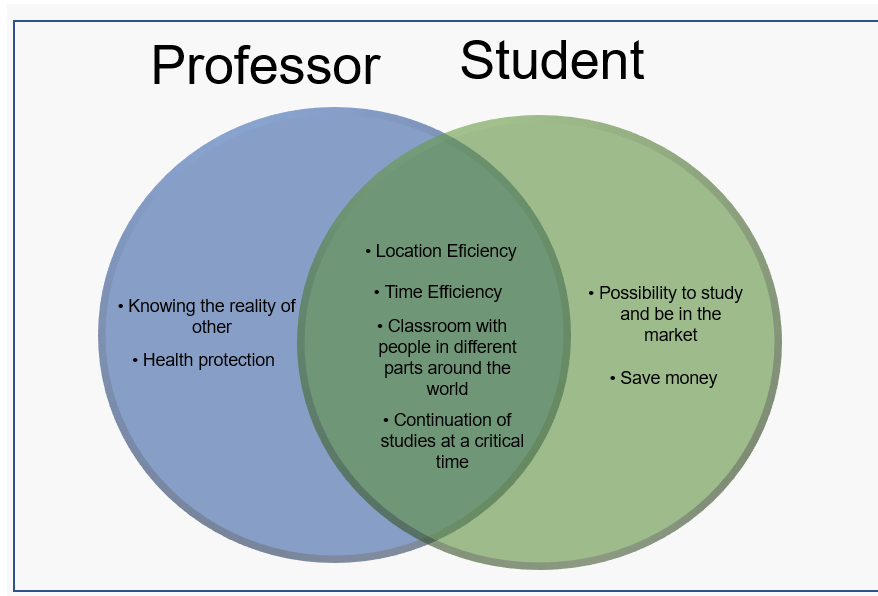


Figura 7 -Environment and Setup Benefits

Professor's Environment and Setup Benefits

Knowing the reality of others - Knowing the reality and being in the familiar environment of the student through a camera, were perceptions of some professors, especially those with small classes and orientation meetings. They reported that through this contact they were able to get to know their students' environment and their realities better, making teaching more shaped to the realities of those students.

Heal Protection- Facing a pandemic causing the death of thousands of people worldwide, being able to carry out teaching service from their home gave Professor the greatest sense of safety and protection of the environment in carrying out their services.

Student's Environment and Setup Benefits

Save money - Students said that being able to study in their homes, and without the expense of travelling and housing commuting among others, especially those living at considerable distances is a positive aspect.

Students and Professor's Environment and Setup Benefits

Time and Location Efficiency - Being one of the most cited benefits, not having to spend much time in locomotion, mainly actors who live at great distances from the learning environment, and even live-in other countries. With this more efficient availability of time and location many actors said they were able to do other activities, including activities and courses that aggravated their learning area.

Classroom with people in different fields around the world - Because blended learning allows students to attend classes from anywhere in the world for a period, many actors identified this as an advantage because their classes were more diverse with people from other countries, which made learning richer with other experiences.

Below there is a demonstration of some transcripts made in these interviews, in Table 2 - Transcript Demonstration was separated by dimension, the characteristic of this dimension, as reported above and an example of the transcripts, that exemplify these characteristics. Other transcripts are also provided below on support discussions.

Table 2- Discourse of the interviewees

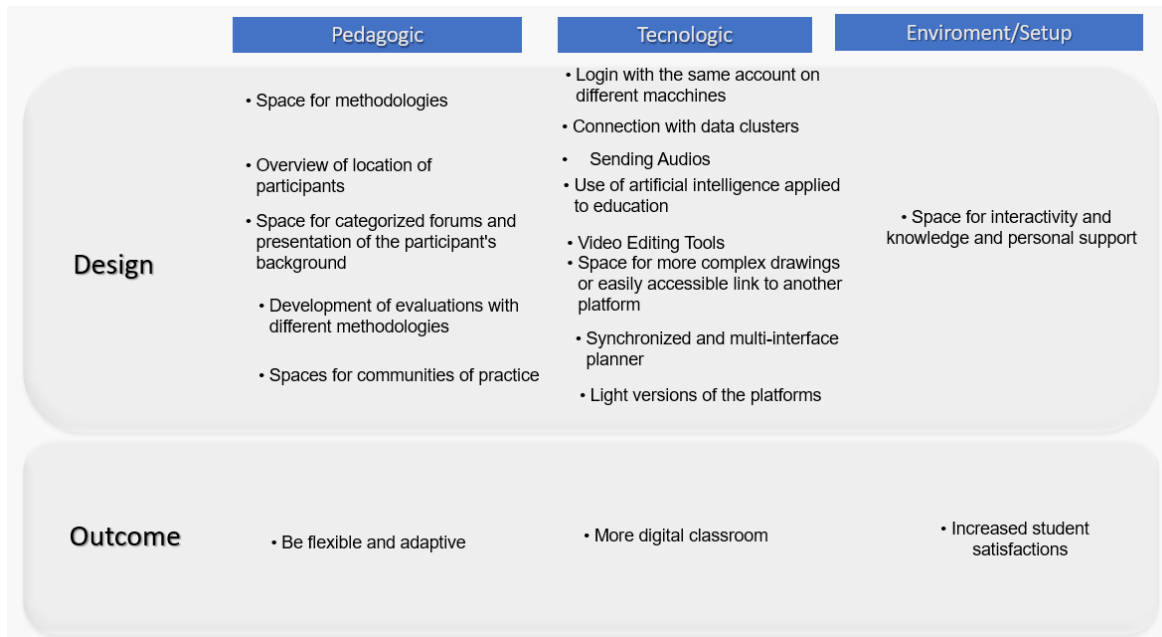
Dimension	Characteristic	Description of interviews
Technological Challenge	Poor editing of recorded classes	<i>“The Professor always recorded classes and subjects, but often the material was very bad, with lots of noise, too many excerpts, which did not need to be there”.</i> (Nursing student,26, Portugal)
	Lack Technology Competence	<i>“In the beginning they had a certain difficulty in entering the environment and knowing how to interact such as launching a question to the virtual room or screen sharing, it is a difficulty that they persist today. So, we can see that these digital natives that we used to say do not exist. They are very good on Facebook, Instagram, and WhatsApp, but tinkering in a more robust environment, as I can say more technological that has more functions. They are not the expected natives.”</i> (Pedagogy Professor,40, Brazil)
Pedagogical Challenge	Professor not using their own methodology for BL	<i>The biggest problem is not the tools, but the methodology that students and Professor use the tools.</i> (Education Professor, 62, Portugal)
		<i>A big problem for me is the distraction, in the classroom I find myself in the</i>

