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The elephant in the (class)room: Emergency Remote Teaching in an ecological perspective

O elefante na sala(de aula): Ensino Remoto Emergencial em uma perspectiva ecológica

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ABSTRACT: Most teachers are working from home and using digital tools to mediate their classes as a response to a demand for transitioning face-to-face to online classes due to the COVID-19 pandemic. Drawing on the ecological approach, this paper reports a qualitative study that aims to understand how digital technologies are integrated in the teaching practices during the Emergency Remote Teaching. Seventy-six language teachers answered a quasi-structured questionnaire about their experiences. The findings show how the network created with their peers scaffolded this experience and played a crucial role in their appropriation of those technologies. Moreover, the findings suggest that this network may have contributed to the "normalisation" of digital technology use.

KEYWORDS: Emergency Remote Teaching; ecological perspective; normalisation; language teaching; digital technologies; smartphones.

RESUMO: A maioria dos professores está trabalhando de casa e usando ferramentas digitais para mediar suas aulas em resposta à demanda de transição de aulas presenciais para aulas online devido à pandemia do COVID-19. Com base na abordagem ecológica, este artigo relata um estudo qualitativo que visa compreender como as tecnologias digitais se integram às práticas de ensino durante o Ensino Remoto Emergencial. Setenta e seis professores de línguas responderam a um questionário semi-estruturado sobre suas experiências. Os resultados mostram como a rede criada com seus pares apoiou essa experiência e desempenhou um papel crucial na apropriação dessas tecnologias. Além disso, os resultados sugerem que essa rede pode ter contribuído para a normalização do uso da tecnologia digital.

PALAVRAS-CHAVE: Ensino Remoto Emergencial; perspectiva ecológica; normalização; ensino de línguas; tecnologias digitais; *smartphones*.

1 Introduction

Most teachers these days are teaching from home and using digital tools to mediate their classes. This, in essence, is a response to a recent demand for transitioning face-to-face classes to online classes due to the COVID-19 phenomenon experienced around the world.

In this context, we have all been compelled to experiment with the online medium in our day-to-day interactions with friends, family, coworkers, and students. In other words, we have been forcefully led to try our hand at several technology tools, albeit often unwillingly. The pandemic has been speeding up the use and integration of technologies that had so far been slowly taking place and marked by each teacher's pace. This has given rise to a teaching format named Emergency Remote Teaching (ERT).

The changes that have taken place since the beginning of the pandemic have driven scholarship to seek a better understanding of the underpinning elements and the permeating relations in the process of appropriation of technologies in language teaching. That said, drawing on the ecological approach, this study aims to contribute to this discussion by answering the following research questions:

a) What networks (coworkers, institutions etc.) emerge as teachers experienced ERT during the pandemic?

b) What challenges and opportunities can be identified regarding the use of technologies in this context?

c) What does the experience with ERT reveal concerning the post-pandemic use of digital technologies?

d) What possible factors and elements impact the use of digital technologies in ERT and what do they reveal about the process of "normalisation"[1] in Bax's (2011) terms?

Considering the many contexts and networks that ERT comprises, it is our contention that the ecological approach will serve as a lens through which to view the teaching experiences of language teachers from different locations in Brazil who agreed to participate in a research study. In this respect, Sprout and Sprout (1965, p. 8) state that the ecological perspective draws attention to various kinds of phenomena in such a way that "explanations and predictions are likely - indeed, nearly certain - to reflect some idea of the environment and some hypothesis of relationship between the person or group and the surrounding conditions and events." Discussing the teachers' interactions in their contexts situated within this perspective can help us to better comprehend ERT dynamics and their potential implications for a post-pandemic context.

The choice for a title adapted from the metaphorical idiom 'the elephant in the room' was due to the fact that emergency remote teaching is a controversial and multifaceted issue. This teaching format has caused an unprecedented disruption and mobilization in educational systems around the world, making the topic even more sensitive, since any effort to discuss it entails recognizing its complexity and understanding that different responses may emerge from its implementation, depending on the context.

Thus, the proposed study is an invitation to discuss one of ERT's facets, namely teacher experience regarding the use of digital technologies, in hopes of contributing further to future research in the field and recognizing the efforts of teachers in its implementation.

2 Emergency remote teaching (ERT)

According to UNESCO, the COVID-19 pandemic has caused the biggest disruption in education systems in history and has reached almost 1.6 billion people in more than 190 countries (UNESCO, 2020, p. 2). Soon after the pandemic started, government officials and agencies responsible

[1] We will keep the original spelling of the term as used by Bax (2011).

for educational policies began to establish ERT guidelines to reduce the losses caused by the interruption of classes.

In this context, although the acronym ERT was coined to refer to something to be used during the pandemic, there was a need to define this teaching format and discuss the differences between this format of teaching and Distance Education (DE).

Some DE scholars rushed to present a conceptual definition of this teaching format and pointed out that this emergency model was a different concept altogether. In the same vein, some educational administrators and teachers who adhered to ERT emphatically sustained that ERT was not to be mistaken for DE. Therefore, we still see reluctance by some people in accepting ERT as a form of DE, whereas others adhere to ERT with the caveat that it is not DE.

According to Brazilian law (Law 9394, of December 20, 1996), DE is an educational modality organized under specific regimes and offered by federally-accredited institutions. Decree 9057/2017, which regulates art. 80 of the aforementioned law, defines DE as

> [...] the educational modality wherein didactic-pedagogical mediation in teaching and learning processes takes place by means of media and information technologies with qualified personnel, entry policies, compatible follow-up and assessment, among other things, while educational activities are developed by students and education professionals in different times and places.[2]

The exceptionality of emergency situations is already stated in Art. 32 of Brazil's National Educational Bases and Guidelines Law (LDB, in Portuguese) which sets forth DE guidelines for elementary education. According to this article, "Elementary Education will be in person, with distance learning being used to complement learning or in emergency situations."

