Teaching during the Pandemic: An Exploratory Study in Portuguese and Brazilian Secondary Education Teachers

Sara Dias-Trindade, Susana Henriques, and Joana Duarte Correia

Abstract—The present study takes as a starting point the COVID-19 lockdown to which Portuguese and Brazilian schools were confined during 2020, to trace the scenario regarding the training needs of secondary education teachers in terms of digital skills. The research questions seek, firstly, to understand how the transition from face-to-face environments to digital environments was carried out in those countries and, secondly, to assess how to improve digital skills in education when considering a post-pandemic future. The results, obtained from responses by 300 teachers to a questionnaire survey, are in line with the conclusions of the intense research that has been conducted in this area: the COVID-19 pandemic has made teachers' digital training more urgent, and has highlighted the importance of integrating digital environments in education, both as a strategy for the continuity and sustainability of education itself, and as a fluid space that allows the development of practices that enhance quality learning. The analysis also allows us to perceive the differences and similarities in terms of education between two countries that share the same language and have historical proximity, but different socioeconomic indices.

Index Terms—Improving classroom teaching, media in education, pedagogical issues, Secondary education, teacher professional development.

I. INTRODUCTION

During March 2020, day after day, schools all over the world closed their physical doors. Portugal and Brazil were among the countries that did so, first as an option, but soon after the governments of both countries assumed that keeping schools open would contribute to an even greater spread of the disease.

Brazil and Portugal have been partners in the educational and professional sphere since times of colonization (the colonization of Brazil began in 1500, with the arrival of the Portuguese in the territory, and continued until 1822, when the country gained its independence). However, even when Brazil was established as an independent nation, the strong relations between these two countries that share the same language and have historical proximity continued. The

Sara Dias-Trindade is with Centre for Interdisciplinary Studies (CEIS20) and the Department of History, Political and International Studies of the Faculty of Arts of the University of Porto, Portugal (e-mail: sdtrindade@letras.up.pt).

Susana Henriques is with Iscte - Instituto Universitário de Lisboa / Centro de Investigação e Estudos de Sociologia (CIES - Iscte) and Universidade Aberta (UAb), Portugal (e-mail: Susana.Henriques@uab.pt).

Joana Duarte Correia is with Iscte - Instituto Universitário de Lisboa / Centro de Investigação e Estudos de Sociologia (CIES - Iscte) and Iscte Soft Skills Lab, Portugal (e-mail: Joana_Telma_Correia@iscte-iul.pt).

opportunity to compare culturally close educational contexts was enhanced by the variety of bilateral and multilateral agreements that have strengthened the cultural and scientific relationship between Brazil and Portugal, in an effort to unite Portuguese-speaking countries. This context and proximity make studies that allow for deepening differences and similarities in Education interesting from a critical comparative educational perspective. It is made all the more interesting to do so against the backdrop of the crisis triggered by the emergence of the COVID-19 pandemic.

According to UNICEF data from March 2021, over the eleven months of the pandemic (between March 2020 and February 2021), "schools have been fully closed for an average of 95 instruction days globally, which represents approximately half the time intended for classroom instruction" [1] (p. 2). Brazil was among the most affected countries, recording the fifth-highest number of days (191) on which schools were physically closed and ranking first in terms of the number of students (44.3 million) who have missed at least three-quarters or almost all classroom instruction time since March 2020. In Portugal, the situation was not as serious, with schools being physically closed for only 34 days throughout the period analysed by UNICEF, well below the world average of 95 days [1].

The effect of the COVID-19 pandemic has been unprecedented in that teaching and learning activities have had to be significantly altered under the circumstances. Although the foundations for different pedagogical strategies were being worked out and debated long before the pandemic, the virus forced the accelerated adoption of new (and, for some, unknown) models on a massive scale. Recent research has focused on these issues [2]-[5].

This exploratory study contributes toward documenting the impacts of the pandemic crisis in Portuguese and Brazilian schools from the teachers' perspective. Assessment of the research questions primarily seeks to understand how the transition from face-to-face environments to digital environments was carried out in both Portugal and Brazil at the beginning of the physical closure period of schools. With a post-pandemic future in mind, it also seeks to assess how to improve digital skills in education and takes into account the experience gained during this period which has led to a new awareness of the need for adequate and structured training in this field, where digital environments and resources are used to enhance genuinely sustainable educational processes.

II. DIGITAL LITERACY AND DIGITAL COMPETENCES: BEYOND DEFINITIONS

In this era where it is difficult to distinguish between

online and offline environments [6], the digital is positioned as the dominant aspect of literacy [7], given that being digitally competent depends more on a combination of knowledge, skills and attitudes than on access to technologies and knowing how to use them [8] [9]. In the context of ICT (Information and Communications Technology) and communication, being digitally literate means being able to go beyond ICT as a tool. It involves being able to understand the technology, its functioning and purpose, to use it effectively and efficiently to achieve the intended purposes. Arriving at a single definition of digital literacy is challenging because of the constantly evolving technological, cultural, and social landscapes that redefine what, when, how, and why digital technologies are used in personal and professional activities [10].

