Emergency Remote Teaching and Learning and Teachers' Digital Competence

Enseñanza y aprendizaje remoto de emergencia y las competencias digitales del profesorado

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Abstract

The challenges posed by the COVID-19 pandemic forced schools to quickly mobilize toward emergency remote teaching and learning (ERTL) practices. Teachers' digital competences were essential in this context. This study aims to identify the ERTL practices adopted in Portugal and how they were perceived by teachers of students aged 3 to 18. Data were gathered through a questionnaire administered online during April and May 2020 to 329 teachers. ERTL was perceived as an opportunity to develop their own and their students' digital competences. Teachers expressed a moderately positive view of the process and reported an experience of work overload. The pedagogical practices implemented by teachers during this period were diverse and differed according to gender, self-assessment of digital competence, and level of education taught. Results point to the importance of continued teacher training to achieve quality distance education.

Keywords: teachers, primary education, secondary education, teacher qualifications

Resumen

Los retos planteados por la pandemia de COVID-19 han obligado a una rápida movilización de las escuelas hacia las prácticas de enseñanza y aprendizaje remoto de emergencia (EARE) y las competencias digitales de los profesores han sido esenciales en este contexto. El presente estudio tiene por objetivo identificar las prácticas de EARE adoptadas en Portugal y la manera en que éstas fueron percibidas por profesores de alumnos de entre 3 y 18 años de edad. Se recopilaron datos a través de un cuestionario aplicado en línea en abril y mayo de 2020 a 329 profesores. La EARE se percibió como una oportunidad para el desarrollo de las competencias digitales tanto de los propios profesores como de sus alumnos. Los profesores valoraron el proceso de manera moderadamente positiva y manifestaron una experiencia de sobrecarga de trabajo. Las prácticas pedagógicas aplicadas por los profesores durante este periodo fueron variadas y diferían según el sexo, la autoevaluación de la competencia digital y el nivel educativo impartido. Los resultados señalan la importancia de la formación docente continua para lograr una educación a distancia de calidad.

Palabras clave: docente, escuela primaria, escuela secundaria, competencias del docente

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I. Introduction

Confronted with the sudden impact of the pandemic crisis, schools had to abruptly embrace previously peripheral perspectives and practices that took on central importance. This accelerated transition to distance education would later become known as emergency remote teaching and learning (ERTL) (Czerniewicz et al., 2020; Hodges et al., 2020), understood as an array of pedagogical practices where projects and activities developed for face-to-face education are now repurposed in digital and analog distance contexts.

How did Portuguese teachers experience this abrupt transition from in-person education to ERTL? What ERTL practices were adopted in Portugal and how were they perceived by teachers of students aged 3 to 18? Given these questions, our goals were to describe the ERTL practices adopted in Portugal and to characterize how teachers of students aged 3 to 18 perceived them. A sample of teachers was invited to express their perceptions and self-assessments in relation to this process.

As these were the questions that guided this study, we have chosen to center this article's theoretical framework on ERTL, reconstructing the stages of this process in Portugal. We reflect on teachers' perceptions concerning ERTL. Given the impact of digital inequalities – an issue that has gone hand in hand with the evolution of digital media and the internet – theoretical frameworks allowing for a better understanding of the relationships between digital competences and teaching activities have been included (Redecker, 2017).

ERTL has emerged in response to a need to refer specifically to the teaching experience of the first lockdown imposed due to the SARS-CoV-2 pandemic. Hodges et al. (2020) begin their seminal contribution by signaling that the intention during this experience was not to present a well-constructed system built to respond to a well-defined and well-known educational reality, but rather to offer an immediate, large-scale response to an unprecedented emergency, ensuring the educational system would continue to function promptly and creatively.

Unlike distance education – a robust form of education structured to be accessible anytime and anywhere, and one that is ubiquitous, mobile, and developed by groups of professionals specifically trained to contribute to different aspects of the system – ERTL responds to a context of crisis, transposing a teaching model conceived initially to operate in a face-to-face context into online or blended contexts, digital or analog. It is a provisional solution, and due to the conditions mentioned above, it provides poorer levels of quality than distance education (Barbour et al., 2020).

Considering the perspectives of Hill (2020) and Kelly (2020), later adapted to the K-12 context by Barbour et al. (2020), four phases can be identified in this process. The first two phases correspond to ERTL promoted during the first lockdown, starting in March 2020. The latter two phases encompass remote teaching (RT), starting in September 2020. These phases, adapted from Hill (2020), encompass a temporal horizon starting in March 2020 and ongoing in May 2021. Below we characterize the first two phases, which correspond to the period over which data was collected.

- Phase 1: March 2020 - "Rapid Transition to Remote Teaching and Learning" – schools mobilize to make sure the school system remains functional, promoting radical changes to ways of teaching and learning and resorting primarily to synchronous communication by video and cell phone, pre-recorded television programs, and to a lesser extent, postal communication.

- Phase 2: April to June 2020 – "(Re)adding the Basics" – Schools are concerned with recovering essential aspects of teaching and learning and trying to ensure equity in access, supplementing the lack of access to computers and the internet, digitalizing learning materials, supporting students at risk of exclusion, and addressing concerns about academic integrity.

