Teaching strategies mediated by information and communication technologies: a systematic review of pandemic dossiers

ARTICLE

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Abstract
This article is based on the dissertation *Teaching Strategies Mediated by Information and Communication Technologies: A Systematic Review of Pandemic Dossiers*, which aimed to analyze educational research carried out during the COVID-19 pandemic, when teachers and students needed to resort to Emergency Remote Teaching to continue their studies. Thus, the study identified and analyzed teaching strategies mediated by ICT. Thematic dossiers were used for the investigation, with theoretical support from authors in the area. The methodology consisted of a Systematic Review to explore the generated data, systematized into categories, based on Bardin. The results and discussions led to the conclusion that ICTs are important for teaching-learning as auxiliary tools and not an end in themselves.
Keywords: Systematic Review. Information and Communication Technology (ICT). Emergency Remote Teaching (ERE). COVID-19.

Estratégias docentes mediadas pelas tecnologias de informação e comunicação: uma revisão sistemática de Dossiês Pandêmicos

Resumo
Este artigo foi gerado a partir da dissertação *Estratégias docentes mediadas pelas tecnologias de informação e comunicação: uma Revisão Sistemática de Dossiês Pandêmicos*, que analisou pesquisas educativas realizadas durante a pandemia de COVID-19, quando docentes e discentes precisaram recorrer ao Ensino Remoto Emergencial para continuarem os estudos. Assim, o estudo identificou e analisou estratégias docentes mediadas pelas TIC. Foram utilizados dossiês temáticos para a investigação, com suporte teórico em autores da área. A metodologia constou de Revisão Sistemática para explorar os dados gerados, sistematizados em categorias, baseada em Bardin. Os resultados e discussões levaram à conclusão de que as TIC são importantes para o ensino-aprendizagem como ferramentas auxiliares e não um fim em si mesmas.
Palavras-chave: Revisão Sistemática. Tecnologias de Informação e Comunicação (TIC). Ensino Remoto Emergencial (ERE). COVID-19.

1 Introduction

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The year is 2020 and the situation is strange, to say the least. This is due to a virus called COVID-19 (SARS-CoV-2), discovered in China, in the city of Wuhan, in December 2019. The world almost came to a standstill as social isolation was decreed for all countries affected by it, including Brazil. This often lethal virus has generated a pandemic of major proportions, comparable only to the Spanish flu of 1918/1919, which ravaged the world at the time, causing millions of deaths.

Faced with this scenario of isolation imposed by the world's health systems, there were drastic changes in people's quality of life. The order was to stay at home to prevent the spread of the disease and minimize the damage to people's health. As a result, many workplaces were closed, including schools and universities. Face-to-face teaching was to be disrupted in the lives of teachers and students at all levels of education and replaced by Emergency Remote Education (ERE). This was a quick and indispensable response to maintain learning at a time when public health and safety were at risk.

As its name suggests, ERE works on an emergency basis. Therefore, it cannot be considered Distance Learning, as it is not based on pedagogical theories. The practices and strategies used during the pandemic period were improvised to assist students and help them continue their studies. Thus, due to the need to create a new form of learning, now remote, teachers and students were forced to use the available technologies to continue with classes. This has had a significant impact on their daily lives and on the daily lives of schools and universities

As Moreira and Schlemmer (2020, p. 9) state,

> [...] Emergency Remote Education is, in reality, a temporary education model due to the circumstances of this crisis. It involves the use of fully remote teaching solutions identical to those practiced in physical environments, and the main objective in these circumstances is not to recreate a robust online educational ecosystem, but rather to provide temporary and rapid access during the emergency or crisis period.

Thus, "in this context, the discourse of remote teaching stood out, understood as a possible response, albeit improvised, to the challenge of continuing academic activities in the face of the impossibility of face-to-face activities" (Saldanha, 2020, p. 126).

Class topics, as well as books, handouts and videos, for example, were reorganized and made available in different applications (digital tools) on social networks, such as *WhatsApp, Facebook, Google Classroom, Google Meet*, among others. Classes then became synchronous (in real time) or asynchronous (non-simultaneous), with the aim of maintaining a possible rapprochement between teachers and students, even if they were isolated in different home environments. This allowed dialogue and interaction to continue, thus enabling the systematized construction of knowledge.