As with its root concept, literacy, there is no clear-cut definition of digital literacy or what makes it up, although similar typologies and definitions for the term exist. Even geographically, the term for the concept differs: in English-speaking countries we speak of literacy, while in Brazil one refers to "letramento" or "alfabetização" and in Spain, "alfabetización". Some studies combine the concepts of digital literacy, media literacy, information literacy and computer literacy, while others use 'digital literacy' broadly to cover these and all other technological literacies. Some authors, such as [11], trace the evolution of the concept over time, while others such as [12] compile frameworks of the different concepts and applications. Classifications such as those by [13]-[15] already point to the rapidly changing nature of the concept. There is a clear divide between authors who understand digital literacy as being associated with technical skills and those who emphasize cognitive and socio-emotional aspects in digital environments, as well as conceptual and operational definitions [16].

The concept is ultimately understood by most as the ability to navigate and adapt to a changing digital environment. This includes the ability to continue learning throughout life and points generally to the basic skills needed to use digital technology [17]. Aligned with the concept of digital literacy is the increasing attention given to information literacy and media literacy, because the ability to search, select, and work with the most credible sources information is seen as a requirement and an essential skill in a globalized and mediatized digital society. Definitions of digital literacy thus tend to highlight aspects such as perception, skills, motivation and critical thinking required to operate in information-rich digital environments for different purposes.

However, models, recommendations, and major policy interventions increasingly use the term digital competences rather than digital literacy. As early as 2008, [18] noted that in moving from literacy to competence "we take on board the crucial importance of situational embedding. Digital literacy must involve the successful use of digital competence within life situations" [18] (p. 169).

Ala-Mukta [9], in turn, even proposes a model based on three major areas that cover knowledge, skills and attitudes in digital competence: "instrumental skills and knowledges", a block that covers the skills needed to use digital tools; "advanced skills and knowledge", which covers the three main areas present in the use of digital environments (media

application, strategy and personal goals); "attitudes for skills and knowledge application", a level that refers to ways of thinking and motivations to act.

Many studies break down digital literacy into a set of elements, some of which are more complex than others. The MediaSmarts study [19] identifies four levels of digital literacy: first, access to digital technologies; second, the ability to use these technologies; third, understanding how they work; and, fourth, creating digital applications and innovations. Hinrichsen and Coombs [20] identify five essential components of digital literacy: the ability to use digital technologies, decode information, make meaning from information, analyze it, and finally manage one's digital identity. The European Union's digital competency framework focuses on five broad areas whose specific skill sets can be continually redefined: information, communication, security, problem solving, and content creation [21]. Belshaw [22] has a model of digital literacy that is also very broad with eight elements: cultural, cognitive, constructive, communicative, confidence, creativity, critical sense, and civic. Von Hamel [23] sees digital literacy as encompassing three major capabilities: using digital media, understanding them, and creating from them (this three-level view has been used at the policy level in Canada, the US, Australia, and Britain).

For this exploratory work, aggregate definitions such as the one presented by [22] are valid, since she states that in ICT use and digital media scenarios, we are in the presence of a set "of knowledge, skills, attitudes, abilities, strategies and awareness" that is required "to perform tasks; solve problems; communicate; manage information; behave in an ethical and responsible way; collaborate; create and share content and knowledge for work, leisure, participation, learning, socialising, empowerment and consumerism" [24] (p. 84).

III. DIGITAL COMPETENCE IN LEARNING ENVIRONMENTS: THE CASES OF PORTUGAL AND BRAZIL

According to [25], competences encompass very varied constructs, which go well beyond knowledge or skills, and imply the ability to accomplish complex tasks by mobilizing and articulating psychosocial resources to achieve the desired goals. In this sense, it is not uncommon to find the definition of this concept, particularly about competence for the use of digital media, in references or documents related to educational environments, since it is often associated with the need to develop skills in general (and digital ones in particular) starting at school in the early stages of training at a young age, and necessarily continuing into older age groups. In fact, the concept of "competence" is constantly evolving. It is subject to different definitions depending on the objectives or interests of the writer or the fields with which it is associated, and these also evolve as the society in which we find ourselves develops.

In the field of education, where different skills must necessarily start being developed, competences can be understood as "complex combinations of knowledge, skills and attitudes that enable effective human action in diverse contexts. They are of diverse nature: cognitive, metacognitive, social and emotional, physical and practical"

[26] (p. 5). Currently, with all the demands of a global, fast-paced world, where the transition between analogue and digital is a constant, it is also necessary for this concept to integrate the capacity for a critical and enlightened use of various digital technological resources in different educational environments.