Therefore, the Law deals with DE as a teaching modality with specific organization and conditions, while hinting at the possibility of using ERT as a form of distance learning complementarily to classroom teaching in emergency conditions. Hence, we understand that ERT does not fit the

[2] All translations are the sole responsibility of the authors.

definition of the DE modality in art. 80 of the LDB. Rather, it represents a form of distance learning complementarily and provisionally authorized for this emergency pandemic context.

According to Hodges et al. (2020), unlike educational experiences that are planned from the beginning and designed to be online, ERT is a temporary change to fully remote teaching solutions due to crisis circumstances. These scholars state that many countries are responding to the crisis by using different educational models such as mobile learning, blended learning, radio, or other feasible solutions according to the specific context. Therefore, the objective of this alternative mode is not to re-create a robust educational ecosystem, as face-to-face or blended learning modes will most likely resume once the crisis or emergency has abated.

Ribeiro (2020) reminds us that this migration to ERT occurred overnight, with no time for either planning or qualifying teachers, who in turn have had to improvise and learn to use the technological resources and methodologies of DE by experimentation.

Cope and Kalantzis (2020) claim that educational institutions were dragged by the feet to migrate from traditional classroom teaching to ERT as they still maintained classrooms and textbooks as essential tools. They add that these institutions have put a brake on the innovation needed to build innovative and engaging online learning infrastructures and approaches (COPE; KALANTZIS, 2020, p. 51).

As Ribeiro (2020) points out, education and technology experts have been arguing, for at least thirty years, about the need to integrate technologies, invest in infrastructure, adapt resources and methodologies, and above all, have ideas and experiences, learn the ways, and have the courage to remodel (RIBEIRO, 2020, p. 115).

According to Ribeiro (2020), some technology-related projects have already been implemented in Brazil, such as providing simplified notebooks or tablets to students, setting up computer labs in schools, among others. However, she contends that such projects generally fail to provide adequate teacher training for the educational use of such technologies.

Teacher development initiatives regarding the use of digital technologies, with more investment in some locations than others, do not always emphasize the pedagogical use of these resources and the need for teachers to rely on their expertise to choose not only what tools they can use to achieve specific educational goals, but also when and how to use them.

The process of appropriation of technologies in the educational context goes through stages until reaching a point where normalisation occurs and technology becomes invisible and common in our daily lives (BAX, 2003). According to the author, in the final stage of the normalisation process, this technology will be fully integrated into teaching practice. Thus, the technology will no longer be the center of attention or a prominent element in educational planning, but simply a resource for school activities like the pencil, the pen, and other technologies already integrated into our educational routine.

Bax (2011) revisits the issue of the normalisation of technology in language education, and questions the belief that normalisation is an inevitable process and whether the stages of this process occur in the same way with different technologies and in different contexts. He points out that the central focus must be on the educational process and on learning; therefore, technology cannot be placed on a "pedestal" and learning in the background. According to the author (p. 10-11), the normalisation process is impacted by the following factors or elements:

> Access and Participation
> 1. **Access** to and interaction with sources of prior knowledge or information is frequently important in learning.
> 2. **Participation and interaction** with others, which includes a social and even an emotional dimension, is also frequently of value in education.
> Expert intervention
> 3. **Expert scaffolding:** interaction with an expert, who actively 'scaffolds' the experience, through planning, feedback, and advice, constantly checking that learning is taking place.
> 4. Expert modelling: the example of an expert, who exemplifies in his/her own behaviour:
> a. A set of *approaches to knowledge and learning*, including a criticality and rigour in dealing with sources of knowledge, and b. A methodical and cautious *mode of expression* in communicating ideas and information to others, and who models this behaviour to the learner.
> 5. **Challenge and contradiction** from an expert, and from other learners, in a way to cause the learner to rethink and review a position or idea.

Therefore, the discussion on normalisation of digital technologies in education is not an isolated action, but a culturally situated activity, that is, a social process that develops according to social standards and contextual factors. Gomes (2015) advances the discussion as she considers normalisation as a process made up of multiple interconnected agents, rather than made up of simply technology, the teacher, or the student; each being responsible for what happens in this system as they interact with one another.

3 Ecological perspective

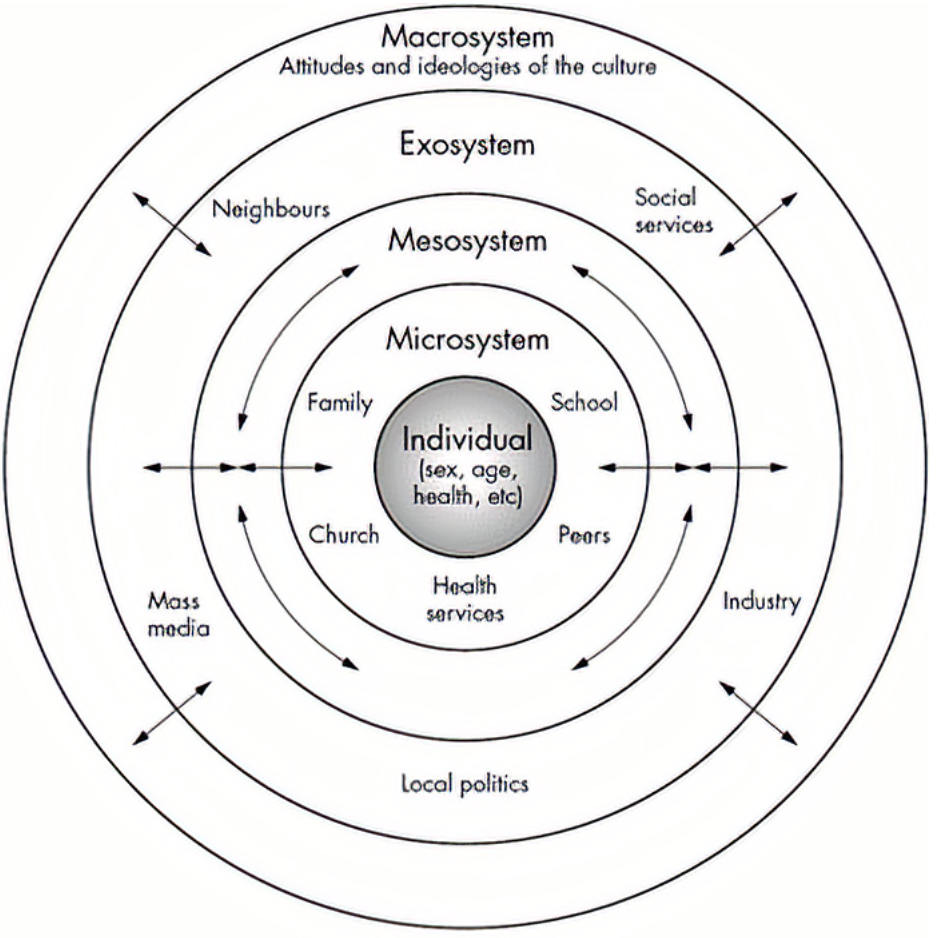
Capra (1999, p. 2) argues that "the principles of ecology should be the guiding principles for creating sustainable learning communities." In his words, being ecologically literate, or *ecoliterate*, means "understanding the basic principles of ecology and being able to embody them in the daily life of human communities."

