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Teachers' perceptions of technological pedagogical knowledge in a continuing education course

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Abstract: The aim of this study is to understand the perceptions of teachers of technological pedagogical knowledge. For this purpose, we used the instrument "Analysis of the development of digital skills in a continuing education course using the TPACK model", applied between August 15 and 31, 2023. The results show that teachers understand how to use digital tools to facilitate the teaching-learning process.
Keywords: Digital Information and Communication Technologies; Continuing Teacher Training; Pedagogical Technological Knowledge.

Percepções docentes sobre o conhecimento tecnológico pedagógico em um curso de formação continuada

Resumo: O objetivo deste estudo é compreender as percepções dos docentes sobre o conhecimento pedagógico tecnológico. Para isso, utilizamos o instrumento “Análise do desenvolvimento de competências digitais em um curso de formação continuada utilizando o modelo TPACK", aplicado entre dias 15 a 31 de agosto de 2023. Os resultados mostram que os docentes compreendem como usar ferramentas digitais enquanto facilitadora do processo de ensino-aprendizagem.
Palavras-chave: Tecnologias Digitais da Informação e Comunicação; Formação continuada de professores; Conhecimento Tecnológico Pedagógico.

Percepciones de los profesores sobre los conocimientos pedagógicos tecnológicos

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en un curso de formación continua

Resumen: El objetivo de este estudio es conocer la percepción de los docentes sobre el conocimiento pedagógico tecnológico. Para ello, se utilizó el instrumento "Análisis del desarrollo de competencias digitales en un curso de educación continua utilizando el modelo TPACK", aplicado entre el 15 y el 31 de agosto de 2023. Los resultados muestran que los docentes comprenden cómo utilizar las herramientas digitales para facilitar el proceso de enseñanza-aprendizaje.

Palabras clave: Tecnologías digitales de la información y la comunicación; Formación permanente del profesorado; Conocimientos tecnológicos pedagógicos.

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1 INTRODUCTION

Digital Information and Communication Technologies (TDICs) are present in our daily lives and can be used to optimize tasks or solve problems (Souza, 2021). It is well known how these technologies have been incorporated into economic, social, cultural, and political contexts as a result of the advances experienced by society, known as the Information Society (Coll; Monereo, 2010).

During the pandemic period caused by Covid-19, TDICs were present and played a fundamental role, allowing the continuity of various activities remotely, including those from the educational sphere (Baganha; Bernardes; Antunes, 2021; Sales; Albuquerque; Santos, 2022). Meanwhile, "the sudden introduction of technologies has challenged classroom teachers to use digital resources that were previously little known" (Morais; Morais; Gonçalves, 2023, p. 3, translated by us).

The pandemic has affected society in several areas, affecting education at all levels, as face-to-face activities have been interrupted (Matta; Rodrigues; Lima, 2020). As a result, there has been a search for a reformulation of teaching practices, accompanied by adopting tools to support this process. In this scenario, teaching strategies should favor the construction of collaborative knowledge, encouraging creativity, questioning, autonomy, and student interest.

The use of TDICs during the pandemic highlighted some social problems, such as digital illiteracy and the need to train teachers who are able to use TDICs and understand their role in education (Araújo; Negrão; Andrade, 2022). The student-teacher relationship has been compromised, causing concern for educators who have had to reformulate their approaches to mediating the teaching-learning process in the face of the pandemic scenario and the changes imposed by this situation (Franco; Rezende; Moraes, 2023).

n the current educational scenario, there is a growing demand for TDICs (Goulart; Pastorio; Vidmar, 2023). To this end, teachers need to develop the skills to implement these technologies effectively in their teaching practice (Matta; Furlani, 2020), since "today's world requires more than just the interpretation of information, it also requires skills and abilities related to the use of these interpretations in the processes of investigating problematic situations to solve or minimize them" (Predebon; Del Pino, 2009, p. 239, translated by us).