It is therefore important to understand the different dimensions within teacher digital competence to identify how, when and for what purpose different digital resources can be used to enhance the educational process. Such adaptability takes on particular importance when recognizing the need to keep abreast of change. Knowing one's digital competences and being able to make effective use of digital tools for social participation, working together involving communication, critical thinking, and problem-solving skills [27], [28], is an early stage in the evolutionary process of what it means to be digitally competent. This stage, of digital literacy, of knowing what to do with what resources to achieve goals, can evolve towards achieving digital fluency, that is, mastering a whole set of other skills, such as the ability to go beyond critical thinking to create new knowledge and face new challenges [29]-[31].

Dias-Trindade and Ferreira [31] also argue that digital teacher competences refer to "the ability to work in digital environments, associating the pedagogical component with the technological and digital component" and that this same digital competence "should materialize in the ability to mobilize knowledge and attitudes for an effective use of digital technology in a professional context" (p. 169). In line with this idea, [32] warns about the need to consider digital competence in the creation of quality educational environments, from the perspective of inclusion of all, so that the digital can assist in the development of teaching and learning practices and a whole educational ecosystem of high quality.

Digital competence in educators embodies the merging of the ability to work and the educators' ability to use their digital competence to facilitate and develop learners' experiences. To develop these competences, therefore, educators need to be critical, especially when it comes to discerning the use that can be made of the different digital technologies and the resources to which they provide access [33]-[35]; they need to possess the creativity and confidence to use different digital technologies to achieve the desired goals in respect of employment, education, leisure, inclusion and engagement in society [34]. In light of the evolving digital technologies, educators may find it too complex to keep up with them, and even more so to know how to add their potential to the educational process.

In this sense, understanding digital competences directs us to focus on the acquisition of digital competences by ability, because this process enables the development of a framework of domains that teachers must acquire in order to integrate and use technology correctly and meaningfully for the teaching and learning process [36], as a way to develop better learning models in the digital environment and make student teaching effective, whether in a hybrid or fully online environment.

As a result, it becomes central to the understanding that while technology has the potential to boost student development, it is only a tool used by the teacher to integrate and innovate teaching [37], leading us to believe does not happen by itself and still relies on the figure of the teacher to mediate the activities with the student.

To enable the development of these competences, it is essential to promote a digital culture in schools, which depends not only on public policies, but also on the school's objectives regarding digital technologies, the engagement of school management and the teaching staff.

However, although the insertion and democratization of technologies in education have become the subject of educational policies, programs, and projects, the analysis of the effects and impacts of the pedagogical use of technologies in schools shows that the use of technologies, in many cases, is limited to specific activities.

Given all the technological advancement, its impact on the educational sector and the need for teachers to have the appropriate skills to make the teaching and learning process effective for the student, it is essential to provide support to teachers to enable them to acquire digital skills so that the use of technologies is not limited to specific activities, without effective curriculum integration [38].

OECD [39] identified the COVID-19 lockdown as an opportunity to change the predominant trend of teaching based on exposure and learning that involved the passive reception of knowledge, which neglects ways to interact, question, and experiment. Thus, it is an opportunity for experimentation and the development of new models of education and new ways to make the most of face-to-face learning time. Specifically, it empowered teachers to make the most of digital advancement, yet also provided edtech companies with the chance to attempt to monetize learning platforms on an international scale.

In both the Brazilian and Portuguese cases, the entire educational system was driven to profound changes in how the expected education was provided. The process of management and implementation of educational projects required the concerted effort of all actors to find appropriate solutions consistent with their institutional characteristics, expectations and the potential of its academic community that were in compliance with regulatory and health restrictions. Faced with the need to transition education to a completely digital format in 2020 exposed the weaknesses of relatively older teachers in the teaching population, whose initial training had provided them with little or no pedagogical preparation in the use of technologies (still less digital technologies). These weaknesses were evident even though throughout their career they had undergone some training and, because they recognized the value of technology, had been trying to understand how it could be integrated into their teaching practice [40].

In Portugal, the centralization of basic education by the Ministry of Education led to the decision to close all schools in the country on March 16, 2020, and, following that decision, to prepare a set of guidelines and training in digital environments so that teachers could transition to a fully digital format, while monitoring all students who did not have access to digital devices or internet at home [41]. The Portuguese Ministry of Education created at short notice a support website, guides, and roadmaps for schools to

reorganize themselves during their period of physical closure, while trying to ascertain the students' (technological and social) support needs. A partnership was also established with the Portuguese Open University for the preparation and implementation of teacher training in digital technologies.