We summarily present some of the political initiatives taken in Portugal to respond to the COVID-19 pandemic in the educational sector within those two phases. We note that the parallel between the two phases mentioned above (Hill, 2020; Barbour et al., 2020) and the Portuguese reality in the context of

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preschool, basic and secondary education cannot be assumed as a perfect blueprint since the contexts and realities under analysis have specificities that differentiate them. The rhythm at which the pandemic spread and affected each country was not uniform, and countries encountered similar conditions at slightly different moments in time.

On April 14th, Law-Decree nº 14G/2020 was approved, establishing exceptional and temporary measures for education, including the suspension of all face-to-face teaching activities during the 3rd term (April 14th to June 26th, 2020) and the suspension of national examinations for basic education (2nd, 5th, 8th, and 9th grades). On March 16th, 2020, Portuguese schools were physically closed to control the spread of the COVID-19 pandemic. Then began a sudden transition from face-to-face education to remote distance teaching (phase 1, Hill, 2020; Barbour et al., 2020). This led the Ministry of Education to implement several measures, including notably:

a) A document was developed by the General Directorate of Education (Direção Geral de Educação-Ministério da Educação [DGE], 2020a) under the title "Guiding Principles for the Implementation of Distance Education in Schools," presenting recommendations for the development of distance teaching (phase 1, Hill, 2020; Barbour et al., 2020). With this document as a guide, schools were asked to develop their distance teaching plans and implement them according to their specific contexts. This document was issued ten days after the closure of schools, and while this was a swift response, it still left a significant gap during which schools had already implemented ERTL without central guidance.

b) The TV program "Study at Home," launched on April 20th, allowed even the most isolated students and those without access to computers or the internet to access relevant educational content (phase 2, Hill, 2020; Barbour et al., 2020).

c) A course named "Training for Digital and Online Teaching" (DGE, 2020b), resulting from a partnership with Universidade Aberta, Portugal, was launched on April 15th, 2020, and has since been delivered to 2,300 teachers of basic and secondary education (phase 2, Hill, 2020; Barbour et al., 2020).

d) The website "Support for Schools" was created, making available a growing array of resources to support learning and school management (phase 2, Hill, 2020; Barbour et al., 2020).

It would later be decided that older students (11th and 12th grades) would return to school in person on May 18th, 2020, but only to take classes for subjects for which they would be required to attend national examinations to apply to higher education (Conselho Nacional de Educação [CNE], 2021). These measures were an attempt to balance concerns regarding equity (Aguilera & Nightengale-Lee, 2020) with issues of academic integrity, as pointed out by Hill (phase 2, 2020).

One of the most significant of the many challenges posed by the pandemic for education was the existence of inequalities in access to electronic equipment and the internet, which would enable all children and students to access adequate ERTL (CNE, 2021; Flores & Gago, 2020; Seabra et al., 2021; Pacheco et al., 2021). In response to this challenge, it is worth noting the fundamental role played by local institutions and authorities in fighting inequalities and ensuring access to education (Flores & Gago, 2020; Khlaif et al., 2020).

While there was a swift reaction to the pandemic (Sá & Serpa, 2020), many actions were left to the decisions of teachers, schools, and local entities. These relatively self-organized measures also gave rise to a heterogeneity of practices – creative and context-specific, at best, but uncoordinated and inequitable on the other hand.

Pacheco et al. (2021) found that a variety of ways of contacting students had been put in place during ERTL in Portugal, and bureaucracy increased. However, teacher satisfaction among our sample at the moment of data collection, which was after the return to in-person education, was low, in contrast to the moderate level of satisfaction and the potential gains found in another Portuguese study from early in the pandemic

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response (Seabra et al, 2021).

Studies in the Portuguese context have found mixed results concerning the types of pedagogical activities promoted during ERTL. Whereas some refer to Zoomism (Pacheco et al., 2021), others found a variety of practices being implemented, which were not limited to synchronous online activities (Seabra et al., 2022) and required teachers to use a range of platforms and develop technological and pedagogical competences (Graça et al., 2020).

The abrupt transition from traditional schooling to new methods of teaching posed challenges and difficulties for teachers and students, which should be acknowledged (Kerr-Sims & Baker, 2021; Pacheco et al., 2021; Seabra et al., 2021, 2022). These difficulties are multidimensional, affecting pedagogical, technological, organizational, and management aspects.

Students' and teachers' behaviors, attitudes, and feelings, may have been affected by several factors, such as the predominance of a markedly instrumental discourse about ERTL, combined with low levels of pedagogical competences for teaching in digital environments (Lederman, 2020); inadequate digital competences on the part of teachers and students; poor access to the internet; an inability by teachers and students to remain engaged; a high workload demanded of teachers, students and their families; and an inability to identify the specificities of this form of teaching at different levels of the educational system. This problematic context may also have had an impact on teachers' confidence, self-efficacy, and expectations, resulting in feelings of insecurity, confusion, and threat about how students approached this exceptional context (Kerr-Sims & Baker, 2021; Markova, 2021; Seabra et al., 2021, 2022). Concerns about equity were particularly acute (Aguilera & Nightengale-Lee, 2020; Pacheco et al., 2021).