Van Lier (2004, p. 11), an early adopter of the ecological perspective to discuss phenomena in Applied Linguistics, claims that in order to use this approach one must look at the entire situation and ask oneself what in a given environment makes things happen the way they do and wonder how learning comes about. According to Van Lier (2010, p. 4), ecology studies "the relationships among elements in an environment or ecosystem, in particular the interactions among such elements." These relationships involve physical, social, and symbolic levels, which interact in multiple ways and arrangements.

In this line of thinking, an ecological approach underscores the role of context in which language learning emerges. As the ecological approach encompasses movement, process, and action, it can embrace things that are happening all the time, in schools, classrooms, at desks and around computers; it aims to understand and recognize the complexity, interrelatedness and interdependence of all the elements within an ecosystem.

One of the earliest theories on ecological systems was developed by psychologist Urie Bronfenbrenner, who examines how human development may be influenced by different types of environmental systems. According to Bronfenbrenner (1979), there are four interrelated types of environmental systems, namely the (1) micro-, (2) meso-, (3) exo-, and (4) macrosystems. These systems within an ecological system are usually presented graphically as nested in such a way that they influence and are influenced by one another as can be seen in Figure 1.

Figure 1 – Bronfenbrenner's ecological systems theory



Source: Bronfenbrenner (1979).

As can be observed in Bronfenbrenner's representation, the four systems influence one another. The most proximal ecological level to the individual is the microsystem, which includes the settings in which individuals directly interact. The next system moving away from the center is the mesosystem, which involves processes that occur between the multiple microsystems in which individuals are embedded. The exosystem comes next and includes the microsystems in which individuals are involved but not directly embedded. Lastly, the outermost system is the macrosystem, defined

as the set of beliefs, values, and norms reflected in the cultural, religious, and socioeconomic organization of society. It influences development within and among all other systems and serves as a filter or lens through which an individual interprets future experiences. Bronfenbrenner later adapted his theory to include a broader system, which he named the chronosystem, adding time as a new element. Time is related to the historic changes in society across generations (ETTEKAL; MAHONEY, 2017).

According to Ettekal and Mahoney (2017), in recent years, scholars researching network systems have challenged the notion of nesting in ecological systems theory claiming that the nested arrangement of systems may not be the precise way to conceptualize the interrelatedness of the various systems.

We contend that Brofenbrenner's model may serve as a starting point for discussions on the ecological perspective, especially in that it can shed light on the interrelatedness of these systems if they are in nested arrangement or in network. For the purposes of this inquiry, we find it essential to look at these relations and to the manner they inform and nurture learning in situated contexts.

As can be seen, the adoption of the ecological approach to comprehend human systems is not novel, but it has gained strength with the incorporation of Complexity Theory principles. According to Capra and Luisi (2014), complexity theory has contributed to the systems' thinking and the organic conception of life, and "the strong interest in nonlinear phenomena generated a whole series of new and powerful theoretical models that have dramatically increased our understanding of many key characteristics of life" (CAPRA; LUISI, 2014, p. 14).

The ecological approach acknowledges that "all members of an ecological community are interconnected in a vast and intricate network of relationships" (CAPRA, 1996, p. 298). Capra and Luisi (2014, p. 14) add that:

> According to the systems view, an organism, or living system, is an integrated whole whose essential properties cannot be reduced to those of its parts. They arise from the interactions and relationships between the parts.

According to the authors, the ecological view has shaped a change from metaphors from the world, as a machine to the world, as a network rather than a dissociated collection of parts. In this systemic perspective,

an ecological community is viewed as a whole with an interconnected network of relationships. The focus, therefore, does not lie merely in the basic elements or components, but mainly in their organizational principles.

We share Steinberg's (2001) thoughts that the ecological perspective provides a conceptual framework within which to investigate more complex interactions between individuals and environments. The focus of inquiry in this perspective is on how different settings are linked, and the impact of these links on other systems. This is the case of this study, in which we focus on teachers' educational experiences in the ERT as an ecological system.

4 Methods

This study employs a qualitative design to investigate the integration of digital technologies in the ERT context. Since this study aims to understand how these technologies are used as a response to the challenges imposed by the COVID-19 pandemics, 76 language teachers from different parts of the country answered a quasi-structured questionnaire about their teaching practices and experiences in this context. This questionnaire included eight closed-ended questions to collect participants' demographic data (location, subjects taught, teaching levels, sector, etc.) and eight open-ended questions regarding their experience using digital technologies in ERT (tools used before and after the pandemic as well as mobile apps, their pedagogical use, challenges, opportunities, etc.), and was made available in the authors' network. Figure 2 displays the location of all the research participants.

Figure 2 Location of the participants

Source: Created by the authors on https://pt.batchgeo.com/map/59efafdc3af6f04a71e677da2901f284.

Although most participants were from Southeastern Brazil, some hailed from other regions, where they taught one or more languages, including Portuguese (language arts and as a foreign language), English, Spanish, Italian, and even Brazilian Sign Language.