However, as with any issue there are at least two sides to it, there were limitations to this type of teaching, not only physical, but also social and emotional. These included access to classes, often hampered by the lack of adequate internet for both teachers and students; the often inadequate learning environment, due to problems with the student's home environment, creating difficulties in maintaining their study routine; anxiety; lack of interaction between the school community; difficulties in using teaching platforms, as well as challenges when it came to assessing student performance.

With regard to this last item, the assessment had to be carried out in a specific way and targeted at the skills developed by the students, be they in terms of content or interaction/cooperation with the teacher or classmates, considering that they were all in different environments, interconnected only by the image reproduced on the screen of a cell phone, tablet or computer. The (synchronous/asynchronous) activities indicated by the teachers to the students had to be commented on, taking care to keep the students' self-esteem high in the face of errors, in an effort to facilitate the distance learning process.

Given this scenario and initial considerations, the research that led to this article is called *Teaching Strategies Mediated by Information and Communication Technologies: A*

Systematic Review of Pandemic Dossiers[1]. Its central objective was to analyze what had already been commented on in the scientific literature on the subject. The study was organized around a systematic process, searching for dossiers and a bibliographic survey, with the option of a Systematic Review. A time frame of *pandemic dossiers* was used, with the help of filters to define the sample, previously discussed in relation to the study's objectives.

For the analysis, we considered the research selected through inclusion and exclusion criteria present in the dossiers examined, so that they could be analyzed in the medium/long term and could, in some way, contribute to the debate on future public policies in the area of education in the country.

The motivating question for the study to take shape was the following: what were the pedagogical practices mediated by ICT in the pandemic and post-pandemic periods? Based on this question, the general objective was outlined, through which teaching strategies mediated by ICT were investigated as described in the articles selected for analysis, during the period from June 2020 to July 2022.

The study's specific objectives were: to identify the general characteristics that make up the research *corpus*; to organize the information from the articles in the *corpus*, such as: a) keywords, b) object of the research, c) approach, d) study participants, e) technologies used by teachers in their practices, f) research collection instrument, g) teaching network and modality, h) results and final considerations.

The challenge was therefore to investigate what was being done empirically in schools with the help of Information and Communication Technologies (ICT) during the period of social isolation between 2020 and 2022, based on the articles published in the *Pandemic Dossiers* during this period.

2 Methodology

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[1] A dossier is a set of documents containing information on certain subjects or people. In this study we call *Pandemic Dossiers* those Thematic Dossiers that aggregate/publish research developed on and during the pandemic between the years 2020 and mid-2022.

The methodological path taken by the study involved a Systematic Review (SR) of *pandemic dossiers* published from June 2020 to July 2022. This type of methodology was chosen because of its relevance, since it allows important information on the subject to be gathered and analyzed, even though research on the subject was just beginning to appear in the scientific literature.

RS has the characteristic of identifying and selecting, in an orderly fashion, studies relevant to the topic, with the aim of answering a specific question. Thus, according to Sampaio and Mancini (2007, p. 149), "[...] the systematic review is the best option for new or little explored topics, as it allows a more detailed and complete analysis of the available evidence, providing a broad and up-to-date view of the topic".

The Systematic Review (SR) does not seem to be widely used in the field of education yet, and is more frequently used for research in the medical field (Minayo, 2026). The Systematic Review, up until the moment the research presented here was carried out, has not been a common methodological option in investigations in the field of education[2], which are mostly qualitative in nature. However, Minayo (2016) validates this option by stating that qualitative and quantitative approaches are not opposites, but complementary.

The support drawn from authors such as Minayo (2016) and Sampaio and Mancini (2007) was fundamental to the methodological path taken. Both authors argue that SR should compare selected studies for a specific intervention, identifying relevant concepts, aiming for a conclusion based on the literature.

Another contribution that defines the SR is that of Medina and Pailaquilén (2010, p. 7) when they state that "researchers need the Systematic Review to summarize existing data, refine hypotheses, estimate sample size and help define agendas for future work". Thus, based on the analysis carried out, it is also possible to find issues that require (new) research, due to existing gaps or propositions, through these empirical studies.