Although currently there is a deeper understanding of the experiences of teachers and students with ERTL, there is still a need to increase knowledge of these experiences. This is most valuable for designing teacher-training activities, which can promote competences in course design, development, and evaluation, or more specifically, communication between teachers and students (Markova, 2021).

Although ERTL has contributed to the accelerated development of digital competence by teachers and a decrease in difficulties accessing the internet (Portillo et al., 2020), accessibility and teacher levels of digital literacy remain relevant and constitute obstacles that have been reported worldwide. The Digital Education Action Plan 2021-2027 (European Commission, 2020) reports that 95% of respondents consider the coronavirus crisis a tipping point in the use of technology for education and training. However, only 39% of EU teachers consider they are ready to use digital technology in their daily professional activities.

One notable research project on teachers' digital fluency in teaching contexts is that of Portillo et al. (2020), which points to the following relevant aspects: i) the most meaningful difficulties reported by teachers and educators relate to insufficient digital competences, which is strongly related to the perception of a high workload and negative emotions pertaining to teaching practices in ERTL; ii) a strong connection between teachers' digital divide and variables such as gender, age, and type of school; iii) the identification of lower levels of digital competences in the lower levels of the educational system; iv) teachers who considered themselves to be more competent exhibited more positive emotions and some revealed a lower perception of effort.

The relevance of developing teachers' and educators' digital competences has been acknowledged as a priority among EU policies. Precedents for the European Framework for the Digital Competence of Educators (DigCompEdu) (Redecker, 2017) include the Framework for Developing and Understanding Digital Competence in Europe (DigComp) (Ferrari, 2013), the current version of which is DigComp 2.1 (Carretero et al., 2017). The DigCompEdu (Redecker, 2017) encompasses 22 essential digital competences in six areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence.

Teachers' ICT competence beliefs were closely associated with their use of ICT (Rubach & Lazarides, 2021), which highlights the relevance of this construct in understanding teachers' practices. Recent studies of teachers' digital competences, including one in Portugal, have found that teachers have moderate

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competence levels, recognize ICT as useful, and are capable users of several resources on a personal level, but at the pedagogical level their digital competences are often limited, and ethical concerns are seldom observed in their use of technology in educational contexts (Dias-Trindade et al., 2021; Falcó, 2017).

Digital competence has been associated with personal characteristics, including gender (Cheryan et al., 2013; Gebhart et al., 2019; Suarez et al., 2012) and age (Rubach & Lazarides, 2021). Some studies have found that teachers with fewer years of professional experience (Drossel et al., 2017; Gil-Flores et al., 2017) and younger teachers (López-Vargas et al., 2017) tend to assess their digital competence levels as higher. However, Rubach and Lazarides's (2021) findings did not support differences according to teachers' years of experience.

As far as gender is concerned, studies find male teachers tend to self-assess more positively in a number of dimensions of ICT competence and use (Gebhardt et al., 2019, Kaarakainen et al., 2018), although differences seem to be small and inconsistent among countries (Gebhardt et al., 2019). In a Portuguese study, gender showed no impact on teachers' digital competence (Dias-Trindade et al., 2021). Gil-Flores et al. (2017) found that personal variables, such as age and gender, were irrelevant when other variables – such as training, collaboration among teachers, perceived self-efficacy, and teaching concept – were considered. Given the different findings across studies, we considered these dimensions were relevant for analysis in our study and could have implications for teacher training and education policy.

II. Method

The study falls within an interpretative paradigm, focusing on participants' understanding and assigned meaning (Coutinho, 2018). The study is descriptive and correlational, using a mixed-methods approach (Creswell & Plano, 2007).

Data was gathered using a questionnaire developed by the authors and previously validated through the reflective discussion method. The questionnaire was reviewed by the ethics committee of the host research center. Ethical concerns, particularly voluntary participation, the right to withdraw at any moment, and anonymity, were considered (AERA, 2011).

The questionnaire was directed at teachers of preschool education (ages 3 to 6), basic education (ages 6 to 15), and secondary education (ages 15 to 18) in Portuguese public and private schools during the first lockdown period due to the coronavirus pandemic. Answers were gathered between April 24th and May 19th, 2020, through an online form, resulting in a non-probabilistic convenience sample. The questionnaire was disseminated online through several platforms, including a nationally well-known blog aimed at teachers, and several teachers' groups on Facebook[1].

Given that the school closures were ordered on March 13th, 2020, effective March 16th, 2020, the research collects data from a short window of time just after the transition, describing initial educational responses to the pandemic and the experiences associated with these responses.

The questionnaire included closed and open-ended questions. The first block of questions gathered socio-demographic and professional data aimed at characterizing the respondents: gender, age, level(s) of education taught, type of school, years of professional experience, school location and context, and socioeconomic level of the students served.

Secondly, teachers were asked about their access to the internet and computers or other mobile devices from home, and were invited to describe their levels of competence and/or experience with digital technology in educational contexts and distance education. These questions were taken as a self-assessment measure of teachers' digital competence.

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[1] According to EUROSTAT, in 2020 there were 149,629 teachers in Portugal, although there was no data regarding childhood education, which falls outside the purview of the Ministry of Education.