Drawing on the ecological perspective, we analyze the answers to the questionnaire qualitatively to identify the networks, challenges, and opportunities that emerged as teachers experienced ERT during the pandemic. Moreover, we identify and discuss the elements and factors that impact the use of digital technologies in light of Bax's (2011) normalisation.

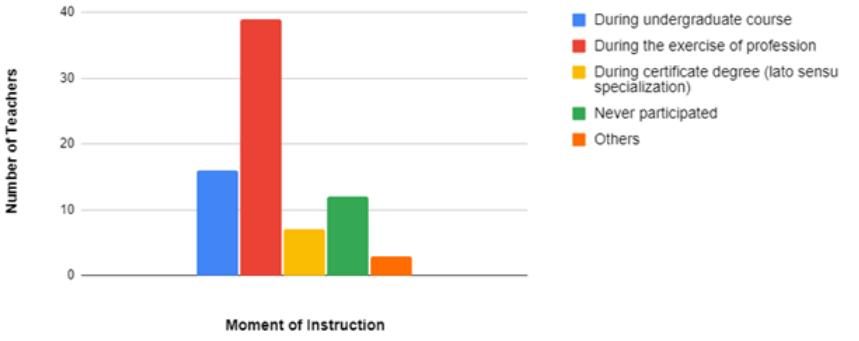
5 Findings and discussion

The 76 research participants teach different grades, ranging from K-12 to higher education in private (n = 35) and public (n = 51) schools, with some (n = 10) teaching in both. Most participants teach grades 6-9 (n = 31) and grades 10-12 (n = 32), followed by those who teach grades 1-5 (n = 18), in

language institutes ($n = 16$), and in higher education ($n = 9$). Others include kindergarten ($n = 3$), private tutoring ($n = 3$), and night school ($n = 2$).

When asked if they had had teacher development regarding the pedagogical use of digital technologies, most teachers reported having had some sort of training as part of their continuing education. Figure 3 shows the number of teachers and moment of instruction.

Figure 3 Period of time teachers received formal instruction on technology use in their teaching practice



Source: created by the authors.

While 16 participants reported having had formal instruction on the pedagogical use of digital technologies during their undergraduate courses, 49 said they only had this kind of instruction after graduating from college, 39 during the exercise of the profession, 7 during their certificate degree courses, and 3 either during their doctorate degree program, in extracurricular classes outside college, or after the pandemic started. Out of the 76 participants, 12 answered they had never participated in any teacher education initiative that could have helped them cope with ERT.

As the ecological approach recognizes that all members within a community are interconnected and establish relationship networks (CAPRA, 1996), we seek to identify the connections established by these teachers during remote emergency teaching and the potential networks that either emerged or were strengthened from the demands arising out of this context.

One of the networks identified in the data analysis shows peers (language teachers, in this case) to be the main element. If before the pandemic these teachers were recognized as apt to share experiences and resources, with the advent of ERT, these peers expanded their connections.

As they were asked in the questionnaire to show what type of support they had sought for their classes during ERT, most of the participants mentioned relying on their peers to improve their practices.

The excerpts[3] below illustrate that at different schools, there were initiatives for network formation, seeking to exchange ideas and share experiences and resources for the specific demands of ERT, which involve appropriating digital technological resources for classroom practices:

> 1) Tutorials, short courses, trial and error (or success) and interaction with colleagues. Yes, we have formed some groups for interaction.
>
> 2) I have sought support from colleagues, through calls, video calls via cell phone, exchanging ideas via email, meetings via Meet, in addition, I seek support by accessing the pages available on GOOGLE. And now, with the new teaching-learning format, according to which teachers and students must access Teams, I seek support through various means, Google, exchange of ideas with colleagues, exchange of audios, etc.
>
> 3) We have a WhatsApp group where we share experiences, courses, and tips on materials, and which has gotten stronger with the beginning of the COVID-19 pandemic. In this group, we always share courses available on the internet or being offered at other educational institutions.

Interaction with more capable peers in the use of technologies is one of the elements that most influences the normalisation process. In other words, it involves participation and interaction with peers, as well as "interaction with an expert, who actively 'scaffolds' the experience" (BAX, 2011, p. 10).

During data analysis, it was seen that the sharing of experiences and resources played an important role by nurturing and sustaining the connections among teachers, in addition to creating an interdependence among them as each individual contributed and benefited from the collective repertoire of the community. This repertoire includes the use of digital technologies and methodological discussions, which can be seen in the following excerpts:

> 4) Some online courses that were made available during the quarantine (use of tools such as Google Classroom, some extensions for Google Chrome) as well as some referrals from other colleagues in the field (sites

[3] The authors kept the translations of the excerpts as close to the original as possible.

for making mind maps, "quizzes", online summaries). In addition, some tools to create and edit videos (like Loom).

5) Courses, websites, institution training. Colleagues who already knew and used technological tools passed on their knowledge to others. We held weekly meetings in June and July 2020.

6) Well, I am taking this Training Course in Teaching Technologies, I see many YouTube videos and tutorials that help me a lot, I have also participated in other free training courses from MargiEducation. We have a WhatsApp group from the school, where we exchange information about courses and hold virtual meetings on Google Meet. All of this has helped me a lot in the use of teaching technologies.

7) I am taking courses to learn how to deal with the new tools. With my co-workers, we swapped formal preparation for the WhatsApp group.

8) I have taken several courses that address the use of technologies, both general and specific to the English language, courses, etc. I also use Google, Nova Escola, Khan Academy, and other sites that give tips and information. As for colleagues, I talk to some, we shared tips on activities we did with our students and that worked. But it is nothing formal, regarding participating in meetings or groups, we talk through WhatsApp.

As stated by Bax (2011, p 10), the "access to and interaction with sources of prior knowledge or information" is another element that impacts the process of normalisation. One of forms of access is through the use of information and tools available online and the establishment of relations and interaction mediated by social networks platforms.

It is possible to see evidence that the relations established among peers involves engagement among them which at the same time nurtures the individual needs of the teachers while strengthening the collective repertoire. Some excerpts illustrate these exchanges and demonstrate an interdependence among peers: "referrals from other colleagues in the field" (4), peers "passed on their knowledge" (5), "we exchange information about courses and hold virtual meetings on Google Meet" (6), "we swapped formal preparation for the WhatsApp group" (7) and "we shared tips on activities we did with our students and that worked" (8).