In Brazil, due to the decentralization of education policies and the necessary articulation between Federal and State powers, guidelines were issued by the central government, but, in some cases, subject to definition or approval at state level. On March 17, 2020, the Implementing Order [Portaria] No. 343 of the Brazilian Ministry of Education "provide[d] for the replacement of classroom classes by classes in digital media while the situation of the New Coronavirus pandemic - COVID-19 lasts", which was followed by the publication of reports by the State Governments, on whom rested the responsibility for presenting initiatives directed to the replacement of classroom classes by remote classes or the adoption of distance education modality [42]. In this sense, the State Education Councils, and several Municipal Education Councils "issued resolutions and/or guidance opinions for educational institutions belonging to their respective systems on the reorganization of the school calendar and use of non-contact activities" (BRASIL, Report 5/2020 of the National Education Council, partially homologated on 29 May 2020).

In fact, the decentralization of the Brazilian education system has contributed to a greater difficulty in the organization of the educational system in each of the States, a situation aggravated by disparities at the level of access to digital content by students, as noted by [43], when referring "the heterogeneity and complexity of educational circumstances in Brazil that range from students in serious situations of social vulnerability to precarious teacher training and professionalization for the development of pedagogical practices without the physical presence of students and teachers in the conventional school space" (p. 82).

However, the problem of internet access will naturally have to go through government strategies to be overcome. In the Portuguese case, the Government has accelerated the process of digitalization of schools, seeking to provide all students and teachers with computers and internet connections and, at the same time, prioritising on the development of teachers' digital competences, necessary for teaching and learning in this new digital context, through the "Plan for Digital Training of Teachers", included in the "Action Plan for Digital Transition" (PORTUGAL, Resolution of the Council of Ministers No. 30/2020, Series I, April 21).

Despite that, to promote sustainable digital educational environments that promote learning and overcome the emergency needs such as the one the world was going through at the time, it was necessary to go beyond technological support and provide both teachers and students with digital skills that enable them to go beyond a transposition from face-to-face environments to digital environments in the different educational processes. Taking the example of another European country, Croatia, [44] state that, although since 2015 schools have implemented the *e-skole project*, this abrupt transition to remote learning has completely changed the scenarios (which have moved from classrooms to students and teachers' homes) and therefore it was necessary to implement a set of strategies so that no student would stop being connected to their teachers. However, in addition to this, it was also considered essential for teachers to have access to equipment and the necessary training, pedagogical guidelines, and acquisition of new skills.

As mentioned in another UNICEF report, it is necessary to think of strategies that go beyond this pandemic and that can produce sustainable results in the medium and long term. Among these strategies, UNICEF recognizes the importance of a change in teacher training, explaining that "it will be useful both in times of normality and crisis to build teachers' capacity to manage a remote 'virtual' classroom, improve their presentation techniques, train them to tailor follow-up sessions with caregivers and blend technology effectively into their lessons. Many teachers will be able to build on the knowledge and expertise they have swiftly acquired in response to this crisis" [45] (p. 6).

The 2018 PISA studies presented in the work of [46] show that there is still a long way to go regarding teacher digital competence. In the Portuguese case, the results indicate that, on average, students estimate that only just over 60% of teachers have the technical and pedagogical skills necessary to integrate the digital component into educational processes, whereas in Brazil this percentage drops to around 50%.

This study follows the results of other work in the area of digital skills [47], conducted in both Portugal [48] and Brazil [49], which show that teachers' digital skills are at average levels (B1/Integrator – level 3 of a scale with 6 levels), demonstrating that, although they already use digital technologies in different contexts and integrate them into their educational practices, they still need to understand how to capitalize their use to truly enhance the educational process. The understanding of the different areas that make up the teaching digital competences is of particular importance today. In fact, digital competence is built on an evolutionary path between digital literacy and digital fluency that varies depending on the areas of use of the digital (independent work, teaching and learning, assessment, communication or empowerment of students) and is configured in the ability to master basic knowledge and sometimes limiting the ability to work in digital educational environments or, more advanced and close to fluency, when teachers "feel capable and confident in distinguishing which are the best digital tools or strategies to use, at different times and, above all, how to make use of them to better achieve their goals" [31] (p. 183).

IV. MATERIALS AND METHODS

A. *Research Model and Procedure*

For this research we follow an experimental model based on quantitative data to set up an extensive study [50], [51].

The data presented and analyzed in this article result from the application of a questionnaire designed in the months of March and April 2020, the beginning of the critical period of the global pandemic resulting from the spread of COVID-19.

Disseminated and applied online, through social networks in groups of Brazilian and Portuguese teachers, the sample was non representative. The questionnaire is composed of 15 questions (plus three questions regarding the description of the participants), of which 9 were used in this study as they reflect the dimensions that were intended to be analyzed:

(a) Transition process (4 questions),
(b) Digital divide (5 questions).