Environment Challenge	Challenges with distraction	<i>environment with fewer distractions. Something that does not happen when I watch class from home.</i> (Data Science Student, 28, France.)
	Ergonomic challenges	<i>I found that three, four hours in front of a computer, giving it your full attention, can bring you problems like eye strain, lower back pain, among other problems.</i> (Engineer Professor,45, Brazil)
Technological Adoption	Recording of classes	<i>Today I always record my dissertation orientations and even classes, so when students have doubts, they can resort to this material, besides making the class more accessible to them.</i> (Pedagogical Professor, 34, Brazil)
Pedagogical Adoption	Greater adherence to international practice communities	<i>With many professors using BL and with similar problems around the world, the international communities of practice mainly around pedagogy had a significant increase.</i> (Psychology Professor,44, Brazil)
Environment Adoption	Classroom with people in different parts of the world	<i>One of the great benefits for me in e-learning is having classmates who live in different parts of the world and work in different companies around the world. Having this exchange of knowledge is something incredible for my personal life and career.</i> (Management Student,30, Germany)

5.3 Design of a Framework for Blended Learning Environments

The realization of this research, mainly after studying the benefits and challenges described by professors and students in blended environments and through across country research with actors from 5 countries. Thus, it led to creating a Figure 8- Framework for Blended Learning Pos COVID 19, which would provide a better experience for both actors. This final framework was based on the project carried out by Bower (2015) in The Blended Synchronous Learning Design Framework. The same design categorization was used for features and aspects that could enhance blended learning and results that would be visualized.

When developing this framework, it was also considered what these actors believe could provide a better experience and how they believed it would be improved in the future. These two factors were divided into technological, pedagogical, and environmental categorizations, categorizations with the same significance as the challenges and benefits described by the actors. The proposed improvements in each categorization are described below:



Source: Own elaboration

Adoption from Bower (2015)

Figure 8-Framework for Blended Learning Pos COVID 19

When developing this framework, it was also considered what these actors believe could provide a better experience and how they believed it would be improved in the future. These two factors were divided into technological, pedagogical, and environmental categorizations, categorizations with the same significance as the challenges and benefits described by the actors. The proposed improvements in each categorization are described below:

Pedagogical Design

Space for methodologies- Understanding the different methodologies and strategies for teaching and watching an online class is still very challenging in BL. Another methodology gap described by the actors is the understanding of methodological characteristics that often change depending on the countries and institutions. The framework has a part dedicated to categorizing methodological materials that will save time for research and adaptation by the actors to solve this.

A tool that shows the methodology of the area in these determining countries, research methods, design research, all geared towards the country's practice. It would not make us depend so much on the professor and would reduce my time searching for information that is scattered through you tube, books, and other files.

(Engineer Student, 29, Germany)

Overview of location of the participants - This overview will show in a simple and interactive way the location of the virtual classroom participants, including the professor, especially when students are allocated in virtual groups in the classrooms. This will allow that everyone will have an overview without having the need to use other communication tools to know the virtual location of the professor and students.

This issue of separating the rooms when the professor speaks individually, sometimes we wait a little, we do not know which room the professor is in. We

need to communicate in the WhatsApp group to know that the professor is in that room because we cannot find him.

(Management Student, 34, Portugal)

Space for categorized forums and presentation of the participant's background - This feature will specially support PhD students and researchers who need to increase their networking and get to know scientific investigations like their own. Nowadays they do not easily find tools to support this process, and many of them feel the need of a tool that supports this meeting with interactive forums, presentation of the background of the listeners and space for knowledge between them.

Certainly, it would be an advance, there is a program that is proper of research, forums organized by research themes, the creation of integrated spaces. I have participated in webinars. I even saw people who had cool ideas, researching things like mine but I could not get the connection to talk to them.

(Engineer Student, 29, Germany)

Development of evaluations with different methodologies - One of the great impasses for online environments is student assessment. One of the options for this gap is the development of evaluative activities such as projects, cross feedback among students, among other forms. So, this environment was created for the development of these activities and with interactive spaces between professors and students.

Our group of experts has discussed developed research that show different forms of distance assessments: whether through projects, investigations and even assessments among the students themselves.

(Psychology Professor, 44, Portugal)

Spaces for communities of practice - With a Pandemic challenge for education around the world, Professors and students are getting to know even more about educational technologies and BL method, bringing with it benefits and challenges, which are mostly common. Thus, they see the need to share best practices by experts in different areas of the world, thus increasing the number and investment of communities of practice. In this way this research needed a proper space to be better catalogued and implemented.

After the pandemic, the University has developed a lot of practice communities, mainly because this problem has been faced in different parts of the world with the same characteristics.

(Psychology Professor, 44, Portugal)

- **Pedagogical Outcome**

Be Flexible and adaptive - In the pedagogical result, this framework for the BL environment will be teaching-learning increasingly flexible and adaptable to students and professors' different realities. The framework will make teaching more accessible and inclusive.