It can also be observed in the teachers' answers that the established networks branch off insofar as they connect with other networks, as is the case with participation in courses offered by other institutions, as described in excerpts 1, 3, 5, and 6. Moreover, as defended by Steinberg (2001, p. 2706),

within the ecological perspective different settings are linked because "events that take place in one setting often have ramifications for individual behavior and development in another".

Though the teachers' answers indicate that a bottom-up mobilization emerged with the teachers themselves, they recognize the importance of formal initiatives by educational institutions, both local by the schools and by other institutions, including higher educational institutions, as their networks branched off. The following excerpts illustrate the issue as the teachers were asked to mention the type of support they counted on during ERT:

> 9) The school I work at has offered several virtual support groups, where the pedagogical coordinators present tools and ideas for remote classes. They also circulate information on courses, such as this one at UFMG, so we can delve into the subject. Apart from that, I look for additional information and alternatives in specialist websites.
>
> 10) Searches; help from coworkers and from the pedagogical coordinators through virtual meetings; courses suggested in teachers' groups on WhatsApp.
>
> 11) Coworkers (sharing tips and materials); online courses at public universities; teacher development courses at work.
>
> 12) I have sought courses, lives, and tutorials on the Internet, talking to coworkers to share ideas, and read articles. My coworkers and I take part in a WhatsApp group where we promote courses, initiatives, and swap ideas.

In addition to recognizing the systems in which the local communities are nested and linked, as is the case with other teacher-preparation institutions, the survey participants interact with cultural artifacts that are available on the Internet.

We understand that teachers are integrated within an ecological community or ecosystem, which is a system nested within other systems. These social systems may include a family, a school, a village, or larger ecosystems. We agree with Capra's ideas that the human being, like any other living organism, "is an integrated whole, a living system". Therefore, digital technology integration and normalisation "arise from the interactions and interdependence of their parts." According to him, an ecosystem "is not just a collection of species but a community, which means that its members all depend on one another." In his words, the members of an ecosystem

"are all interconnected in a vast network of relationships, the web of life" (CAPRA, 1999, p. 3).

There are signs that these participants branch off their local networks when appropriating YouTube tutorials and videos (excerpt 6), Google tools and platforms, like for example Google Classroom (excerpt 4), to agentically seek a better understanding of resources for their classroom practices.

To that end, mobile technologies, particularly WhatsApp, play an important role in mediating this network. WhatsApp is mentioned as the most used social medium among the teachers who participated in this study. It warrants mentioning that the network-creation initiatives via WhatsApp in this situated ERT context appears to have come from the teachers themselves, as a teacher explains in excerpt 8: "it is nothing formal, regarding participating in meetings or groups, we talk through WhatsApp".

The appropriation of mobile technologies, in particular WhatsApp, for local interactions and the sharing of resources produced locally or in other ramifications of this network can be observed in a great number of the answers in the questionnaire and are here illustrated by excerpts 3, 7, 10, and 12: "We have a WhatsApp group where we share experiences, courses, and tips on materials, and which has gotten stronger with the beginning of the COVID-19 pandemic" (3), "we swapped formal preparation for the WhatsApp" (7), "Courses suggested in teachers' groups on WhatsApp" (10), "[we] take part in a WhatsApp group, where we promote courses, initiatives, and swap ideas" (12).

The teachers' answers with respect to the use of digital technologies before and after the beginning of the pandemic show a significant increase in the appropriation of these technologies in teaching, as can be seen in Figures 4 and 5. It is possible to notice change concerning the types of apps, which seems to suggest a situated appropriation of these tools by the teachers, mainly towards meeting the demands of the schools where they teach. If at first the teachers were using these devices, apps, and platforms commonly used in day-to-day life, with the pandemic they started to incorporate a greater number of tools, generally geared towards ERT-imposed issues, such as presentation of content in video, interactions via videoconferencing, and class management through virtual learning environments, to name a few.

Figure 4 – Digital technologies used before the Pandemic

Source: Created by the authors on https://worditout.com/word-cloud/4492277.

Figure 5 – Digital technologies currently being used

Source: Created by the authors on https://worditout.com/word-cloud/4492298.

It is worth mentioning that, although the tools that teachers reported using during ERT were already available before the pandemic, only after its onset was there a rush to incorporate ERT into teaching practices. It can also be noticed that these tools require some form of training for their use in the educational context, which in a way justifies the networks created by the teachers themselves in search of this training.

The teachers also answered a question about the ERT-oriented digital technologies they use on their smartphones. The word cloud in Figure 6, created from their answers, shows a combination of the most frequently cited tools in Figures 4 and 5, suggesting that they recognize the potential of mobile devices for mediating the use of the different resources available.

The data seems to show a flexibility on the teacher's part to use fixed and mobile devices interchangeably.

Figure 6 – Technologies used on the smartphone

Source: Created by the authors on https://worditout.com/word-cloud/4492312.

It can be seen in the cloud map that smartphones were used not only to access applications typically created for the device - WhatsApp - or that in a way connected to it - Kahoot - but also to access responsive technologies to mobile devices, such as Zoom, Google Classroom, Google Meet, and other technology artifacts. We share the idea that "mobile and fixed technologies may be used complementarity and fluidly, depending on their affordances for a given task, and the users' needs and convenience, and occupy distinct functions and niches" (BRAGA; MARTINS, 2020, p. 354).

Smartphones, often vilified in the classroom, seem, like fixed technologies, to be one of the mediation supporting agents during ERT. Although these findings are promising for scholars researching the use of mobile technologies for language learning, it is unfortunate that smartphones are not always welcome in schools. According to the answers to the questionnaire, 41 teachers say these devices are prohibited at their schools as opposed to 35 that are allowed to use it in their classes. As for the percentage of students who own smartphones, Table 1 shows that according to teachers' perceptions, a significant number of students would be able to use their own devices if allowed by school administrators, and broadband

connections were provided. Though this number also points to a certain inequity among students, teachers could resort to the smartphones available in class to promote activities in which they would help in a group task instead of being used individually by each student.