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[2] In the initial search for texts and authors on the Systematic Review, sparse texts were found that used this methodological option in the area of education, and more results were obtained in other areas of knowledge, such as health.

As for the study's approach, this is a quantitative-qualitative study, as it uses metrics to select articles, creating a corpus[3] of analysis based on inclusion/exclusion criteria. The *Pandemic Dossiers* were selected using *Google Scholar*. It is important to note that this database was selected because it indicates the references cited in the papers, prioritizing relevant metrics for the selection of the dossiers. In addition, *Google Scholar* is an uncomplicated and fast-response tool, allowing access to a large number of studies, including those from some universities and repositories such as SciELO, among others.

The quantitative-qualitative approach found its place in this research because, through SR, different studies were surveyed and inclusion and exclusion criteria were selected, which proved to be fundamental for understanding the empirical evidence present in the articles that make up the thematic dossiers related to the pandemic.

Sampaio and Mancini (2007, p. 85) state that in order to start a review we need to follow a few steps, a research protocol with the following phases/planning: (1) Definition of the research question; (2) Construction of the review protocol, in which the descriptors and databases in search of evidence are defined; (3) Selection of the search previously planned in the review protocol, with organization and storage of the texts retrieved in appropriate places, review and selection of research; (4) Extraction, among the dossiers researched, the most appropriate to answer the research problem, applying the inclusion/exclusion criteria previously defined, in addition to analysis and categorization of the study; (5) Survey and synthesis of data, interpretation and presentation of results. Thus, by indicating the stages of the research, the authors intend to strengthen the methodological option of the Systematic Review as a path that is rigorous and reliable in the face of research.

Thus, the study in question, by considering the reports of those involved in the teaching and learning process (teachers and students) found in the dossiers analyzed, sought to understand some aspects of remote teaching aided by ICT in the midst of the COVID-19 pandemic. This data is listed in the dossiers/articles analyzed through

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[3] Initially, 12 *Pandemic Dossiers* were collected in the period indicated by the study, i.e. from 2020 to July 2022. Of this set, 28 articles that make up the dossiers were analyzed.

Systematic Review processes, with an emphasis on teaching strategies mediated by Information and Communication Technologies and their developments.

3 Results and discussion

Kenski (2012) points out that the evolution in the use of Information and Communication Technologies (ICT) has transformed the contemporary world, especially in relation to ways of relating and communicating. Thus, for the author, ICT facilitates and enhances the various forms of learning.

However, it is necessary to pay attention to the fact that social inequalities often do not allow both actions (facilitating and enhancing) to be developed, especially among the less economically favored sections of the school-age population.

Pretto, Bonilla and Sena (2020, p. 2) point out that:

> Without schools, students of all ages and from all social strata theoretically stay at home. We say theoretically, because we can't minimize the debate about the housing and living conditions of the Brazilian population. In a country with enormous social inequality, such as Brazil, it is necessary to specify that the home, for the middle and upper classes, is a building with several rooms, which allows arrangements for the development of individual and collective activities; for the lower classes, the home is often a single room, where many people live, from children to the elderly, which makes it practically impossible to stay in this space all day, or to develop any type of activity that requires a minimum of concentration and dedication.

The fast pace of Emergency Remote Education (ERE) has led to a rapid need for both subjects and school institutions to adapt. This is because the use of ICT has proved to be a challenge in terms of maintaining collaboration, creativity and critical thinking throughout the teaching and learning process. This is because teaching means developing the student's critical capacity, leading them to interpret the reality that surrounds them and thus develop their autonomy (Freire, 2019).

In relation to the autonomy factor in the teaching process, it is essential that teachers are also aware of what is happening around them and that they embrace technology not as a solution to all academic problems or yet another emergency

educational device, but with a critical-reflective attitude. This attitude is fundamental to the development of a more aware, just and democratic society. Thus, faced with the new challenges that the health crisis caused by the COVID-19 virus has imposed on society and the educational process, it is possible to agree with Pretto (2012) when he states that technological resources can no longer be ignored as learning tools. It is therefore necessary to learn how to deal with the new, combining it with what already exists, so that everyone can benefit from it.