- **Technological Design**

Use of artificial intelligence applied to education- with the advancement and accessibility of artificial intelligence even in the educational field, there is a need for platforms that integrate these resources, be it in the transcriptions part, help in the evaluations and performances of the students, virtual assistants, and exclusive tools for different fields of studies. This functionality will make the teaching experience more valuable and competitive, just as it has become in other areas.

I think we are going to have a very big increase in the impact of artificial intelligence on tools in a highly learning analytics logic.

(Professor Pedagogy, 62, Portugal)

Login with the same account on different dispositive - Login with the same account on different dispositive will help when actors need to use different devices to aid in some demonstration, this functionality is still not allowed in many platforms of teaching-learning however such functionality is noticeable in app and platforms for technological services of other natures.

Another improvement would be to be able to login from different devices or to be able to access at the same time because I could for example access the platform from my iPad and be teaching from the computer and I could draw while waiting to share the screen with my students and at the same time I was teaching there on the computer using this other resource as an extra tool.

(Professor Architecture, 30, Brasil)

Connection with data clusters - This feature was created mainly actors of the technology areas and researchers in general who need to work with a large amount of data, according to the interviewees who need these tools, the current most used tools like Google Meet, Zoom, among others designed for teaching-learning do not have these spaces or an accessible link without generating many tabs and making it difficult for these actors to use them.

Another concern is that we work with a large amount of data. I would like a platform that could make this connection with clusters in which we could work remotely.

(Student Engineer, 30, Germany)

Space for more complex drawings or easily accessible link to another platform - The same issue that occurs with data management occurs with acts from the areas of design, engineering and arts that need spaces that provide better visualization in the parts of the drawings, or that lead to another program that develops this service in a simple and usable way.

In my area we work a lot with drawings and image visualization, a platform that could visualize these drawings, the platforms we use was very difficult.

(Arquologic, 32, Spain)

Sending Audios - Sending audios to describe processes, especially in orienteering teaching is a need that professors have shown to use other platforms. Thus, a space where these audios can be recorded and archived was one of the technological solutions of this Framework.

During the pandemic in my orientations, I sent many audios by WhatsApp for my students in the orientations, I really loved this resource of sending audios because some information is clearer, faster, and consistent.

(Pedagogical Professor, 34, Brazil)

Video Editing Tools - Use of video recording to answer questions and review content is a process often used by students, but these recordings require editing, sound treatment, image enhancement. Thus, the Framework brings a dedicated space for these edits in a usable and accessible way for professors and students.

Having the lessons recorded allows when I study alone, I can review the content, ask questions, and have more material to study.

(IT Student, 29, France)

Synchronized and multi-interface planner- Synchronized and multi-interface planner is a tool that will help in the organization of the activities related to teaching, nowadays there are different platforms that have this functionality, but many of them with a predefined interface that cannot be adjusted to the needs of different actors.

I conduct dissertation orientations with different timelines and deliveries, having a planner that is synchronized to my email and the team's, customizable and that I could change the layout as I need, would be something that would help a lot in my work.

(Pedagogical Professor, 34, Brazil)

Light versions of the platforms- One of the main issues described by professors are the problems with the internet connection that slows down or prevents the best development of the classes. For that this framework has the solution of creating lighter versions of the platform, with only minimal configurations, which will allow the development of the classes in those moments of low connection. This type of version already occurs mainly with applications.

The internet can't support the processing of that platform to load so you can't use all the functions you have there because it's too heavy. If you had a parallel function like Uber or Instagram already have a lighter app for lower connectivity, it would be something that would help a lot not to cut classes.

(Arqueologic Student, 33, Germany)

- Technological Outcome

More digital classroom - More digital classroom benefits as engagement, actors involved in information systems increasing their technological knowledge, besides the information sharing being more accessible and practical.

- Environment and Setup Design

Space for interactivity and knowledge and personal support and Increased student satisfactions - This space will be part to meet each other and students' activities so they can interact and know who the people on the other side of the screen are, participating in the same learning process, as well as the contact for help from the University, especially in the psychological part. With this, it will make a group of students and professors less distant, greater care related to mental health and increase their satisfaction with the use of the teaching model.

At my university during the pandemic and especially in online classes, they took great care of us, sent emails asking how we were doing, organized online activities for us to do together, even someone came to our accommodation to support us. It was something incredible and it helped me a lot in this difficult time.

Data Science Student, 28, France)

- Environment and Setup Outcome

Increase Student Satisfaction- With all the suggestions reported by the individuals themselves who study through the BL, many of them reported in the end that with the improvements they described, their satisfaction with learning and using the method would become more pleasurable.

For sure all these features and spaces that I said would help a lot during my classes and give me more satisfaction with my learning and would make me want to use it again and again

(Data Science Student, 29, Spain)

6 Discussion

This chapter will discuss how higher education will adopt blended learning after the COVID-19 pandemic. The research questions will be answered, and the findings discussed in the previous chapter will serve as a basis for such discussion.

The Challenges dimension answers questions R1 and R3. When it is related to difficulties, we notice that the challenges that the actors have most in common are the Technological Challenge. One of the big problems is related to the lack of technological competence that many teachers and students comment on. According to Maycock et al. (2018) technology innovates every day and, along with it, BL will present new challenges and the necessary digital skills. Actors being both digital and non-digital born students, miss this competence.

In the Challenges related to the Pedagogical issue, the major challenges addressed are the loneliness of the teacher, where due to the closed cameras and microphones, many students perform other activities and teachers cannot have direct contact to feel how is the development of learning, which generates teachers' feelings of loneliness, insecurity and depression in towards the work developed and even in personal issues. The other pedagogical challenge is the methodology that teachers are using to teach in online environments. Rasheed (2020) and Oliveira et al. (2021) develop in their work that the loneliness of the teacher is linked mainly to the non-interactivity with students because many of them are with cameras and microphones off, which generates a demotivation in the Professor. The following is a call that depicts this information.