Table 1 – Percentage of students who own smartphones

Percentage	Number of teachers
Between 81% and 100%	39
Between 51% and 80%	20
Between 31% and 50%	7
Less than 30%	10

Source: Created by the authors.

When asked how they appropriated the applications pedagogically, the teachers reported using the applications to present content, review content, post content and tasks, interact with students, propose collaborative activities, and evaluate the proposed activities. The responses to the questionnaires on the pedagogical use of digital tools seem to indicate that a good number of teachers use these digital resources for these purposes, as shown in the excerpts below:

> 13) I'm using Canvas for my presentations. I made some videos at Powtoon to welcome students and present the objectives of the subject.
>
> 14) To post activity guidelines, reports, announcements, etc.
>
> 15) To give support to students with his/her questions, share the learning contents.
>
> 16) I prepared my PowerPoint lessons with animations and then saved them on video. The slides, besides the written part, had my voice recorded.
>
> 17) Zoom to teach live classes, present materials, e-mail to send activities.

The appropriation of digital tools to present content is understandable considering that they are part of the pedagogical practices of the classroom. The emphasis on this use also does not mean that teachers do not use other tools in the classroom. However, this emphasis perceived in the responses may be indicative of a more teacher-centered approach, considering that many of them only refer to the use of tools for this purpose. The use of

videoconferencing platforms, such as the Zoom pointed out in excerpt 17, as well as the frequency of tools that allow synchronous meetings pointed out in the cloud maps (Figures 5 and 6) also seem to point to a trend of classroom dynamics in which the teacher is the center of the process.

Some teachers mentioned using digital tools to send materials. In this sense, the tools serve as repositories for texts, tasks, videos, etc. The following examples point in that direction:

18) Live, posting material, tips, and content.

19) For posting texts.

20) To send weekly class content.

21) What I use most is Whatsapp, because through it I can share the recorded video lessons, links related to the use of the language, songs, curiosities. Because it is a very popular app among students, it was widely accepted.

There are also those teachers who emphasized in their responses that they use digital tools to interact (excerpts 22, 23, 24, 26, and 28) with their students and to promote collaborative activities. It is worth mentioning that, in some responses, it is possible to notice that the pedagogical use of digital tools is more decentralized and focused on the student's perspective as a protagonist when students are afforded opportunities to create their own materials (see excerpts 25, 26, 27, and 28 below).

22) Kahoot! for interactive games.

23) I use the Mentimeter for a warm-up activity or to gather students' opinions for a discussion activity.

24) Through exchange of information about students' questions during remote activities.

25) I try to make my student the central character of my class, from the texts that I must discuss in the classroom, I ask questions to motivate participation and debate.

26) Jamboard - simultaneous collaborative activities.

27) I created an Instagram for my students to post their productions, some specifically for this medium - it makes no sense to teach teenagers to make a printed poster, as they communicate almost exclusively through social networks. So I ask them to make stories or post to the feed. On WhatsApp, we exchange messages about classes, and sometimes use

them during activities - they should record audios or videos for each other, send messages, create Gifs or bitmojis on a certain subject [...].

28) To answer students' questions through WhatsApp and provide material, as well as receive activities in video and audio format.

The appropriation of digital tools for assessment purposes is also observed. The tools for creating questionnaires and quizzes are widely mentioned by teachers and seem to be used with some frequency for this purpose, as indicated by the following excerpts in which a teacher refers to the pedagogical use of these resources: "Usually, it is used to review activities at the beginning of the class and to correct exercises, in the case of Kahoot and Quizizz" and "I use Kahoot, usually, at the beginning or at the end of classes as a way to motivate students through competition and check their knowledge." The tools for creating questionnaires (Google forms) and quizzes (Quizlet, Quizz and Quizizz, shown in Figure 5), seem to confirm this trend.

When asked about the challenges they faced during ERT, teachers mentioned elements and factors that somehow proved to be obstacles. Based on their responses, we grouped these challenges into: lack of access and equipment, lack of support from institutions, lack of familiarity with digital technologies and technological training, increased workload, and worsening health conditions.

One of the most cited challenges identified in the teachers' responses was lack of Internet access and equipment affecting students and teachers alike. The precariousness of connectivity and equipment in a context essentially mediated by digital technologies invalidates the efforts of teachers and students to engage in classroom practices, triggering additional challenges, such as guiding and motivating students in these practices in the context of a pandemic-imposed home environment. The following excerpts illustrate these issues:

29) In addition to the great difficulties of digital access for families, with a lack of equipment and connection in homes, there is a great challenge for professionals and families to be able to guide and motivate students in studying in the home environment.

30) A very big problem is the internet, both mine and that of students.

31) Digital access for families, with lack of equipment and connection at home.

As emphasized by Chambers and Bax (2006), for digital technologies to become normalized in the classroom, they must be incorporated in the school's everyday life, like pencils and books. One of the factors impeding normalisation, according to Bax (2011), is the availability of and accessibility to technologies. The presence of computers in Brazilian public schools does not necessarily imply that they are available and accessible to teachers and students.

Although the data analyzed here focus on the teachers and on their relationship with technology in their pedagogical practices, the teachers' responses allow us to learn a little about who the students are and what the teachers' day-to-day school life is like in the schools where they work. As can be seen in Table 1, the teachers underscore that a sizable number of students have smartphones and could easily use these devices if their use were allowed in their schools and if internet connection were made available. Conversely, the teachers point out that a number of their students do not have access to these devices.

Viewing the educational setting where these teachers work as an ecological community, we can understand that the process of normalizing digital technologies in this context affects and is affected by a wider ecosocial system, which includes the students, their families, and their socioeconomic context. As we have already mentioned, the teachers cite lack of access to the internet and to equipment as a challenge for both teachers and students with regard to engaging in educational practices, especially in the context of ERT.