Between May and August 2020, 300 responses were received from Higher Education instructors and Secondary Education teachers. In this article, the data to be worked on refers only to Secondary Education. Thus, out of a universe of 231 valid responses, 92 were from Brazilian teachers (39.8%) and 139 from Portuguese teachers (60.2%).

Neither age nor gender were asked of participants, as other studies related to education and digital competences indicate that there are several factors that affect the level of teaching digital competence and that motivation and training are more relevant than age, gender, or even basic scientific area, according to [48] and [52].

The research project on which the present article is based, even though it was not submitted to the appreciation of an ethics committee, it did follow the ethical guidelines contained in the Ethical Charter published by the Portuguese Society of Educational Sciences [53]. Throughout the investigative process, the authors maintained high levels of vigilance and self-reflexivity regarding ethical issues, as advocated by [54].

V. Results and Discussion

The purpose of this exploratory study was twofold: 1) to understand how the transition was carried out from face-to-face to digital environments, in both Portuguese and Brazilian schools; 2) to understand how to improve digital skills in education for a post-pandemic future. In this paper we follow these two for presenting data analysis and results discussion.

A. The Transition Process

One of the main concerns regarding the emergency remote teaching was the digital platforms used. "An online 'platform' is a programmable digital architecture designed to organize interactions between users – not just end users but also corporate entities and public bodies. It is geared toward the systematic collection, algorithmic processing, circulation, and monetization of user data." [55] (p. 4). Such platforms have been provided by global and local technology companies for both private and public schools [55].

Table I shows a difference between the one that stands out the most in Portugal – Microsoft Teams, 67% – and in Brazil – Google Classroom, 50.4%.

Although digital platforms tend to be deeply embedded in education it is an issue that requires some attention as, on one hand it is important to avoid focusing exclusively on major edtech players, such as Microsoft and Google [4]. On the other hand, those actors in the edtech industry tend to be the most present at the initial phase of emergency remote teaching. There was an active marketing strategy for these products with teachers, transforming the crisis scenario into a

business opportunity [56].

TABLE I: Digital Platforms Used

Digital Platforms	Portugal		Brazil	
	N	%	N	%
Microsoft Teams	62	67.4	56	40.3
Google Classroom	24	26.1	70	50.4
Moodle	12	13.0	21	15.1
Zoom	12	13.0	56	40.3
Other	24	26.2	53	38.0

TABLE II: Types of Classes

Your lessons included:	Brazil		Portugal	
	N	%	N	%
Regular follow-up via email or other mechanisms	35	38	87	62.6
Investment in formative assessment	30	32.6	98	70.5
More asynchronous than synchronous moments	36	39.1	68	48.9
More synchronous than asynchronous moments	35	38	59	42.2
Asynchronous time only	3	3.3	0	0
Synchronous time only	7	7.6	2	1.4
Other	4	4.4	10	7.2
Kindergarten classes synchronous every day for 50 minutes	1	1.1		
Sending and giving feedback on activities	1	1.1		
Initially, there was a tendency for the school to insist on synchronous activities	1	1.1		
The student carried out practical work	1	1.1		
50% synchronous and 50% asynchronous, by decision of the school			6	4.3
Stimulation of autonomous work, observation, and research			1	0.7
Increased written feedback			1	0.7
Teaching new content			1	0.7
Activities from Educational Publishers websites (Aula Digital and Escola Virtual)			1	0.7

The educational use of platforms "is at risk of becoming fetishized as a catch-all term encompasses all initiatives and efforts undertaken to make education (broadly conceived) 'more digital' [4] (p. 4). Nevertheless, platforms allow new organizational forms in learning and teaching processes [57].

For that purpose, a pedagogical embeddedness of digital platforms is required, which is why we asked teachers about the types of classes they delivered during the first lock down period because, as [58] point out, before the pandemic the main source of information was school. With the lockdown, digital education has changed the channels of communication, extending to television, phones, tablets, and a variety of learning management systems (LMS) the possibility of sharing and disseminating knowledge.

Results show some similarities and differences between Portugal and Brazil (see Table II). In both countries there were synchronous and asynchronous moments which are consistent with the functionalities of the digital platforms that teachers used the most (Table I). More than 70% of Portuguese teachers claim their investment in formative assessment while 38% of Brazilian teachers claim they provide regular follow-up to their students via e-mail or other means.

These activities are consistent with other findings, namely of [59] or [60]. Evidence suggested that most teachers struggled to develop different approaches to teaching and learning using digital technologies. König, Jäger-Biela and Glutsch [59], in their research, found that most teachers introduced new content, along with assigning different tasks for students to work on their own. These results stress the importance of integrating curriculum, digital technologies and pedagogical strategies for which teachers need more competences, so they are better prepared for the digitalization of education. In fact, recent data provided by [61] has shown great disparities between countries (and even inside some of them), not only regarding access to technology, but especially in teachers' ability to use digital technologies in a pedagogically effective way.