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Questions concerning the process of transition to ERTL and levels of efficiency, simplicity, coordination, articulation between colleagues, and equity were assessed on a 5-point Likert scale. These items were computed into a global appreciation scale, with a Chronbach's alpha of .799, confirming adequate consistency. The scale results vary from 6 to 30. A measure of how much teachers considered their workload had increased was also expressed on a 5-point Likert scale. Furthermore, teachers were presented with several possible types of pedagogical activities and asked to identify how frequently they had used each of them. Lastly, the questionnaire included open-ended questions related to the difficulties faced by teachers and their students, as well as the positive aspects that emerged from the process.

A total of 329 answers were gathered. Most respondents worked in public schools (n=291, 88.7% valid), located in an urban (n=155, 44.1%) or semi-urban (n=83, 25.2%) context, teaching a population of predominantly lower-than-average socioeconomic status (n=221, 66.8% valid). All the Portuguese territory was represented in the sample, and the more densely populated coastal districts were more prevalent. Indeed, most respondents reported teaching in the districts of Lisbon, Santarém, or Setúbal (n=114, 35.2% valid), and Porto, Braga, or Viana do Castelo (n=83, 25.6% valid). Participants were mostly women (n=263, 80.2% valid) and aged between 36 and 45 years (n=105, 32% valid) and between 46 and 55 years (n=129, 39.3% valid). This is consistent with the gender and age structure of Portuguese teachers. The participants also represented all levels of education and teaching.

Because 21.3% of the sample taught at more than one level, this variable was recoded into two categories. The first category corresponded to preschool education and/or the first cycle of basic education (levels where a single teacher is responsible for all curricular activities, including 97 respondents, 30.7% valid), while the second category was for the second and third cycles of basic education and/or secondary education (where teachers are responsible for a single subject, including 219 respondents, 69.3% valid). Consequently, eight teachers (2.5% valid) were excluded from analyses pertaining to levels of education taught due to the fact they taught both newly computed groups.

The number of years of experience of respondents ranged from 0 to 43 ($\bar{X}$=24.44, SD: 8.65). The majority held an undergraduate degree (4-5 years of higher education) (n=206, 63.2% valid). Data were analyzed using descriptive analysis, correlations, and hypothesis testing with SPSS. Given there were qualitative variables under analysis, correlations were calculated using Spearman's rho. Hypothesis testing was conducted using Mann-Whitney, Kruskal-Wallis, and t-tests.

Qualitative results were analyzed through thematic content analysis, based on indicative emergent categories, using MaxQDA software (Creswell, 2013; Rädiker & Kuckartz, 2019). For this article, only partial results of the qualitative data were considered, namely those concerning teachers' digital competences.

III. Results

First of all, we present results relating to the goal of characterizing how teachers of students aged 3 to 18 perceived the changes implemented in the ERTL phase in response to the COVID-19 lockdowns in 2020.

Given the importance of resources in remote education, we gathered data on teachers' access to hardware and internet connection at home. Although all participants had access to the internet, 15.8% (n=52) reported only having access to mobile internet, which greatly limits accessibility. The vast majority had access to a computer at home (n=328, 99.7%), complemented by mobile devices (n=269, 81.8%). A less substantial majority also had access to a printer (n=243, 73.9%) and a scanner (n=208, 63.2%). The majority also reported having at least one device (computer or mobile device) available per person in the household working or studying from home, although a non-negligible proportion (n=54, 16.4%) did not.

When asked to self-assess their levels of knowledge and experience when the transition to emergency digital teaching took place, this being a simple measure of teachers' self-assessed digital competences as applied to education, most teachers reported having little or no knowledge or experience concerning distance education (n=218, 69.6% valid). Respondents were more optimistic when assessing their expertise in using technology for education; none of the respondents considered they had no knowledge or experience, and the most frequent answer was positive (some knowledge and/or experience, n=152,

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47.5%). In both cases, only a minority of teachers viewed themselves as very knowledgeable and/or experienced: 7.7% and 10.6% for distance learning and educational technology, respectively (Figure 1).

Figure 1. Self-assessment of level of knowledge and experience at the time of transition
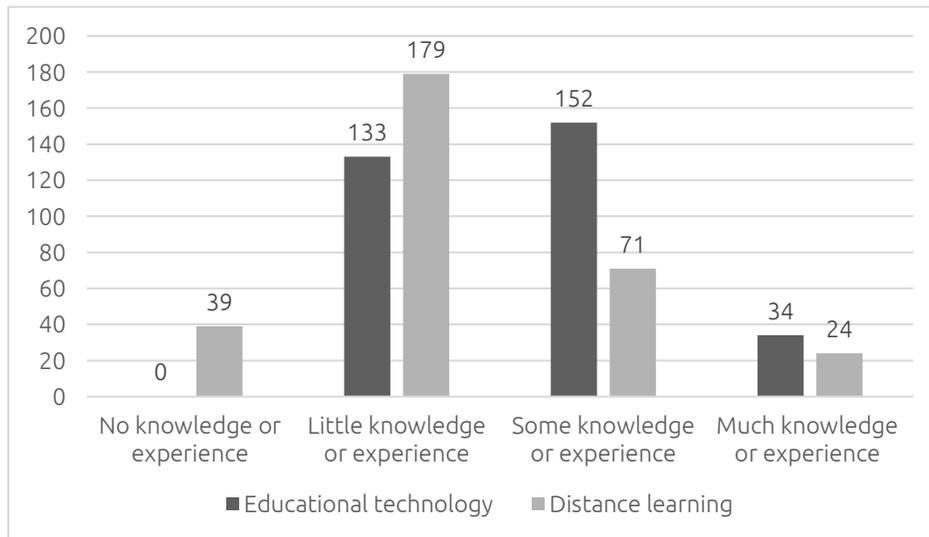
This finding is further supported by the answers given by some respondents to the open-ended questions, in which they cited a lack of digital competences as one difficulty they faced when coping with the transition to ERL. Adapting to specific platforms and tools was a concern expressed by 64 teachers ("Quickly needing to become familiar with synchronous and asynchronous platforms," r.8), while 23 teachers referred to digital competences ("I feel insecure and have difficulty working with ICT," r.68). Similarly, 23 teachers reported situations related to training as a difficulty, and six made express reference to their lack of knowledge concerning distance education.