Thus, teacher training must be based on developing skills that allow them to use technology

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to reflect, analyze, validate, and share knowledge (Gonçalves, 2018). The continuous training of teachers should follow the same principle, providing these professionals with the necessary knowledge to meet the needs of students in the face of the changes observed in the educational scenario (Silva; Tomio, 2023). The latter can be promoted in different ways, such as educational policies, professional development by the teachers themselves or by the institution where the teacher works (Matta; Furlani, 2020).

The "Emerging Technologies" project was created in 2015 to encourage and prepare teachers to incorporate TDIC for pedagogical purposes, taking into account the Technological Pedagogical Content Knowledge (TPACK) model. It was offered from 2016 to 2021, with 548 teachers trained (Furlani; Matta; Costa, 2023).

TPACK integrates and relates the three main types of essential knowledge that teachers using TDICs in the classroom must possess and master. This model was proposed by Mishra and Koehler (2006) and includes the intersections between technological knowledge, pedagogical knowledge, and content knowledge, resulting in seven dimensions: (1) technological knowledge (TK), (2) pedagogical knowledge (PK), (3) content knowledge (CK), (4) pedagogical content knowledge (PCK), (5) technological content knowledge (TCK), (6) technological pedagogical knowledge (TPK), and (7) TPACK. It is important to note that the acronyms used to represent the seven dimensions of knowledge in the TPACK model are in English, as it was developed by Mishra and Koehler (2006). This standardization facilitates international communication and understanding among educators and researchers in different parts of the world. In this sense, when discussing the TPACK model, it is common to use English acronyms to refer to each specific dimension.

These dimensions represent a set of essential skills that teachers need to develop to integrate TDIC into their pedagogical practices to support the teaching of specific content. They are interrelated and do not exist in isolation. Therefore, in order for teachers to be able to develop and implement effective instructional strategies supported by technology, they must develop a certain fluency and understand the interactions between each of these dimensions of knowledge (Koehler; Mishra; Cain, 2013).

In this context, the purpose of this article is to present an excerpt from a study analyzing teachers' perceptions of the TPK dimension developed in the Emerging Technologies project. The aim is to answer the following question "Do teachers perceive that digital information and communication skills have been developed for teaching purposes in the context of basic education, considering dimension six of the TPACK model?".

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Understanding this question makes it possible to understand teachers' perceptions of the development of TPK after completing the courses proposed by the project. By considering the intersection between content and technological knowledge, the research seeks to elucidate how the participants developed specific skills to effectively integrate technologies into the educational context.

2 THEORETICAL BACKGROUND

Considering that the information society is permeated by the use of TDICs in different contexts, learning in the 21st century is now promoted through the use of emerging technologies, accompanying the process of constant evolution to which humans are subject (Silva; Correa, 2014). The easy access to TDICs makes the search for information faster due to their prevalence in society, causing significant changes in the process of knowledge construction, which can be facilitated by the use of emerging technologies (Bueno; Ballejo; Viali, 2020).

As a result, TDICs have become tools with great potential for improving learning, since they can make education more accessible and provide new educational resources and opportunities (Coll; Monereo, 2010). TDICs

> [...] can transform the role of teachers, shifting their focus from the transmission of knowledge to the assimilation and integration of this knowledge by students who are increasingly capable of carrying out complex learning tasks autonomously (Tardif; Lessard, 2009, p. 268, translated by us).

The integration of TDICs in education also makes it possible to create new knowledge by facilitating the immediate incorporation of information that was previously unavailable, as well as strengthening student learning by promoting collaborative work in the process of knowledge construction (Testa et al., 2023). In this way, the use of TDICs for pedagogical purposes becomes innovative, as it "provides education with a learning environment more suited to the new society that is emerging" (Damaceno, 2013, p. 23, translated by us).

In this context, the information society,

> [...] as a result of the technological revolution and its developments in the field of production and information, it has characteristics that can guarantee education an autonomy that has not yet been achieved. This happens to the extent that the development of the cognitive and cultural skills

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> necessary for full human development begins to coincide with what is expected in the sphere of production (Parâmetros Curriculares Nacionais do Ensino Médio, 2000, p. 11, translated by us).