B. The Digital Divide

Training aims to develop teacher competences, understood as "context-specific, cognitive performance dispositions that are functionally responsive to situations and demands in certain domains" [62] (p. 599). Most teachers in both Portugal and Brazil had already had training in digital environments (Table III). The percentage of respondents who did not have any training is larger among Brazilian teachers (49%) in comparison with Portuguese ones (33%).

TABLE III: TEACHER TRAINING IN DIGITAL ENVIRONMENTS BEFORE COVID19

Did you already have training or experience in digital environments?	Brazil		Portugal	
	N	%	N	%
Yes	47	51.1	93	66.9
No	45	48.9	46	33.1

Regarding teacher preparation, it is noteworthy that the TALIS study [63] already showed that only 39% of educators felt well or very well prepared to use digital technologies in their daily work, with significant differences between countries. Teachers' needs for training comprise different main areas: education enhanced by technologies; teaching in multicultural/multilingual environments; working with students with special educational needs [63].

Notwithstanding the fact that most teachers have previous training in digital environments, they sought to do additional training on digital education during the first period of schools' closure. As we can see in Table IV, almost 80% of Portuguese teachers and nearly 70% of Brazilian teachers claim to have pursued specific training to improve their competences in digital education.

TABLE IV: TEACHER TRAINING IN DIGITAL ENVIRONMENTS DURING COVID-19

Did you seek to do any kind of training during this period to feel more comfortable in this period of Digital Education?	Brazil		Portugal	
	N	%	N	%
Yes	64	69.6	111	79.9
No	28	30.4	28	20.1

Evidence from international studies suggests that those teachers who were already using digital technologies intertwined with the school curriculum were more secure and more competent in dealing with emergency remote teaching [39], [64]-[66]. At the same time, students also benefitted from this integration as they had opportunities to use innovative tools and strategies for creative learning in project-based and other problem-solving exercises, as stated by [59] and [67]. Our results (Table 5) are consistent with those their findings. More than 80% of teachers who responded to our questionnaire, in both Portugal and Brazil, recognize the importance of learning by doing. That is, they felt more competent to work in digital education after this emergency period, due to the training completed, the experience acquired, and the collaboration established.

TABLE V: TEACHER'S PERCEPTION OF DIGITAL COMPETENCES AFTER COVID19

Do you feel that, after the work developed in this period, you are better able to work in digital educational environments?	Brazil		Portugal	
	N	%	N	%
Yes	77	83.7	125	89.9
No	15	16.3	14	10.1

Research desiderata on transition to digital education tends to have two main dimensions. On one hand, teachers strive to upgrade competences, to innovate strategies and to develop professionally. On the other hand, as mentioned by [59], [68] and [69], the digital divide is becoming more visible as a portion of teachers and students do not possess the basic skills for constructivist communication and interaction. Sometimes the intensive use of mobile devices and social networks creates an illusory sense of ability that does not quite match with competence in digital education. The pandemic crisis highlighted the need to focus research and discussion on digital literacy, digital skills, and digital fluency.

Our results (Table VI) are consistent with this idea as teachers focus on pedagogical issues and the pedagogical relationship while technical issues have a residual presence in both countries (less than 8%). There are some differences between Portugal and Brazil, though. The main problems pointed out by teachers in Portugal were "Too much work and/or lack of time" (over 28%) and the "Pedagogical monitoring of students" (nearly 11%) whereas in Brazil it

was pedagogical; "Distance from students" and "Inexperience in working in digital environments…" (nearly 19%) and "Preparation of materials" (nearly 9%).

TABLE VI: Main Problems Encountered During Covid19

	Brazil (N=92)	Portugal (N=139)
Pedagogical monitoring of students	6.5	9.4
Students without access	4.4	2.9
Reconciling work and family life	4.4	4.3
Reaching all students/accompanying students with different needs	3.3	5.8
Too much work and/or lack of time	6.5	28.1
Distance from students (at a pedagogical level)	18.5	10.8
Physical/affective distance	3.3	7.2
Lack of support or organization from the school	8.7	4.3
Inability to carry out practical or laboratory lessons	1.1	0.7
Inexperience in working in digital environments, difficulty in initial adaptation	18.5	4.3
Students' motivation	3.3	5
Other	3.3	2.2
Preparation of materials	8.7	2.9
Technical problems	5.4	7.9
Complaints from students and/or parents	1.1	0.7
No problems	3.3	3.6

It is important to stress that these difficulties are interwoven with the need for digital skills development, as [70] also concluded in their study carried out during this pandemic with pre-service teachers. Empirical research on emergency remote teaching suggests that using digital technologies without an adequate pedagogical strategy results in poor gains, if any, in collaborative and constructivist learning, in efficiency, productivity, involvement or psychological well-being, whether for teachers or for students [59], [68] and [71]. These are challenges that the new ecosystem brings to education and teachers' training for living, working and studying in the digital age [24]. Oliveira, Silva and Silva [72], in their study's conclusions, point out that those technologies are not enough to promote production of knowledge; furthermore, that it is necessary to reconfigure pedagogical practices to enhance interaction between the actors involved in the teaching and learning process.