Another issue is how I always had face-to-face contact with my students who fed me personally as a professional. This break took me to an environment of great distance, there are students I do not know.

(Engineer Professor,44, Brazil)

Many actors, including Professor, report that one of the major challenges are not in the platforms, of course as all technology always needs improvements, but in this challenge the main problem is in the methodological approach of Teachers for BL environments, many teachers use the same methodologies addressed in classrooms F2F which generates various factors such as fatigue, demotivation, and even other challenges such as Ergonomic Problems, which are described in the Challenges of Environment. As Rasheed (2018) reported these challenges of cameras and microphones off. According to Broadbent (2018) and Bower (2015) show that when in BL teachers use pedagogical strategies not appropriate for the online environment, such as time management of lectures and diversification of methodology to gain students' attention, the results of satisfaction and motivation for learning tend to be not the best.

I feel that, even today, one of the main challenges is getting the student's attention. When we are in person, I could perceive the attention of the class and when to use strategies to retain attention. Now, with the distance class, it becomes more difficult, especially with the screens turned off, and because they are different strategies, especially in expository classes.

(Architecture Professor,34, Brazil)

The Adoption section was used to answer the Research question R2 and parts of R3. When it comes to technological actions, the ease of use of gamification was one of the major factors

mentioned by professors. Thus, using software for gamification makes migration faster and more accessible than students who have classes F2F, because the actors are already in an online environment.

With computer classes I can more easily gamify my classes, as everything is a distance from a client to reach students. If I were to do the gamification in the F2F classroom, it would take more time and it would be less accessible because not everyone could not have their devices.

(Pedagogue Professor, 40, Brazil))

When the characterization of being able to record the classes in the adoption Technology that is found for both, was a technological factor of great mention by teachers and students, when performing this feature both realize different benefits, such as students can have more material to verify doubts after the class, whether synchronous or asynchronous, especially students who have other constrains, such as being in the labour market, have children, are sick, among others, and teachers may have a material for verification of possible improvements in their teaching process and discourse. According to Vu and Fadde (2013) in this study, students demonstrate that they feel more advantages in having their lessons recorded, as they can recap and resolve doubts when they are studying alone. And teachers also demonstrated that in this way they contribute more material to students, thus helping their learning.

I have several students who study and work, have children and have returned to the academy to specialize. Having this material recorded allows greater inclusion of this type of student, plus more material for revision for students in general.

(Engineer Professor,30, Brazil)

In the benefits presented in Figure 6, the description of the student being the protagonist in this process is related to the student having more autonomy in BL in relation to their learning and that in this method the student develops more leadership skills. According to Chilingaryan, et al. (2017) when the student becomes the protagonist of their learning, they assume more responsibility, become more creative and increase their critical thinking about the activity they are doing.

As for the Benefits that count in Figure - 7, the time efficiency benefit was one of the most discussed topics during the interviews, and it responds to R2 and R3 as well. Mainly people who lived in large urban centers, or in a different location from their F2F study, not wasting time in commuting was one of the benefits that made both actors adopt BL. Another benefit related to Environment and Configuration that is in the diagram is the possibility that BL, for having an online character, allows people from different parts of the world to carry out part of the activities in their countries, exchanging and enriching with knowledge and multiculturalism among the members of the class.

In my online class there are people who live in the US and Europe and who are also in the job market there. I have even talked to many of them about processes that I carry out in my work that are very similar to the ones they carry out in these countries. I believe it is a very good exchange of experiences.

(Engineer Student,34, Brazil)

The proposed Framework Figure – 8 is the innovative feature of this research and provides solutions to the challenges reported by the actors interviewed. In figure 8, the Framework one

of the solutions is to have in the BL environments a space dedicated to methodologies, the use of appropriate methods for the development of BL classes requires knowledge and preparation by the professors and students. According to Bower (2015), synchronous BL is fundamental to prepare an active methodology and the preparation of the environment and people for this type of activity is essential for the best learning experience.

Still, in the characterization of the design of the pedagogical part that counts in figure 8, there is Space for categorized Forums and presentation of the participant's background that brings the light mainly faced by Ph.D. students or researchers in general that in most platforms do not have a space for knowledge of research and background of other researchers who are present in virtual rooms, helping mainly in scientific meetings.

This study also found that categorized spaces for communities of practice, with the progressive increase that has been occurring with communities of practice around the world, so they need categorized spaces and customized to their needs. Per Mujahiddin, M. (2020) how these communities have grown after the emergence of the pandemic, and that makes the faculty staff more competitive and attractive to the various actors. Also in the Framework, in the part related to Technologic, there are spaces for artificial intelligence that help in the teaching-learning process, such as research aid transcripts, support for teachers in the assessment of students, and Holmes (2019) shows how environments in AÍ are growing in universities and still need bigger structures and innovative systems to support you in the online environment.

One of the biggest problems, especially in places where the Internet structure is not good, which happens a lot in developing countries, or online classrooms with many participants, is the lack of Internet connection that does not allow the full use of services and tools available in online platforms. As shown in Figure 8, in the technological part, of the Framework we have the creation of lights versions for the platforms, i.e., versions with the minimum configurations and that need low Internet connectivity, as already happens with platforms and digital applications.

Finally, in the part of Framework Design in the Environment and Setup, the creation of support spaces for teachers and students. This Pandemic has evidenced how much the people inserted in the academic community go through such problems as burnout, depression, loneliness, among others, and need psychological assistance and spaces for personal and community support programs. According to Pillon (2020) motivation, relationship, and mental health are three of the five main cares that Professors and universities need to be more careful when it comes to distance classes.

7 Conclusion

The services associated with technology always need to be improved because technological transformations are something that happens constantly. The work developed in this research seeks to understand the challenges and benefits those students and professors have when realizing the teaching-learning through the BL, especially in a pandemic period, and provides a framework that enables a better experience in this teaching-learning process. This research has as great importance for the academy and consequently for the society because it shows a problem faced by universities around the world and in its sample brought perspectives of 5 countries, which makes the work even more enriching for science.