There is also evidence of using a smartphone data package as an alternative means to access the resources proposed in online classes. Although access via data package facilitates videoconferencing (excerpt 33), it is both expensive and inefficient for the intended digital materials to be used satisfactorily (excerpt 32):

> 32) Poor student internet connection and many use mobile data which has limited access to digital materials.
>
> 33) Consumption of my internet data. I create a hotspot on my cell phone to hold video conferences.

Lack of support from educational institutions is also viewed as one of the challenges teachers were faced with during ERT. According to the research participants, educational institutions gave little or no support to the process of transition and adaptation from classroom teaching to remote teaching, in addition to not offering the appropriate technological resources

for teachers and students, including equipment and internet connection. The following examples illustrate these points:

> 34) Having to learn to use many new tools on my own, without support from the school administration; [not] having internet and devices suitable for use in remote education; lack of information from administrators or too much information at the same time.
>
> 35) The schools I work in have not given the necessary support. Teachers are having to adapt the lessons and learn how to do it themselves. Also, both students and teachers are having problems with internet connection. And it hasn't been easy for students and teachers to stay in front of the screen for a long time.

Lack of familiarity with digital technologies and training aimed at their pedagogical integration are also pointed out as factors that limit teachers' performance in their classroom practices. The opportunity to interact with digital technologies in training, for example, could contribute to the process of normalisation in Bax's (2011) terms. However, the teachers' discourse suggests that no adequate training was provided to integrate technologies in pedagogical practices. In this sense, it can be affirmed that digital technologies are not yet the norm in most Brazilian schools, despite governmental initiatives to provide schools with computers and tablets and set up computer labs. We corroborate Ribeiro's (2020) assertion that providing equipment, though necessary, is not enough. These challenges, as pointed out in excerpts 36 and 37, instill feelings of insecurity in teachers, as shown in excerpts 38 and 39 below:

> 36) Lack of knowledge of digital tools, such as adapting content that was used in person to online platforms.
>
> 37) Challenge to learn how to use technologies and develop active learning methodologies.
>
> 38) Fear of not being able to cope with this new way of teaching.
>
> 39) The initial challenge was to overcome the barriers of insecurity, self-criticism in relation to my image and voice in the recorded classes, the feeling of being exposed to all families, the fear of not being able to adapt [...].

Teachers also report that ERT is more time consuming; this almost-full-time dedication in front of a computer has taken a toll on their health.

There are signs that institutions have devised new mechanisms to determine whether the teacher is effectively teaching the class and even planning classes during this period, as excerpt 40 points out. Long exposure in front of the computer as harmful to health is pointed out in the example 42 and 43:

> 40) With remote teaching, my work has tripled. There is more bureaucracy to prove that the classes have taken place and this means that we have to do several extremely detailed plans and reports.
>
> 41) Increased time for preparing classes [...].
>
> 42) The biggest challenges are in relation to physical health and adequate equipment. Incorrect posture, back pain, hands, spine [...] we were not used to the excessive use of these technological tools.
>
> 43) Hours in front of the computer, I have no working hours, it is all day, schools do not respect working hours, requirements for innovating in class.

According to the teachers, keeping students engaged during synchronous classes is also a big challenge since students, especially in elementary school, show interest in the tasks at the beginning of the class, but their minds quickly tend to wander (excerpt 44). In addition, few students actively participate in classes (excerpt 45). Teachers also point out other difficulties, such as monitoring and controlling student participation (extracts 46 and 47).

> 44) Having their attention and interest in the subject; most of the time, the beginning of the class is exciting because of the meeting, but then they lose interest because we are distant. This usually happens to minors (middle school students).
>
> 45) Student participation in synchronous meetings. Only a few manifest themselves more actively on virtual platforms.
>
> 46) But I feel that the biggest challenge is the distance from the students. Remote education allows us to monitor students' activities and performance more closely, but personal life, which interferes a lot in school, has not been so closely monitored.
>
> 47) The biggest difficulty is actually controlling who participates in classes remotely, often parents are not able to guide their children very well and end up not giving much importance to absences or not sending activities.

When asked about their takeaway from this experience with digital technologies when they return to face-to-face classes after the pandemic, the

participants stated that the ERT experience would always be remembered and would certainly have a lasting impact on their face-to-face classes.

The use of digital technologies in this context seems to have destabilized classroom practice in such a way that teachers had no choice but to learn to use some digital resources on the fly to teach ERT classes, a process in which they had to 'build the plane while flying it.' In this sense, the peer-created network and its ramifications as well as its interaction with other networks - institutions that offered training, social media and technological resources, etc. - supported the 'learning-by-doing' process that these teachers experienced and fostered teacher development in the use of digital technologies. The following excerpts demonstrate that the participants in this study realized that the experience during the ERL is bound to bring about change to their post-pandemic practices:

48) There is no way I'll be the same teacher or give the same classes after everything I learned and did with my students. I will make my classes more dynamic, while still being a meaningful learning experience.

49) I'll take with me the countless possibilities of using technology! Unlike many colleagues, I knew very little about these uses and was very resistant to using those that anyone recommended to me!

50) In contact with the tools, it was possible to revisit my classroom teaching practices and translate them into the virtual environment, seeking to build a network of dialogue with students and curricular content in a creative and meaningful way, as well as considering hybrid teaching as a not-so-scary possibility.

51) I realize that the classes are more interesting, both for the students and for me! It has been fun to prepare them, and it is very gratifying to see the students' engagement in the proposed activities. In addition... I don't think we'll ever return to teaching in the same way. In my opinion, the pandemic accelerated a change in teaching paradigms; necessity made us update our teaching practices.

52) With endless technological resources available to enable us to interact and share knowledge, which I had never imagined, I believe that from now on there will be no face-to-face education without the use of technology that greatly enriches this exchange of knowledge. At first, at least for me, it was a little scary. Now I'm trying to qualify for this new normal. What I think about is the cultural and social diversity that exists in our country that makes the use of all this technology quite complex.