The transformation of education, and thus of the school and the role of the teacher, has been a recurring theme. The integration of DICTs, whether it is achieved or not, and the guarantee of the right to accessibility have become recurring issues in the daily life of traditional educational institutions, as well as in the initial and continuing training of teachers (Baldo et al., 2022). Furthermore, the process of integrating TDIC in education is supported by various public policies and programs that aim to guide its effective implementation, since it is not so simple, since it involves issues such as adequate infrastructure and professional training (Souza, 2021).

Since the early 1980s, the federal government has implemented initiatives to expand access to TDIC in schools and promote its use in the educational context (Valente; Almeida, 2020). Among these initiatives are programs such as the National Curriculum Parameters for Secondary Education (PCNEM), the National Program for Informatics in Education (PROINFO), and the One Computer per Student Program (PROUCA), whose objectives are to promote equal access to technology in educational institutions, while also having the potential to promote changes in the way students learn, being able to support the process of knowledge construction (Rodrigues; Batista, 2018).

PROINFO was created by Ministerial Decree No. 522 of 1997, to disseminate computer technology in public basic education, using technological resources to improve teaching practices (Brasil, 1997).

Law No. 12,249 of June 11, 2010, created the "One Computer per Student" Program (PROUCA), which aims to

> [...] to promote digital inclusion in schools in the federal, state, district and municipal public education networks or in nonprofit schools for people with disabilities, through the acquisition and use of IT solutions, consisting of computer equipment, computer programs (software) installed in them, and the support and technical assistance necessary for their operation (Brasil, 2010, translated by us).

Decree No. 9,204 of November 23, 2017, established the Connected Education Innovation Program, which aims to "support the universalization of high-speed Internet access and promote the pedagogical use of digital technologies in basic education" (Brasil, 2017, p. 1, translated by us). This document is in line with Strategy 7.15 of the National Education Plan (PNE), which aims to

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> [...] universalize high-speed broadband access to the World Wide Web by the fifth year of this PNE and triple the computer/student ratio in public basic education schools by the end of the decade, promoting the pedagogical use of information and communication technologies (Brasil, 2014, p. 8, translated by us).

On December 20, 2017, the National Education Council (CNE) approved CNE/CP Opinion No. 15/2017, which was ratified by Ordinance No. 1,570, which, together with the attached draft resolution, initiated the implementation of the Common National Curriculum Base (BNCC) (Brasil, 2017). The BNCC is the main document that establishes the basic learning to be developed throughout basic education. In addition, it presents one of its general competencies related to the use of TDIC in education, which is to

> [...] understand, use and create digital information and communication technologies in a critical, meaningful, reflective and ethical way in different social practices (including school practices) to communicate, access and disseminate information, produce knowledge, solve problems and exercise leadership and authorship in personal and collective life (Brasil, 2018, p. 9, translated by us).

The implementation of the new High School, which came into force in 2022, aimed to reformulate the distribution of learning content at this level, creating training itineraries that allow students to delve deeper into areas of interest to them. In this sense, a subject called "Digital Culture" has been implemented, in which one of the specific competencies of the itinerary is to "propose creative actions that contribute to the transformation of society, critically analyzing and using technologies, taking into account the different types of media and the human relationships mediated by them" (Centro de Inovação para a Educação Brasileira, p. 3, 2018, translated by us).

Law No. 14.533 of January 11, 2023, established the National Digital Education Policy (PNED), which aims to "improve the standards and increase the results of public policies related to the access of the Brazilian population to digital resources, tools, and practices, with priority for the most vulnerable populations" (Brasil, 2023, p. 1, translated by us). The PNED is extremely important in promoting digital inclusion, digital education in schools, digital training and specialization, and research and development (P&D) in information and communication technologies (Brasil, 2023).

These programs and public policies favor the implementation of ICT in the classroom. However, for this to be effective, it is up to the teacher to use them properly so that they bring about significant changes in the teaching-learning process (Wermuth, 2016). The teacher mustn't perceive that the implementation of TDICs will solve all the

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problems encountered in the process of knowledge construction but rather that they can enhance the teaching of specific content, provided that the appropriate educational resources are employed for the needs presented by the students in the classroom (Nakashima; Piconez, 2016).