On the other hand, the potential for skill development was the most frequently cited positive aspect or opportunity provided by this experience, found in the answers of 103 teachers. Most frequently mentioned was the development of digital competences, by 63 teachers.

The level of education taught by the respondents correlated with their self-assessment of competence, both concerning distance learning (r = .134, $p < 0.05$; $t_{(300)} = -2.221$, $p < 0.05$) and concerning educational technology (r = .137, $p < 0.05$; $t_{(306)} = -2.028$, $p < 0.05$). These differences between groups were also confirmed by hypothesis testing using a t-test, with p<0.05, indicating that those who teach older students tend to self-assess their levels of digital competence more positively than those who teach younger children.

There is also a significant correlation between gender and self-assessment of knowledge or experience, both regarding distance education (r = .154, $p < 0.01$; $t_{(313)} = -2.557$, $p < 0.01$) and regarding educational technology (r = .11, $p < 0.05$; $t_{(318)} = -1.968$, $p < 0.05$), indicating men tend to self-assess more positively in these measures. The differences between groups are significant, as confirmed by a t-test.

Self-assessment in both measures (distance education and educational technology) was also correlated (r = .49, $p < 0.01$).

The global appreciation scale had an average of 18.82 points and a standard deviation of 4.19, showing a slight tendency toward a positive assessment of the transition process, coupled with a high dispersion of results, indicative of a lack of unanimity among teachers. This variable shows significant correlations with teachers' self-assessment of competence concerning distance education (r = .193, $p < 0.01$) and educational technology (r = .142, $p < 0.05$). Hypothesis testing using the Kruskal-Wallis test confirms the presence of significant differences between groups constituted based on self-assessment of competence concerning

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distance learning (H = 12.859, $p < 0.01$) and educational technology (H = 6.428, $p < 0.05$).

Another measure collected concerned teachers' assessment of the transition to the ERTL process in terms of increased workload, measured on a Likert scale ranging from 1 (not at all) to 5 (very much so). Teachers tended to consider ERTL had caused an increase in workload ($\bar{x}$ = 4.16; SD = 1.05). This variable showed significant negative correlations with the number of years of service ($r = -.170$, $p < 0.01$) and teacher age ($r = -.160$, $p < 0.01$), indicating that less experienced and younger teachers are more likely to consider this change has brought about an increase in their workload than their older and more experienced counterparts. Similarly, teachers of older students considered that the transition to remote learning brought about a more significant increase in their workload than did teachers of younger students ($r = .164$, $p < 0.01$; $t_{(315)} = 11.678$, $p < 0.01$). A summary of the correlations found between these variables is presented in Table 1.

Table 1. Correlation between descriptive variables

	Age	Gender	Level taught	Educational technology competence	Distance education competence
Access to mobile devices	-.176**				
Educational technology competence		.11*	.137*		.49**
Distance education competence		.154**	.134*	.49**	
Global assessment				.142*	.193**
Increased workload	-.160**		.164**		

Note. * = $p < 0.05$; ** = $p < 0.01$. $p < 0.01$ values are stressed in bold.

Secondly, we focus on the other objective of our study: to describe the ERTL teaching practices adopted in Portugal during the ERTL phase introduced in response to COVID-19.

A look at the types of synchronous activities conducted by teachers shows that synchronous debate in group settings was the most frequent, followed by live video lectures. One-on-one tutoring was less frequently reported. There is, however, a wide range of answers, which highlights a diversity of teaching strategies, rather than a universal tendency (Figure 2).

Figure 2. Frequency and nature of synchronous activities

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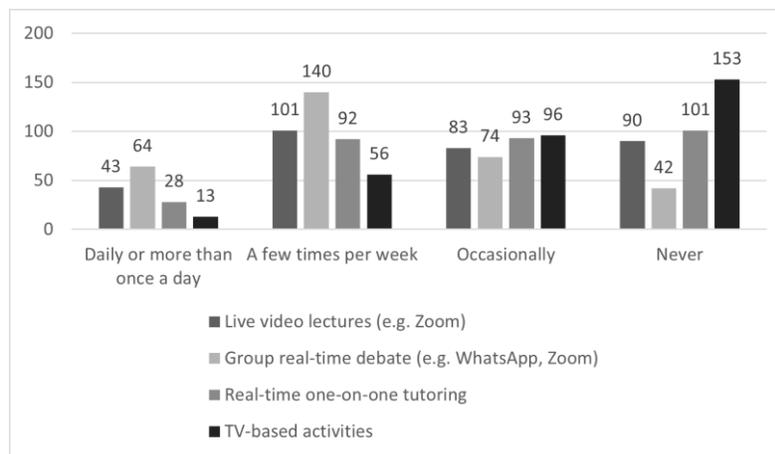
The most prevalent asynchronous activity was asking students to perform individual assignments. Reading assignments and using pre-made resources, such as those developed by textbook publishers, are also notably frequent. On the other end of the spectrum, activities such as group work among students or transdisciplinary/interdisciplinary work were less frequently reported, as can be confirmed in Figure 3.