Analyzing the teachers' responses allows us to have positive expectations regarding the pedagogical use of digital technologies upon return to post-pandemic classes, as pointed out in the excerpts in which the teachers feel more prepared for this integration: "There is no way I'll be the same teacher [...] after everything I learned" (48); "I'll take with me the countless possibilities of using technology" (49); "I don't think we'll ever return to teaching in the same way" (51). However, it is not possible to generalize this "new normal" because these are perspectives based on teachers who somehow successfully overcame ERT-imposed challenges, relying on the support of a network of peers while developing skills that allowed them to use digital technologies in their practices. At the same time, we cannot ignore the potential training opportunities that took place during this period regarding the use of these technologies. Thus, in line with Bax's (2011) normalisation factors and elements, the findings in this study indicates that normalisation was triggered or accelerated during this period.

Adopting an ecological perspective calls for conceiving of the educational context as part of a wider ecosocial system (MARTINS, 2008), which entails conceiving the process of normalisation of digital technologies as too complex and multifaceted a phenomenon to be understood through a single lens only. As discussed by Larsen-Freeman (2002), one must look at phenomena from different angles due to their complex, dynamic, and ever-changing nature.

From the participants' responses, we can tell that technology is becoming increasingly normalized in the context of the pandemic. This conclusion, however, cannot be generalized, considering that in different contexts, with different teachers and students, the results may differ significantly, even if the same technologies are available.

As Bax (2011) points out, access to and interaction with sources of knowledge or information contribute to the process of technology integration and normalisation. This can be seen in the following snippets from the excerpts above: "In contact with the tools, it was possible to revisit my classroom teaching practices" (50) and "With endless technological resources available that enable us to interact and share knowledge, which I had never imagined" (52).

Teachers' reports seem to indicate that these interactions served as scaffolding and played a significant role in their process of appropriating technologies, which would allegedly tend to influence their practices in the

post-pandemic period. In addition, they recognize that they will no longer be the same teachers after what they have learned (48) and that their practices have been reframed throughout this experience (50). Based on that, we dare say that the established networks have become agents in the process of teacher development with regard to the use of technologies.

As stated by Bax (2011), the normalisation of digital technologies in education benefits from access and participation, as well as from expert intervention. Access and participation involve interacting with prior knowledge or information as well as interacting with others. Expert intervention involves interacting with an expert who 'scaffolds' the experience and exemplifies in his/her own behavior, as well as challenges in a way to cause a review of a position or idea.

Through the ecological perspective, speeding-up the process of normalisation within the investigated group of teachers can influence other systems, such as the students, the school, and the classroom, not only in remote teaching, but also upon the resumption of face-to-face teaching, as a few participants in this study point out. Although there is an interdependence between these systems, as they are in evolution, one cannot pinpoint to what extent the speeding-up of the acceleration of the digital technologies will influence the practices of teachers in other systems, since the systems' dynamics act and react as they evolve. Moreover, as Bax points out (2011) the stages of the normalisation process may vary depending upon the type of technology and context. Hypothetically, the normalisation in technology use can have little impact, if any, on a class in which students are savvy regarding its use. At the same time, classes can become more meaningful and interesting, which in turn may lead the school to invest in equipment and more equipment, but this influence is neither linear nor foreseeable. The speeding-up of teachers' normalisation is not directly related to the normalisation of other systems.

To understand digital technology normalisation as an ecosystemic process, we need to take into consideration the relationship among the members of the ecological community. Thus, new studies are needed to confirm this normalisation trend during the pandemic and its possible impact on the network of interdependent systems - students, school, etc. - considering that this study focused on the experiences of a group of teachers. The process of integration and normalisation of digital technologies in education needs to consider the broad ecological network that comprises this context.

6 Final Remarks

In this study, we investigated the integration of digital technologies in the context of the ERT in order to understand how these technologies are used in the teaching practices and experiences as a response to the challenges imposed by the COVID-19 pandemic.

Using an ecological approach, we have sought to identify the networks and connections established by teachers during emergency remote education and the possible networks that have emerged or that have been strengthened from the demands emerging in this context. One of the networks identified in the data analysis has professional colleagues as main elements, in this case, language teachers. This network, which emerged spontaneously, seems to have a significant role in teacher development regarding the pedagogical use of digital technologies.

Mobile technologies, especially the WhatsApp application, play a key role in mediating this network. This application is singled out by the research participants as the most used social space for interactions among teachers who participated in this study. It is worth mentioning that the initiatives to create networks via WhatsApp seem to have started with the teachers themselves, who configured the networks as a virtual teachers' lounge, a space for socialization, and the exchange of experiences during ERT.

The networks established in this context are presented as nested systems. Teachers are part of an ecological community that is nested in other systems, or ecosystems. We therefore underscore not only the nested organization of the systems, but also the interrelation between such systems and their network organization. This organization makes the systems relate to and influence each other, which can have a positive impact or limit the events and practices in these networks. We can underscore, by way of example, the social and regional inequalities that exist in the country, which create uneven conditions to access technological resources. This, in turn, directly influences the process of normalisation of these technologies in the educational context.

We believe that the interaction with peers who were able to actively 'scaffold' the experience during ERT may be an indication that all the elements discussed in Bax (2011) - access, participation, scaffolding of the peers - have contributed to triggering or accelerating the normalisation process of digital technologies.

As Coscarelli (2020) points out, in this pandemic context, we were led to rethink our practices and try other methodological approaches and technological resources, affording "a great opportunity to do things differently, to put into practice the education we have always dreamed of" (p. 107).

As the ERT experience draws to an end, teachers will naturally feel tempted to return to the way things were before the pandemic. In this process of accommodation and self-organization, and in this space between conservation and change, new standards in education may well emerge.

These turning points must be thought of not as a full-blown rupture but rather as a process of destabilization and reorganization out of which something new is born, even as it finds some resistance or opposition. And the aftermath, some sort of accommodation is involved, something in between that will likely emerge from what we were and what we have experienced during ERT.

In seeking to address teachers' experiences regarding digital technologies, we have chosen to focus solely on one of ERT's multifaceted issues. In this respect, referring to ERT as "the elephant in the (class)room" may still apply if one is to investigate other issues that have emerged and will still emerge within this context, considering that the discussions on teachers' experiences and normalisation presented here configure but a single glimpse of 'the tip of the elephant's trunk'.

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Author's contributions

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