For our respondents, presence is essential, as they show concern about "Distance from students (at a pedagogical level)" and "Physical/affective distance" (see Table 6). These results are consistent with other studies. Santana and Sales

[43] argue that physical and social distance has moved education to remote contexts without considering pedagogical foundations of theory and research, hence resulting in less effective practices regarding the quality of the teaching and learning process. König, Jäger-Biela and Glutsch [59] also indicates that while "teachers were concerned about enabling students to access a substantial part of the school year's curriculum content from home, the introduction of (new) learning content to stimulate students' cognitive activation emerged as another challenge" (p. 613).

The results from this empirical study are aligned with what several authors have already stated, when they acknowledge that the speed of technological development makes it difficult to prepare teachers in particular to use technology to contribute to changing practices and making use of different digital resources and technologies to transform the school [73]-[75]. In this sense, it is essential that in addition to a vision of technological integration, changes in practices and mentalities must also be considered.

However, as referred to by [41], this situation promoted a "learning by doing" on the part of teachers. It can, therefore, serve as a time for looking at the past and the future and to take new and assertive steps towards change and innovation. Also, as [76] have stated, although this pandemic has posed posing many complex problems, especially related to keeping every student connected, it has also "given an even greater stimulus to research in the field of digital entrepreneurship" (p. 2), resulting in a positive impact on educational institutions.

As [77] (p. 19) highlights, "spreading the Internet or putting more computers in schools, in themselves, do not necessarily constitute major social changes". In fact, with the social evolution and the new requirements for Education, as well as the constant innovation of technology, it is essential to critically reflect on the new ways of working of the teacher [78], [79], and recognize that there should always be a solid articulation between pedagogy and technology, because "technology can amplify good teaching, but good technology cannot replace bad teaching" [80] (p. 4). It is also true that the higher the level of teacher digital confidence, the greater the capacity for effective integration of technologies in educational environments [81].

These results show that teachers were very interested in learning how to use digital technologies pedagogically, and that the vast majority of teachers did not have this training during their initial preparation for the teaching profession and know that they need raining in this area.

Thus, with the constant technological and digital evolution, as indicated by [82], the focus on teacher training that effectively links technology, pedagogy and content [83] is imperative.

VI. Conclusions, Limitations, and Implications for Future Research

In this exploratory study we establish a comparison between practices and realities concerning teachers from Portugal and Brazil (research question one) to better understand the dynamics of the adaptation and/or transformation that occurred during the emergency period

due to the COVID-19 virus that forced the transition to a scenario that would ideally have been one of digital education but remained one of emergency remote education (research question two).

The results show that, in general, the same technologies and platforms were used, pointing to a geopolitical perspective focused on large technology companies and the commercial advantages they derive from the expansion of education [84]. This context proves the need for a pedagogical embeddedness of digital platforms bearing in mind new organizational forms in learning and teaching processes.

Regarding training for digital environments, most teachers, in both Portugal and Brazil, have had some training within the area [2], [14], [15]. However, their responses seem to demonstrate the importance of integrating curriculum, digital technologies, and pedagogical strategies into a more sustainable and efficient role to be played by teachers.

The results also illustrate the two main dimensions present in a transition process to a scenario of digital education: the teacher efforts to upgrade competences, to innovate strategies and to develop professionally and the digital divide, evident in problems of internet access, lack of technology and in the number of teachers and students that do not possess the basic skills for constructivist communication and interaction in educational digital contexts. These findings are consistent with former research in pointing to the stress of inequalities exacerbated by the pandemic crisis, mainly in education [39], [69] and [85].

The differences identified in this exploratory study between the two countries under analysis are not significant for their context. We can therefore say that the results point to teachers learning by doing, as mentioned by [41] and [86]. Despite their individual efforts, this study reveals that teachers tried to stay very close to digital platforms that were more familiar to them, to pedagogical strategies that were more "conservative" and closer to the work developed in face-to-face environments, and quite close to the guidelines that were given to them from above. Moreover, the teachers used their initiative to develop and intensify collaborative practices among themselves to overcome difficulties and find solutions. However, their responses show that it is necessary to go beyond technological support and provide both teachers and students with digital skills that enable them to go beyond a transposition from face-to-face environments to digital environments in the different educational processes.