Figure 3. Frequency and nature of asynchronous activities
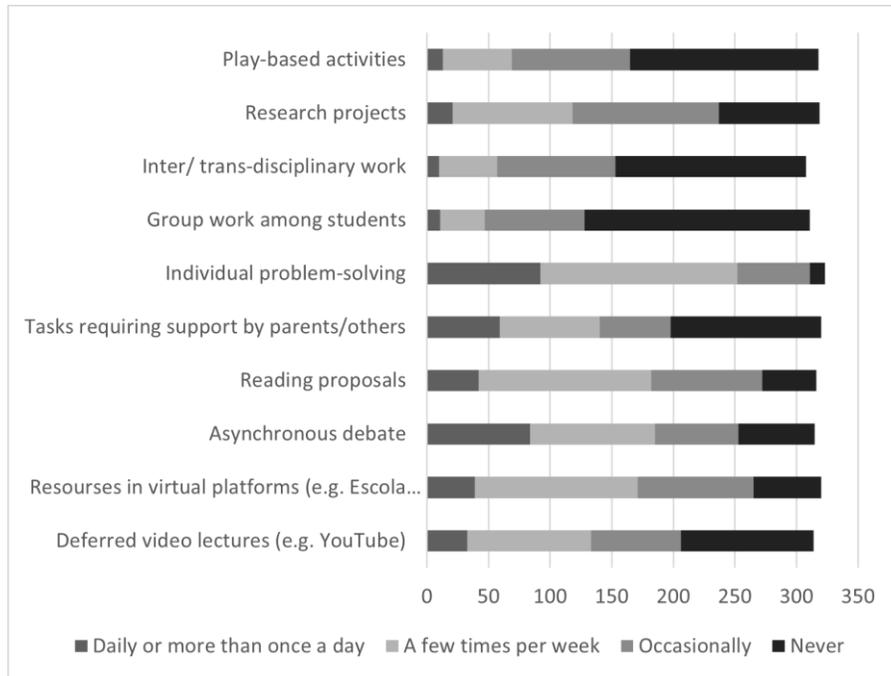
Despite the fact that data was collected at a very early stage of ERTL, 90.6% of teachers reported having introduced changes to their teaching since the closure of schools. In most cases, these changes were attributed to teachers' individual initiative ($\bar{x}$ = 1.89, SD = .84, on a 4-point scale ranging from 0 – Not at all, to 3 – Very much), followed by school-level guidelines ($\bar{x}$ = 1.53, SD = .88), and association with other teachers ($\bar{x}$ = 1.47, SD = .85). On the opposite end of the spectrum, guidelines by the Ministry of Education or other central administration bodies ($\bar{x}$ = .96, SD = .85) were least considered to have brought about these changes.

A correlational analysis of variables associated with educational strategies shows some interesting tendencies. Notably, the use of projects and research assignments correlates with self-assessment of digital competence concerning educational technology (r = .118, p < 0.05) and distance learning (r = .118, p < 0.05; t = -1.735, p < 0.05). Younger teachers use pre-made expository materials available on online platforms (such as those developed by textbook publishers) more frequently (r = -.126, p < 0.05), whereas older teachers are more likely to turn to activities based on asynchronous teaching, such as reading proposals (r = .114, p < 0.05), research assignments and projects (r = .120, p < 0.05), and asynchronous debate among students (r = .131, p < 0.05). Finally, women engage more frequently in one-on-one tutoring (r = -.134, p < 0.05), interdisciplinary and transdisciplinary activities (r = -.153, p < 0.01), television-based activities ("teleschool") (r = -145, p < 0.01), and play-based activities (r = -193, p < 0.01).

A correlational analysis of the levels of education taught by teachers reveals tendencies in terms of the types of activities each group uses the most, with teachers of younger students more likely to use play-based activities (r = .552, p < 0.01), activities to be performed with the support of parents or other caregivers (r = -.532, p < 0.01), inter- or transdisciplinary activities (r = -.329, p < 0.01), television-based activities (r = -259, p < 0.01), reading proposals (r = -.245, p < 0.01), and synchronous one-on-one tutorials (r = -.138, p < 0.05). On the other hand, teachers of older students report more frequent use of group work among students (r = .215, p < 0.01) and synchronous debate with a group of students (r = .118, p < 0.05). A

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summary table of the correlations found is presented below (Table 2).