As for the findings related to the challenges imposed by the BL, the one most exposed by professors and students is the technological structure, especially in developing countries such as Brazil, where many actors complained about the lack of connection and the breakdown of class development. One response reported by professors is the development of asynchronous classes. This way, students who do not have a good internet connection can consult the classes and materials when the internet performs better.

As for the findings related to the benefits, there were numerous, but the most innovative one is how universities have been adopting, and growing international communities of practice, mainly because the number of e-learning in universities has increased. With the Pandemic being a global challenge, experts worldwide can share solutions and research that they are developing to combat the common problems in higher education institutions.

As for the Framework, it brings the answer to several challenges. Discussions and resources for BL teaching/learning innovation were reported as spaces for exposure and learning methodologies, dissemination of IA in the platforms, space for communities of practice, solutions to challenges of assessments, platforms with tools and configurations that provide the best user experience are discussed.

The Pandemic of COVID-19 was a significant challenge in universities' service process, especially in the teaching and learning process. Continuation of F2F classes was no longer an option for most countries and within a few days, teaching changed completely with instructions from higher bodies like OWS and started being carried out in a BL manner. However, with this sudden and challenging change, the challenges and benefits of various characters have become more latent.

The development of this research was qualitatively conducted in different five countries. It is recommended that quantitative research is also conducted to understand the professor and student experience better and measure the impacts generated by COVID- 19 in these different countries.

However, after the Pandemic, this study concludes the adoption of BL will be an even greater reality after the Pandemic. However, from higher education to mainly the baccalaureate level, the F2F component will continue to predominate as actors lose personal contact, which motivates classes. Another insight from this research is that an essential factor for the best BL experience is when actors choose and prepare for this type of methodology and are not forced to use it in emergency teaching. When the choice is pre-defined before the teaching-learning process starts, the user experience with the platforms and the teaching process becomes more rewarding. For future research, I would recommend a quantitative study to understand the user experience with the solutions proposed by the Framework.

It is concluded that more tools will emerge with their teaching-learning concept, but with new challenges in which professors and students will have to become more and more technologically skilled to bring the process to a successful conclusion.

References

- Adekola, J., Dale, V. H., & Gardiner, K. (2017). Development of an institutional framework to guide transitions into enhanced blended learning in higher education. *Research in Learning Technology*, 25.
- Bolliger, D. U., Shepherd, C. E., & Bryant, H. V. (2019). Faculty members' perceptions of online program community and their efforts to sustain it. *British Journal of Educational Technology*, 50(6), 3283-3299.
- Borba, M. C., de Souza Chiari, A. S., & de Almeida, H. R. F. L. (2018). Interactions in virtual learning environments: new roles for digital technology. *Educational Studies in Mathematics*, 98(3), 269-286.
- Bouilheres, F., McDonald, S., Nkhoma, C., & Jandug-Montera, L. (2020). Defining student learning experience through blended learning. *Education and Information Technologies*, 1-21.
- Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis. *Computers & Education*, 86, 1-17.
- Cai, H., Chen, H., Yi, T., Daimon, C. M., Boyle, J. P., Peers, C., ... & Martin, B. (2013). VennPlex—a novel Venn diagram program for comparing and visualizing datasets with differentially regulated datapoints. *Plos one*, 8(1), e53388.
- Chen, T., Peng, L., Jing, B., Wu, C., Yang, J., & Cong, G. (2020). The impact of the COVID-19 pandemic on user experience with online education platforms in China. *Sustainability*, 12(18), 7329.
- Chen, T., Peng, L., Yin, X., Rong, J., Yang, J., & Cong, G. (2020, September). Analysis of user satisfaction with online education platforms in China during the COVID-19 pandemic. In *Healthcare* (Vol. 8, No. 3, p. 200). Multidisciplinary Digital Publishing Institute.
- Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P., & Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, 3(1), 1-20.
- da Silva, U. G., de Figueiredo, S. C. G., Estald, A. S., & de Lima, C. B. Ux design no ensino EAD: O estudo da imersão nas plataformas digitais de ensino e o impacto dos diferentes ambientes e contextos de interação sobre a prática educacional. *Ciências Sociais e Humanidades na Amazônia Volume I*, 47.
- Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 49(1), 5-22.
- Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 49(1), 5-22.
- Ekici, D. I. (2017). The Use of Edmodo in Creating an Online Learning Community of Practice for Learning to Teach Science. *Malaysian Online Journal of Educational Sciences*, 5(2), 91-106.
- Garrett, J. J. (2010). *The elements of user experience: user-centered design for the web and beyond*. Pearson Education.
- Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The internet and higher education*, 7(2), 95-105.
- Gherardi, S. (2009). Community of practice or practices of a community. *The Sage handbook of management learning, education, and development*, 514-530.
- Graham, C. R. (2006). Blended learning systems. *The handbook of blended learning: Global perspectives, local designs*, 1, 3-21.
- Graham, C. R. (2006). Blended learning systems. *The handbook of blended learning: Global perspectives, local designs*, 1, 3-21.

- Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The internet and higher education*, 18, 4-14.
- Hassenzahl, M. (2013). User experience and experience design. *The encyclopedia of human-computer interaction*, 2.
- Huilcapi-Collantes, C., Martín, A. H., & Ramos, J. P. H. (2019, October). A mobile app for developing visual literacy on in-service professors. In *Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality* (pp. 642-647).
- Kintu, M. J., Zhu, C., & Kagambe, E. (2017). Blended learning effectiveness: the relationship between student characteristics, design features and outcomes. *International Journal of Educational Technology in Higher Education*, 14(1), 1-20.
- Kintu, M. J., Zhu, C., & Kagambe, E. (2017). Blended learning effectiveness: the relationship between student characteristics, design features and outcomes. *International Journal of Educational Technology in Higher Education*, 14(1), 1-20.
- Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT press.
- Manson, N. J. (2006). Is operations research really research? *Orion*, 22(2), 155-180.
- Marinoni, G., Van't Land, H., & Jensen, T. (2020). The impact of Covid-19 on higher education around the world. *IAU Global Survey Report*.
- Moradi, S., & Abdi, S. (2021). Pandemic publication: correction and erratum in COVID-19 publications. *Scientometrics*, 126(2), 1849-1857.
- Neto, a. T., Schneider, f., & Bacich, I. (2017). Tecnologia no ensino de língua adicional: personalização e autonomia do aluno por meio de um modelo de ensino híbrido. *Revista cbtecle*, 1(1), 614-631.
- Okaz, A. A. (2015). Integrating blended learning in higher education. *Procedia-Social and Behavioral Sciences*, 186, 600-603.
- Oliveira, G., Grenha Teixeira, J., Torres, A., & Morais, C. (2021). An exploratory study on the emergency remote education experience of higher education students and professors during the COVID-19 pandemic. *British Journal of Educational Technology*.
- Passos, P. C. S. J. (2011). *Interad: uma metodologia para design de interface de materiais educacionais digitais*.
- Petronzi, R., & Petronzi, D. (2020). The Online and Campus (OaC) model as a sustainable blended approach to teaching and learning in higher education: A response to COVID-19. *Journal of Pedagogical Research*.
- Pillon, A. E., Techio, L. R., & Baldessar, M. J. (2020). O ensino híbrido (blended learning) como metodologia na educação atual: o caso de uma instituição de ensino superior do norte do estado de Santa Catarina. *Brazilian Journal of Development*, 6(6), 40731-40743.
- Rahiem, M. D. (2020). The emergency remote learning experience of university students in indonesia amidst the COVID-19 crisis. *International Journal of Learning, Teaching and Educational Research*, 19(6), 1-26.
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701.
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701.
- Ruhe, V., & Zumbo, B. D. (2008). *Evaluation in distance education and e-learning: The unfolding model*. Guilford Press.
- Ruhe, V., & Zumbo, B. D. (2008). *Evaluation in distance education and e-learning: The unfolding model*. Guilford Press.

- Salovaara-Hiltunen, M., Heikkinen, K., & Koivisto, J.-M. (2019). User experience and learning experience in a 4D virtual reality simulation game.
- Suartama, I. K., Setyosari, P., & Ulfa, S. (2019). Development of an Instructional Design Model for Mobile Blended Learning in Higher Education. *International Journal of Emerging Technologies in Learning*, 14(16).
- Thomas, I., Siew, L. Q., & Rutkowski, K. (2021). Synchronous telemedicine in allergy: lessons learned and transformation of care during the COVID-19 pandemic. *The Journal of Allergy and Clinical Immunology: In Practice*, 9(1), 170-176. e171.
- Tîrziu, A.-M., & Vrabie, C. (2015). Education 2.0: E-Learning Methods. *Procedia - Social and Behavioral Sciences*, 186, 376-380. doi: <https://doi.org/10.1016/j.sbspro.2015.04.213>
- UNESCO. (2020). Education: From disruption to recovery. Retrieved from <https://en.unesco.org/covid19/educationresponse>
- Ustun, A. B., & Tracey, M. W. (2019). An effective way of designing blended learning: A three phase design-based research approach. *Education and Information Technologies*, 1-24.
- Wei, H. C., & Chou, C. (2020). Online learning performance and satisfaction: do perceptions and readiness matter?. *Distance Education*, 41(1), 48-69.
- WHO (2020b). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020>
- WHO (2020a). Novel coronavirus – China. <https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/> Google ScholarTexto Integral @ b-on
- Yoo, M., & Jin, S. H. (2020). Development and evaluation of learning analytics dashboards to support online discussion activities. *Educational Technology & Society*, 23(2), 1-18.
- Zahidi, Z., Lim, Y. P., & Woods, P. C. (2014). Understanding the user experience (UX) factors that influence user satisfaction in digital culture heritage online collections for non-expert users. 2014 Science and Information Conference,
- Zydney, J. M., McKimmy, P., Lindberg, R., & Schmidt, M. (2019). Here or there instruction: Lessons learned in implementing innovative approaches to blended synchronous learning. *TechTrends*, 63(2), 123-132.

1 APPENDIX A: Professor's script

Age

Gender

Country in which do you teach?

Disciplinary area

Which platform / platforms do you use for online classes?

Investigative questions

How was the experience with e-learning teaching?

How did the covid pandemic impact the development of your classes?

What were the benefits found during the realization of the e-learning classes?

What were the challenges found in relation to e-learning classes?

What investments need to be made in relation to the use of e-learning classes?

How was the development of the e-learning structure in the institution you work in?

How was the process of adaptability of students with blended learning?

During the online class process. What are the feelings/emotions when using the platform?

How do you believe that the future of learning at universities will be related to the use of e-learning approaches (tools, recurrence of use, structure)?

2 APPENDIX A: Studente's script

Age

Gender

Country in which do you teach?

Disciplinary area

Which platform / platforms do you use for online classes?

Investigative questions

How was the experience with e-learning teaching?

How did the covid pandemic impact the development of your classes?

What were the benefits found during the realization of the e-learning classes?

What were the challenges found in relation to e-learning classes?

What investments need to be made in relation to the use of e-learning classes?

How was the development of the e-learning structure in the institution you work in?

How was the process of adaptability of students with blended learning?

During the online class process. What are the feelings/emotions when using the platform?

How do you believe that the future of learning at universities will be related to the use of e-learning approaches (tools, recurrence of use, structure)?

3 APPENDIX C: Inform consent

Consent was described at the time of recordings with the following script.