In 2021, teachers and students began to interact in the classroom again, but as there was still the danger of contamination from the virus, the decision was made to bring on a hybrid fashion into the school space, defined by Moran (2015, p. 21) as:

> hybrid means mixed, blended. Education has always been mixed, hybrid, it has always combined various spaces, times, activities, methodologies, audiences. This process now, with mobility and connectivity, is much more noticeable, broader and deeper: it's a more open and creative ecosystem. We can teach and learn in countless ways, at all times, in multiple spaces.

In the post-pandemic period, teaching and the role of the teacher had to be reframed. The teacher became more and more the mediator of this knowledge between himself and the student, thus favoring dialogue, interaction and learning.

By critically observing both types of teaching - emergency remote and hybrid - it is clear that the crisis situation in education generated by the pandemic has somehow favored the use of ICT in pedagogical practice, bringing more flexibility to traditional teaching. Challenged by the pandemic and post-pandemic scenarios, teachers have been forced to change their pedagogical strategies in order to be able to teach their classes, which are now held remotely and/or on a hybrid fashion. As a result, both their autonomy and that of their students has been favored by the use of ICT, whether working together online or face-to-face.

In order to ratify the analysis of the results, i.e. the *corpus* of articles contained in the *Pandemic Dossiers*, making it reliable in the light of education research, it was necessary to resort to Bardin (1977), who proposed a Content Analysis method. For the author, categorization "has as its primary objective [...] to provide, by condensation, a

simplified representation of the raw data" (Bardin, 2011, p. 119). Based on this, it was possible to dissect the texts into categories.

The author also points out that the data relating to the objects of study is qualitative and, at the same time, indispensable in content analysis, given that it deals with opinions, beliefs and values. Therefore, this analysis matrix provides for the categorization of recurrences and non-recurrences.

Thematic or categorical analysis was used to process the data, which "works by breaking down the text into units and categories according to analogical groupings" (Bardin, 2011, p. 114). However, it was necessary to resort to the exercise of categorization by induction, since there were no previous categories for analysis.

Regarding Content Analysis, Chizzotti (2010, p. 114) corroborates when he says that

> Content Analysis is one of the different ways of interpreting the content of a text that has been developed, adopting systematic rules for extracting thematic meanings or lexical signifiers from the simplest elements of a text.

In agreement with these authors and adopting Bardin's (2011) technical process, the data was organized, i.e. the research *corpus*, which, according to the author, "[...] is the set of documents taken into account to be subjected to analytical procedures" (Bardin, 2011, p. 96); this is because it is important that the corpus is representative of the universe to be discussed and that it is conceived consistently in relation to the object of study in focus.

According to the author, a good category should be made up of homogeneous units of analysis that are pertinent to the study's objective. Homogeneity is directly linked to the similarity of the elements grouped in the category, while relevance refers to the category's relationship not only with the objectives, but also with the research problem. After clarifying some of the phases of content research, still based on Bardin (2011), and having identified the results/conclusions framework, the material was classified into categories. This is because grouping the subjects of each document researched into categories makes it possible to answer the research question and achieve the objectives set.

The final, refined categorizations were based on the corpus and the objectives of the study. From the 12 *Pandemic Dossiers[4]* established by the Systematic Review process for the research *Teaching strategies mediated by information and communication technologies: a Systematic Review of Pandemic Dossiers*, categories were constructed that emerged from the analysis of the 28 articles that make up these selected dossiers, at the intersection of the descriptors, the theme and the objective of this study. After reading the texts, five categories were constructed, namely: (1) Technological artifacts; (2) Pedagogical practices; (3) Infrastructure; (4) Rights/duties; (5) Teacher training.

The category with the most recurrence in the articles referred to **technological artifacts**. The opinions of teachers, Pedagogy students and others were almost unanimous in stating that ICT has helped teaching a great deal, especially during the pandemic, and continues to be re-signified in the educational field. This is due to the fact that their use is broadened when they are used to prepare lessons, obtain information/entertainment and communicate.