Table 2. Correlation between descriptive variables and teaching strategies

	Age	Gender	Level taught	Educational technology competence	Distance education competence
Synchronous debate (group)			.215**		
Synchronous one-on-one tutoring		-.134*	-.138*		
TV-based activities		-.145**	-.259**		
Play-based activities		-.193**	-.552**		
Research projects	.120*			.118*	.193**
Inter-/transdisciplinary work		-.153**	-.329**		
Student teamwork			.215**		
Tasks with parents' support			-.532**		
Reading assignments	.114*		-.245**		
Resources on virtual platforms	-.126*				

Note. * = $p < 0.05$; ** = $p < 0.01$. $p < 0.01$ values are stressed in bold.

IV. Discussion

As intended by our research objectives, we will attempt to characterize how Portuguese teachers of students aged 3 to 18 perceived the changes implemented in the ERTL phase, introduced in response to the COVID-19 lockdowns in 2020, and compare these results with related studies.

We began by analyzing teachers' access to the internet and relevant hardware, such as a computer, printer, or scanner in their homes. The results showed universal access to the internet from home, albeit in rare cases only to mobile internet, which greatly limits the types of activities they can conduct. These results do not support the picture portrayed by Sá and Serpa (2020), which indicated a lack of access to the necessary media to implement ERTL for a considerable percentage of the Portuguese people. Teachers appear therefore to enjoy better technology and internet access conditions than the general population.

Teachers' self-assessment reported moderate levels of digital competence in the use of ICT in education in general, and this was especially the case in distance learning in particular. These findings are consistent with those of Portillo et al. (2020), who report that teachers in the Basque Country felt partially competent for developing ERTL, more so for the use of general communication technologies than for the use of specific educational technology tools in the context of distance learning. They also support the characterization of Portuguese teachers presented by Sá and Serpa (2020) and concerns regarding the digital competence levels of teachers to handle ERTL, such as those expressed by Lederman (2020), Portillo et al. (2020), or Vieira and da Silva (2020), and align with other studies of the digital competences of Portuguese teachers in the pandemic context (Dias-Trindade et al., 2021) and of Spanish teachers before the pandemic (Falcó, 2017), which are unanimous in stressing some limitations in the use of technology for teaching purposes.

Although self-assessments varied and digital competence was not the most frequently voiced concern in the qualitative section of the questionnaire, it is fair to say that teachers' self-assessment of digital competences tends toward a negative view in the context of distance education. This lends further support to the understanding that this was a process of emergency remote learning (ERL) rather than distance learning (Barbour et al., 2020; Hodges, et al., 2020). It is also relevant that competence in the use of technology specific to teaching is more directly linked to the quality of the distance education that can be provided than general digital competence is. It is precisely in the areas where such competences would be of most use to teachers in the context of ERTL that they are least developed (Dias-Trindade et al., 2021; Portillo et al., 2020), highlighting the need not only to invest in teacher training aimed at developing digital competences, but to ensure that training is specific to the most vital areas.

Despite this concerning situation, digital competences were also frequently mentioned as having been developed during ERTL, supporting the assertion by Portillo et al. (2020, p. 4) that "this new situation has

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pushed [teachers] to increase the use of digital resources abruptly," leading to gains in terms of fluency, mastery, and comfort level with multiple uses of technology in education.

Differences in self-assessment of digital competence by level of education taught and gender were significant. Those who teach older students view their digital competence more positively, as do male teachers. Both these differences were also found in research by Portillo et al. (2020), but not by Dias-Trindade et al. (2021) in Portugal. However, we did not find a significant correlation between age and self-assessment of digital competence in our sample, unlike Portillo et al. (2020). As we stressed in the introduction, there is no consensus on the importance of teachers' personal characteristics in terms of their digital competence (Gil-Flores et al., 2017; Gebhardt et al., 2019). This study raises the possibility of tailoring teacher training to teacher characteristics, such as level taught, gender, and age, targeting those most at risk.

Teachers offered a moderately positive assessment of the process of ERTL. This is in contrast to subsequent results found by Pacheco et al. (2021). We may hypothesize that as the pandemic wore on, teachers' workload and stress gradually took a heavier toll on their wellbeing and satisfaction.

Teachers' levels of satisfaction varied significantly with how they self-assessed their levels of competence. Portillo et al. (2020, p. 7) found that "teachers who perceive themselves as digitally competent present more positive emotions," which is in line with our results concerning how teachers view the transition process and draws attention, once more, to the need to invest in teachers' digital competences and promote their development. The high dispersion of results in this scale points to a heterogeneity of practices and experiences among teachers. As Azevedo (2020) pointed out, schools were at very different stages in their implementation of educational innovation, and therefore it is not surprising that responses and response speeds differ between institutions in the face of this emergency.

Finally, despite a tendency toward a moderately positive view of ERTL as a process, teachers, especially younger ones and those of lower grades, generally found that ERTL resulted in an increase in workloads.

We will now attempt to address our second objective and describe the ERTL teaching practices adopted in Portugal during the ERTL phase, in response to COVID-19.