Hello, I am Júlia Pereira, and I am doing a master's Dissertation in UX Design for Blended Learning environments, by the master's in services engineering at the University of Porto and by the Institute of Systems and Computers Engineering, Technology and Science - INESC TEC, with supervision and guidance from Profs. Drs. Gabriela Beirão and Ana Torres.

My research search to understand how is been the online classroom experience by Professors and students in higher education after the COVID-19 pandemic and based on the data collected, design a framework for blended learning environments.

The objective of the research touches on two points, the first of which is the user experience, which, according to specialists, is to understand the feelings and functionalities of services/products when in contact with users. The second which is blended learning, which is a learning model which combines online learning with face-to-face learning. Do you still have doubts about these concepts and the research objective?

These interviews will be recorded to allow for their transcription and in-depth analysis. We will only start recording after your agreement, expressed through your consent.

The information collected is strictly confidential and will only be used in the context of this study. The results will be reported in aggregate, without identifying the interviewees individually. If during the study and the reporting of the results, it is relevant to quote an excerpt from the interview in a non-anonymous way, this will only be done after a request by the researchers and express written authorization by the interviewee.

Your participation in this study is voluntary, so you can stop it at any time. In that case, all the information collected so far will be unusable.

APPENDIX D: Table with papers

	Author	Title	Research	Methodology	Conclusion	Future Research Suggestion
1	Petronzi,2020	The Online and Campus (OaC) model as a sustainable blended approach to teaching and learning in higher education: A response to COVID-19	This article brings a search in the literature on blended learning in order to suggest an Oac model (Online and Campus)	Exploration of literature	The article shows the concepts about digital synchronous and digital asynchronous approaches. Concluded that literature needs to bring a clear association and connection between campuses, digital synchronous and digital asynchronous approaches.	The OaC model had positive feedback after implementation at Universities in the UK, but the authors cite the need for a study with empirical, quantitative and qualitative data for the validation of the model.
2	Adekola,2017	Development of an institutional framework to guide transitions into enhanced blended learning in higher education	Development a holistic framework to guide universities from the UK in transition for the blended learning from the experience of several authors	Semi-structured interviews with 20 participants Independently coded the survey and then put it on N-Vivo for analysis	A structure was developed to guide Universities, comprising four general themes: An overview of the actors that advance the movement towards enhanced blended learning (why), What institutions should realize for institutional to meet support needs (what), processes that facilitate blended learning (how) stakeholders who should be involved in the transition (who).	

3	<p>Bolliger,2019</p>	<p>Faculty members' perceptions of online program community and their efforts to sustain it</p>	<p>It investigates the perception of members of the academic community and the perception of online programs.</p>	<p>An online survey to understand the academic engineering community's perception of online programs</p> <p>The survey includes 13 Likert-type questions ranging from 1-strongly disagree to 5-strongly agree; five issues related to the program; five demographic issues; and three open questions</p>	<p>It was necessary to understand the community beyond the classroom, to have an inclusive experience</p> <p>They identified some actors' lack of interest in maintaining programs online</p>	<p>In a new research in this line, it would be necessary to review the reward system</p>
4	<p>Rahiem,2020</p>	<p>The Emergency Remote Learning Experience of University Students in Indonesia amidst the COVID-19 Crisis</p>	<p>The research aimed to study and interpret the educational experiences of students in Indonesia before the covid-19. And addresses the differences between blended learning, emergency learning and conventional learning.</p> <p>The Question of this research is ": how university students experienced emergency remote learning due to the COVID-19 crisis? "</p>	<p>Method Qualitative</p> <p>Approach phenomenological (this approach collect the experience lived for this students)</p> <p>Involving 80 students from the Social Science Education Program at a public university in Jakarta.</p> <p>Used the NVivo program for data management and analysis.</p>	<p>The study concluded that during the first phase of covid-19 the students in the research used the emergency learning strategies and concepts and technical from conventional learning, blended learning, and e-learning. This experience had positive and negative ways.</p>	<p>By the researcher should begin new studies to understand viewpoints by parents and other levels of education</p>

5	Suartama,(2019)	Development of an Instructional Design Model for Mobile Blended Learning in Higher Education	The purpose of the study is to develop a blended learning design that can systematically guide the instructor or lecturer in the lecturing processes at the University.	<p>Used the methodology Design Research</p> <p>Utilized the blended mobile learning design a methodology approved and used by Moodle.</p> <p>Procedures :</p> <ol style="list-style-type: none"> 1. Pre-analysis 2. Designing activities and resource 3. Designing learning assessment <p>For validation used the likert scale</p>	<p>The evaluation regarding the design of this platform was very favorable. The authors were also able to realize these advantages:</p> <ol style="list-style-type: none"> 1. Be able to choose from several available learning activity formats, for example, weekly format, topic format and social formats 2. Flexibility in determining learning activities, for example, community, newspapers, questionnaires, and chat 3. All students in the forum, diaries, questionnaires and assignments can be viewed on a page (and can be downloaded as a spreadsheet file) 4. Able to display various user activities. 	
6	Collantes,2019	A mobile app for developing visual literacy on in-service teachers.	Development of a mobile app that conducts teacher training in a blended environment	The visual part of the application was developed using the user-centered design methodology	It was possible to create an application that would enable teachers to have a better understanding.	It is essential to do a pedagogical usability assessment and an assessment of the Visual app user interface

7	Graham, 2013	A framework for institutional adoption and implementation of blended learning in higher education	The research investigates six cases of institutional adoption of blended learning to examine the main issues that can guide university administrators interested in the use of this type of teaching	Used case study methodology at 6 University of Hawaii Semi-structured telephone interviews. The survey results were organized into three broad categories: strategy, structure and support.	The 6 Universities are in different stages of implementing blended learning. They considered BL as a way to address the challenges of growth, cost or flexibility."	-----
8	Chou, 2020	Online learning performance and satisfaction: do perceptions and readiness matter?	It proposes a comprehensive structural model for determining whether perceptions of online learning and readiness for online learning affect students' online learning performance and satisfaction with the online course.	Survey with 356 students Structural equation modelling to investigate the relationships between online learning perceptions, online course performance and course satisfaction, testing the mediating effect of five readiness factors for online learning.	Analyzes indicate that students who received the course by videoconference had lower final grades and were less satisfied with the course and the instructor than students who received the course simultaneously through resident instruction, even after controlling the effects of the instructor and the campus.	Structural equation modeling analyzes indicated that computer / Internet self-efficacy and student motivation for learning had a direct and positive effect on their online discussion score and course satisfaction. The self-efficacy of students' computer / Internet readiness for online learning had a good effect not only on perceptions of online learning and online discussion scores, but also on perceptions of online learning and course satisfaction.