However, it is important to be aware of their limitations, since they are not the solution to all social and educational problems and must be considered in the contexts and realities to which they belong, as Kenski (2012) warns. Thus, the work of the teacher, with the help of technological artifacts, must be taken into account, since it is the teacher who commands the learning situation, and not the technology itself. Cupani (2016, p. 8) reinforces Kenski's (2012) position by stating that

> [...] ICTs are a complex reality that involves multiple aspects, from technical issues related to the production and operation of devices, to social, cultural and political issues that involve their use and appropriation by different social groups.

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[4] These are the Pandemic Dossiers in the study: **(2020)** Revista Científica Educ@ção, n. 8; Brazilian Journal of Policy and Development, n. 4; Revista HOLOS, v. 5; Dialogia, n. 36; Diálogos e Perspectivas Interventivas, n. 10484; **(2021)** Cenas Educacionais, n.10956; Revista Educar Mais, n.1; Revista Humanidades e Inovação, n.61; Revista Práxis Educacional, n.45; Revista Devir Educação, edição especial; **(2022)** Revista da FAEEBA, n. 65; Revista de Estudos em Educação e Diversidade, n. 8.

In this sense, classifying ICT only as artifacts may be a mistake, in order to understand the complexity of these technologies and their multiple social implications.

The second category that emerged from the analysis was **pedagogical practices**, much discussed by teachers and school managers during the pandemic. The "will to do" factor was decisive in ensuring that school education did not grind to a halt. For Schön (2000, p. 33), the educational process focuses on reflection-in-action, which:

> [...] it has a critical function, questioning the structure of assumptions of the act of knowing-in-action. We think critically about the thinking that led us to this difficult situation or this opportunity and, in the process, we can restructure our action strategies, our understanding of phenomena or our ways of conceiving problems.

Thus, at such a confusing, disconcerting and dangerous time for everyone, the role of teachers has intensified, leading them to reflect on their daily practices and to reconsider the use of ICT, in the urgency of the pandemic, as working tools and not just as technological artifacts.

In addition to pedagogical practices, the research also identified, through its *corpus*, that one of the most used technological artifacts was printed material, such as handouts, followed by digital platforms and, in general, ICT. This was because many students did not have access to computers and other technologies. Therefore, the teachers prepared materials to be given to the students, once again an effort attributed to the school community and especially to the teachers.

The emphasis on the printed material used in these works brought us back to technological and scientific knowledge. According to Cupani (2016, p. 172), "analogical thinking is particularly useful when adapting the resources of an existing artifact in the production of a new one". Having said that, we rethink the importance of using technologies, Information and Communication Technologies (ICT) and Digital Information and Communication Technologies (DICT) in a pedagogical way, with the accessory emphasis on technologies, where the main thing is pedagogical, that is, the work of the teacher, always taking into account the needs and objectives of the students and their school context.

Another category that emerged from the articles analyzed in the *Pandemic Dossiers* was the lack of investment in school **infrastructure**, an aspect that directly harms the quality of education when public policies fail to meet demands. This highlights a recurring problem in many Brazilian schools, especially in public schools and in socio-economically disadvantaged regions. This is because inequalities harm those students who are less favored by the system, whether due to the absence or lack of internet access, or difficulties in organizing a good study environment, especially during the pandemic period, which can lead to demotivation/disinterest in studies.

It is possible to agree with Freire (2019, p. 95) when he states that "the equipment necessary for pedagogical work is available in public schools, without which it becomes almost impossible to develop quality work". Therefore, talking about infrastructure means talking about the need for schools to receive more attention from governments and public authorities, with more robust and systematic investments.

Rights and obligations were also part of the categories analyzed in this research. It is a fact that the pandemic period has brought paradigm shifts to the teaching and learning process. The teacher, once supposedly the holder of knowledge, is now the mediator of learning between themselves and the student. During the COVID-19 pandemic, families have also taken on the role of mediators between students and their teachers, in an effort to ensure that education, at all levels, is not lost. This is because the right to education is fundamental in a society that values democracy. To corroborate this point, Saviani (2013, p. 35) states that "the right to education is a universal right and must be guaranteed by the State, but it is also the duty of society as a whole to ensure that this right is realized". This is a factor in raising awareness and consequent change.