This exploratory research confirms that during the period of confinement under analysis, the activities carried out with the support of digital technologies were more teacher-centered than student-centered, thus moving away from their goal that implies the promotion of 21st-century skills. However, the responses given also reveal that the greater their previous use of digital technologies was, the greater, more constructive, and more pedagogical their use during the period of COVID-19 lockdown. This reveals that the fact that teachers use the digital signal and technologies for their teaching practice is directly related to specific training to master these resources and to use them in a pedagogical, constructivist way adapted to different purposes or goals [40].

As [44], [64] and [87] also stated, the contribution of this exploratory analysis thus joins the Portuguese and Brazilian context to the studies that have been carried out around the world in the last two years. However, one limitation inherent to this type of research should be pointed out: the fact that the practices analyzed were presented in the teachers' response to the questionnaire. It is necessary to complement this type of study with analysis of the practices that teachers applied, and to analyze their relationship with their own perspectives of learning and education, as well as to analyze the relationship between student learning and these different pedagogical practices supported by digital technologies.

Emergent remote education models [88]-[90] have the potential to transform educational systems, with effects far beyond the COVID-19 pandemic. If in many ways the shift to online education was random and chaotic, the results of research (including the present exploratory study) point to broader changes with long-term implications, namely in the innovation of pedagogical practices, in the search for more easily adaptable (and even customized) technological solutions, but also in the quality of distance education provided. An integration of the digital in pedagogical processes is important for the development of an education that combines varied learning opportunities, exploring its true potential in the field of the development of transversal skills, to create constructivist and collaborative learning scenarios that are more malleable and adaptable to the needs of each student.

This context implies a cultural change, as it requires rethinking the roles of teachers and students and the existing balance and relationship between them, besides the implications at the level of planning courses and curricula, evaluation systems, and ways of teaching and learning [47]-[49]. To build a different school it is therefore necessary to rethink it and seek to develop activities and strategies that promote the development of knowledge, skills, and attitudes in an integrated way, thus contributing to students acquiring important skills to succeed in the 21st century. Education and the teaching and learning process can thus be thought of as mechanisms for joint and continuous growth, based on experiences that can be enhanced by using the digital and engaging in active, collective, and networked learning.

CONFLICT OF INTEREST

"The authors declare no conflict of interest".

AUTHOR CONTRIBUTIONS

Sara Dias-Trindade, the main author, conducted the research and wrote the main body of the paper. Susana Henriques and Joana Duarte Correia analyzed the data, revised, and edited the manuscript. All the authors participated in conceptualizing the manuscript and approved the final version.

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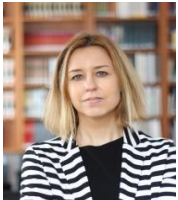
Sara Dias-Trindade has a PhD in history and in educational sciences and post-doctorate in education and communication technologies from the University of Coimbra (Portugal).

She is a teacher at the Faculty of Arts of the University of Porto (Portugal) and previously worked as a teacher at the University of Coimbra (Portugal). She is the author of many journal articles and books and has co-authored the book "Digital education for curriculum development and acquisition of transversal skills".

Dr Dias-Trindade is a researcher at the Centre for Interdisciplinary Studies (CEIS20), currently integrating its coordination team. She collaborates with several research centers of Brazilian Universities, also working as a teacher in different postgraduate courses in Education and Digital Technologies. She has participated in different international projects related to Educational Technologies and Teacher Training (currently coordinating the project "Digital Teaching Skills in Portugal", based at CEIS20-UC).

Susana Henriques has a PhD in sociology from the Iscte – Instituto Universitário de Lisboa (Portugal).

She is an assistant professor with habilitation at the Portuguese Open University (Portugal) and previously worked as a professor at the Escola Superior de Educação e Ciências Sociais do Instituto Politécnico de Leiria (Portugal). She is the author of many journal articles and books.

Susana Henriques is a researcher at the Centro de Investigação e Estudos de Sociologia (CIES). She collaborates with other research centers and is member of Professional and scientific associations, such as Portuguese Sociological Association, European Society for Prevention Research (EUSPR), also working as a consultant in the International Consortium of Universities for Drug Demand Research (ICUDDR) and NGO. She has been a professor in different postgraduate courses and training courses in online education and digital technologies for teachers. She has participated in different international projects related to Online Professional Training (currently coordinating the project "Frontline Politeia", based at CIES-ISCTE).

Joana Duarte Correia has a degree in journalism from the Faculdade de Letras da Universidade de Coimbra, a Master's in Intercultural Relations from Universidade Aberta, FCT scholarship holder for a PhD in Sociology at Iscte - Instituto Universitário de Lisboa. Researcher at CIES-Iscte - Centro de Investigação e Estudos de Sociologia, research group Education and Science. Invited Assistant Professor at the Iscte Soft Skills Lab. She has been conducting research in the area of sociology of education and communication - media, literacy, skills, digital inclusion and digital education.