Teachers seem to have used a diversity of teaching practices, both synchronous and asynchronous. This diversity somewhat contradicts the depiction of phase one of ERTL (Barbour et al., 2020) as "'Put everything on Zoom and worry about details later'" (p. 3), that is, the tendency to "opt for the comfort of synchronous video discussions to replace the face-to-face experience." While it is undeniable that synchronous video discussions were a frequent adaptation among our respondents, they were far from the only option, even at a very early stage of ERTL. Asynchronous activities already played a role, particularly "traditional" activities such as individual problem-solving assignments. While this diversity can be evidence of the transition to phase 2 (Barbour et al., 2020), including concerns about equitable access (Flores & Gago, 2020), which are more readily addressed by not relying entirely on synchronous activities, they may also be manifestations of the relative lack of structure and central decision-making in the process, particularly in early stages. We recall that the responsibility to develop "distance learning plans" was left to each school, allowing for a wide variety of options (DGE, 2020a). This interpretation is also supported by the data, which shows that most adjustments to teaching practice implemented from the beginning of the process were the result of initiatives taken individually, among colleagues and at a school level, rather than at the national level. This appears to point to a relatively uncoordinated process that is nonetheless sometimes coordinated at the school level. The fact that the process had already begun to be reflected upon and changed supports the idea of a transition to phase 2, as ERTL becomes more established and starts to be reflected upon and improved (Barbour et al., 2020).

The types of activities used by teachers were most influenced by the levels of education they taught. Other variables, such as gender, age, and self-assessed digital competence also correlated with the pedagogical choices they made. This is in line with the findings of a concomitant study conducted with the parents of preschool to secondary students (Seabra et al., 2022).

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V. Conclusions

One of the most significant conclusions of this study concerns diversity and heterogeneity, affecting both how teachers experienced the process and the types of teaching strategies they implemented. This is expressed in teachers' self-perceived levels of competence, how they view the transition to ERTL, and in the teaching strategies they implemented to ensure the continuation of teaching activities in unprecedented circumstances. This variability defies classification and stresses the need for more detailed research, tapping into the variables that may help explain these differing experiences: teachers' self-assessed levels of digital competence, especially pertaining to the use of digital means for distance education, emerges as a relevant variable, confirming other studies and the concerns expressed by other researchers (Lederman, 2020; Portillo et al., 2020; Sá & Serpa, 2020; Vieira & da Silva, 2020). As a consequence, this result confirms the importance of investing in teacher training aimed at developing digital competences for teaching, emphasizing competences most directly linked to education rather than general competences in the use of technology (Portillo et al., 2020).

A deeper analysis of how teachers experienced the process of ERTL shows that self-assessed digital competence proves relevant in understanding teachers' assessment of the process as a whole. Our study confirmed the existence of a gender divide and increased levels of perceived competence among teachers of older students (Portillo et al., 2020), but did not find an age divide in teachers' self-assessment of digital competence. As studies are divided on the importance of personal variables in digital competence (Gil-Flores et al., 2017; Gebhardt et al., 2019), this deserves further analysis to determine if these differences are merely at the level of perception or at the level of actual competence. If confirmed, they may point to a need for gender-sensitive teacher training policies and teacher training explicitly directed at teachers of younger children.

Teachers displayed a moderately positive view of the ERTL process, but as we have noted elsewhere, there was a high dispersion of results, further stressing the multiplicity of perspectives on the matter. Feelings of increased workload were prevalent, particularly among older teachers and the teachers of older students. This finding cautions policymakers to take into account the difficulties of the process experienced by teachers and promote alleviating measures.

In characterizing ERTL practices in Portugal, we concluded that the transition to ERTL was faster than the central response from the Ministry of Education, leaving a gap between the closure of schools and the release of early government guidelines (Flores & Gago, 2020; Seabra et al., 2021). Those guidelines themselves were very flexible, calling on schools' self-organization and planning capacity (DGE, 2020a). This has led to a multiplicity of strategies (Azevedo, 2020), differing between schools and frequently differing between teachers. On the one hand, this has allowed schools and teachers to promote context-specific responses and act swiftly, but may also be at the root of persisting differences in the quality of the educational responses provided, and therefore of inequality among students. Still, teachers' capacity for agency, coupled with some central initiatives, ensured the continuity of education in extreme circumstances. As we move into a "new normal" (Hill, 2020; Barbour et al., 2020), these lessons can be drawn upon and used to improve teacher training, curriculum adaptation, organizational development, and reflection on critical matters such as equity (Aguilera & Nightengale-Lee, 2020), integrity (Hill, 2020) or the teaching of practical and applied subjects. This experience is also recognized as offering potential for competence development (Portillo et al., 2020) and even for a long-lasting improvement of education (Azevedo, 2020).

One limitation of this study was the use of a convenience sample, which was not generalizable to the population as a whole. Moreover, the online distribution of the questionnaire may have encouraged more responses from more digitally equipped and competent teachers than from their less advantaged counterparts, potentially positively skewing results. However, the very pandemic that forced schools to close also made it impossible to conduct a stratified sampling process and gather data in person. The sample includes teachers from throughout Portugal and from all levels and areas of teaching and education, and the questionnaire was disseminated as widely as possible among teachers, using multiple online groups. Therefore, we believe the study captures a unique moment in the pandemic response and that the experiences and feelings expressed by the participants help characterize what took place in that

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context. Still, now that the "new normal" is returning, future studies may conduct random or stratified sampling and analyze the current status of education in the post-pandemic era.

Disclosure statement

No potential conflict of interest was reported by the authors.

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