9	Mugenyi, 2017	<p>Blended learning effectiveness: the relationship between student characteristics, design features and outcomes</p>	<p>The objective of the research is to determine which are the factors of the best experience of blended learning. Taking characteristics as design research and experience of the students</p>	<p>-Design Research - Conducted an experiment face to face of students with the Moodle platform -Used the self-developed instruments - Descriptive statistics was conducted.</p>	<p>None of the independent variants were diagnosed as important for student performance. From the research it was identified that students manifest high potential to take on blended learning, more especially with regard to the student self-regulation displayed. It is noticed that the characteristics of the student and the design of the platform are fundamental characteristics for successful learning.</p>	<p>As the independent variants were not identified as determinants, the author suggested that further research on this topic be carried out to better understand this gap.</p>
10	Ustun, 2019	<p>An effective way of designing blended learning: A three phase design-based research approach</p>	<p>The aim of this design-based research study is to determine what elements are necessary for an inexperienced teacher to design classes in Blended learning. And document the instructor's insights into the achievements of his first classes.</p>	<p>Method qualitative and quantitative Redesign of the course Interviews with students and Professors A validated survey instrument using a Likert type Scale with 5 choices</p>	<p>Blackboard Learn (Learning Management System) and Google Documents were two beneficial learning resources for creating the desired BL environment. The instructor's perception was positive in the realization of this teaching design. The program was designed in 3 cycles for the best efficiency and effectiveness of the project</p>	

Managing the uncertainty: How higher-education organizations will adopt a blended learning after COVID-19.

1 1	Salovaara-Hiltunen,2019	User experience and learning experience in a 4D virtual reality simulation game	The main objective of this article was to explore the user experience of health professionals who were learning through a 4D simulation game.	- 13 interviews were applied and were analyzed by applying a deductive content analysis -- Research Design -Interviews followed the multidimensional framework for evaluation of adaptive educational games.	-the conclusions of this study encourage further research and development of this promising method.	
1 2	Bouilheres,2019	Defining student learning experience through blended learning	The aims of the paper is to identify the benefits of blended learning and the learning experience at a Campus of Australian localized in Vietnam.	-Involved the collection of quantitative data from 61 students, which utilises survey methodology. - The research used scale likert to analyze	the study shows that students and teachers, and content, have been beneficially impacted by the move to blended learning.	Suggest deeper studies to identify the suitability of each individual / material when interacted with blended learning
1 3	Tinggui Chen,2020	The Impact of the COVID-19 Pandemic on User Experience with Online Education Platforms in China	Builds a reasonable rating index system by obtaining user ratings on seven major education platforms before and after the COVID-19 outbreak. Article explores the support skills and response levels of online education platforms during COVID-19, and proposes corresponding measures to improve the functioning of these platforms.	It combines emotional, hot mining technology, and literary review. The variation coefficient method Comprehensive evaluation method to analyze the post covid user experience	They detected that mainly these areas needed to improve in order to have a better UX: Improved service support improved interactive communication between the parties Ease of use optimization Carrying out activities continuously	

1 4	Chen,2020	Analysis of User Satisfaction with Online Education Platforms in China during the COVID-19 Pandemic	Investigates user satisfaction (students) on online education platforms in China post COVID-19 and the creation of a surprise propagation neural network (BP) model to predict user satisfaction.	<p>Uses survey by and a web crawler to collect user experience data online and offline, builds a customer satisfaction index system by analyzing emotion and existing literature for quantitative analysis.</p> <p>creates a model of neural network of propagation of surprise (BP) to predict user satisfaction.</p>	<p>Personal factors of users have no direct influence on user satisfaction, while the availability of the platform has a greater influence on user satisfaction.</p> <p>I suggested to improve the online education platform: The bidirectional interaction of teaching should be improved; problems related to technological structure need to be improved.</p>	<p>-Carry out the same research but with other components (teachers)</p> <p>-The design of the questionnaire and the prediction of the structural equation algorithm need to be improved.</p>
1 5	Rasheed Kamsin Abdulllah,2020	Challenges in the online component of blended learning: A systematic review	<p>The research carried out a systematic in the literature to discover the main challenges in online component blended learning by Professors, students, and Organizations</p> <p>They listed three research question: (1)- 'What are the challenges that students face in the online component of blended learning?', (2) - 'What are the challenges that teachers face in the online component of blended learning?' and (3) - 'What are the challenges that educational institutions face in the online component of blended learning?'</p>	<p>A systematic review of literature</p> <p>Web of Science (WoS) electronic database.</p> <p>Inclusion and exclusion criteria were used in the selected articles.</p> <p>Kitchenham's systematic literature review methodology in order to identify the reported challenges in the online component of blended learning</p>	<p>They realized that students suffer mainly from self-regulatory challenges and inability to effectively use technology to study; The Professors is their unwillingness and negative perception of the use of technology for teaching;</p> <p>The Institutions the mains challenges are the difficulty in providing a good sufficient technological infrastructure and training for Professors on the use of technology.</p>	<p>This research is support for other research on the topic</p>

Managing the uncertainty: How higher-education organizations will adopt a blended learning after COVID-19.

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