The fifth category, **Teacher training**, underpins the previous ones commented on and structured in the study. Quality initial and continuing training is one of the demands of education. During and after the pandemic, this demand was strengthened, as teachers began to reflect more acutely on their role in the daily life that involves the teaching and learning process. Thus, questions arose among teachers about how to mediate the act of teaching and how they could improve their academic training, in an attempt to deal with the

new forms of teaching mediated by ICT, not only in the virtual environment during the pandemic, but also in the hybrid teaching that succeeded ERE in the post-pandemic period.

Therefore, *cyber-training* for teachers would be necessary and welcome, given that this new process - the intensive use of ICT and its environments - has brought insecurity due to the unpreparedness faced during the pandemic. Nóvoa (2009, p. 15) states that "teacher training is not a set of technical answers, but a space of social construction, a place of culture, a place of practices, a place of reflection, a place of professionalism", which is indispensable for reviewing and reframing pedagogical practice today.

4 Conclusions

The research that led to this article had the investigative focus of analyzing teaching strategies mediated by ICT, through the Systematic Review of articles that make up *Pandemic Dossiers*. With this, we also reviewed behaviors that emerged from that uncertain moment of pandemic that affected many people in different societies. Teaching, which until then had been face-to-face, became emergency teaching (ERE) and was mediated by information and communication technologies (ICT).

In this way, the research was able to help emphasize that there were many changes in the educational community during the pandemic and post-pandemic, and the new habits incorporated during this period directly influenced teachers, students and families. Thus, we highlight the issues that permeated this study, both negative and positive, such as: the paradigm shift in teaching, where the teacher is not the center of knowledge; the need to adapt to a new form of pedagogical interaction mediated by ICT; the emergence of emergency remote education (ERE) due to transactional distance and social isolation; the experience gained with synchronous and asynchronous classes; the challenges faced, such as the lack of adequate equipment in schools and universities and structural problems. This is reflected in the reality of students without internet, without cell phones, computers/notebooks, and in unsatisfactory housing situations, where there is a

lack of space to study. Faced with this scenario, there is an urgent need for investment in infrastructure and teacher training.

ICT can help and make lessons more dynamic and attractive, but it does not replace the role of the teacher. Some teaching practices were mirrored, others were reframed and interdisciplinarity was evoked in teaching practices. Lessons are now planned in a shorter timeframe. However, printed material prepared by teachers for those who didn't have easy access to the internet was produced, resulting in a necessary coexistence of new and "old" technologies.

During the remote teaching period, various practices emerged, such as: the production of videos for young children; access to virtual learning platforms such as *Google Classroom, Microsoft Teams, Moodle*, among others, to organize the activities and interactions of students and teachers in a single online place; concern about student dropout and abandonment; the issue of assessment that should be rethought collectively; and reflections on the instrumental and technicist perspective of technologies, with the urgency of considering the critical and reflective perspective of education, not only with the concern of how to use technology, but what to use it for.

In view of the above, it is clear that we need to pay attention to the different conditions that teachers and students face in their daily practices in such diverse school spaces, and that we need to take into account the diversity of geographical conditions in a country like ours when it comes to the quality of education.

We can say that, thanks to the teacher's work, it was possible to continue the lessons. With their holistic, multiple and multifaceted approach, the teachers were able to get the students to resume their studies through ICT mediation. The teachers involved the areas of knowledge, skills, competences and interaction, seeking to promote the all-round development of the students, because technologies are not an end in themselves; they create and recreate needs, they bring comfort, but the pedagogical reflection will always be the teacher's. In this sense, this study highlights the importance of ICT.

In this sense, this study highlights the importance of the critical-reflective exercise, as it is essential to contextualize education in the new means of teaching. This aims to

ensure that those who depend on it - teachers and students - feel included and committed to the search for a quality school, both in what they teach and in what they learn.

It is therefore important to point out that, despite all the setbacks faced during the pandemic, the aim of the research was achieved. We therefore continue to be aware of the fact that, with adequate and quality public policies, the school structure can be strengthened. This, in turn, will also strengthen teaching practices, with the help of new technological artifacts, respecting the rights and duties of teachers and students.

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