In a contemporary society where TDICs are used in different contexts, including education, it is important to reflect on the training of teachers in terms of their integration in the process of knowledge building. However, for the incorporation of TDICs into the school environment to be effective, it is necessary to integrate them into the training of teachers, be it initial or continuing, so that they can use them to contribute to the process of knowledge-building (Baganha; Bernardes; Antunes, 2021).

Given the challenges posed by the Covid-19 pandemic concerning the implementation of ICT in education, it is extremely important to analyze the reality of teacher training, highlighting the need to change the vision of the profile of graduates of this profession (Oliveira; Garbin; Pirillo, 2021). This is because these professionals must be able to implement them in the process of knowledge construction so they can contribute to more meaningful and efficient teaching.

In order for teachers to be able to integrate TDIC as a pedagogical tool, initial or continuing training courses must provide them with an integration of these technologies, as well as the creation of learning opportunities that integrate TDIC into the classroom, allowing these teachers to experience teaching and learning situations supported by TDIC (Strycker, 2020).

As already explained, TCK is one of the seven dimensions of the TPACK model and results from the intersection between technological knowledge and pedagogical knowledge, which can be understood as the relationship between technology and content in the educational context, that is, the teacher needs to be aware of how technologies can positively influence the teaching and understanding of certain content or subject (Mishra; Koehler, 2006).

In this context, "the development of digital literacy for educational professionals requires an understanding of the dimensions involved in this construct" (Ribeiro; Filho, 2022, p. 7, translated by us). This implies that, in addition to acquiring practical skills, teachers need to have a comprehensive understanding of the complexities involved in the use of digital technologies in the process of knowledge construction.

This is because teachers must develop a set of skills to incorporate digital technologies into their teaching practice to support the process of knowledge building, providing new ways of teaching and learning while keeping up with the changes experienced by society (Baganha; Bernardes; Antunes, 2021).

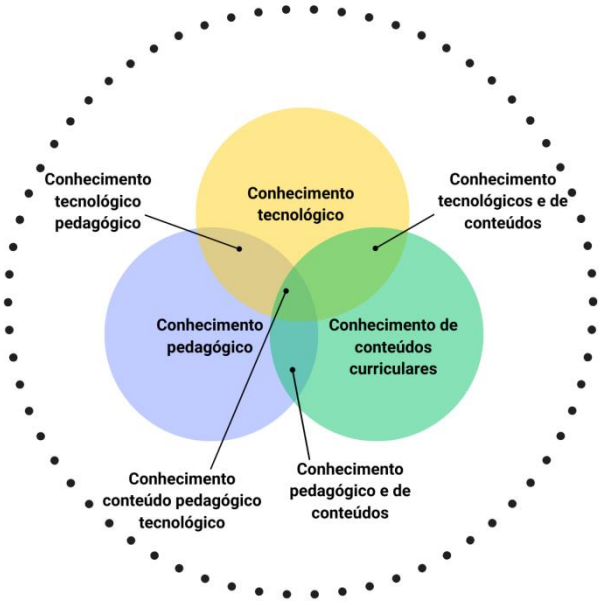
DOI: http://doi.org/10.53628/emrede.v11i.1025 ISSN 2359-6082

Given the advances in society marked by the implementation of TDIC, there is a need to train teachers who can use these technologies. Thus, in 2015, the "Emerging Technologies" project was created to provide free online training courses for basic education teachers with a degree in any field of knowledge (Matta; Furlani; Oliveira, 2016). This initiative aims to strengthen teacher training in the face of educational transformations.

3 METHODOLOGICAL PATH

This article corresponds to a section of the research entitled "Analysis of the development of digital competencies in a continuing education course using the TPACK model", with a Certificate of Submission for Ethical Appraisal (CAAE) 70296923.8.0000.5094. This section analyzes the pedagogical-technological knowledge that corresponds to dimension six of the TPACK model, which is the intersection between pedagogical knowledge and technological knowledge. This intersection corresponds to the relationship between technology and pedagogical knowledge (Mishra; Koehler, 2006). For a better understanding of the model, we present Figure 1.

Figura 1 – TPACK model



Source: Adapted from Mishra and Koehler (2006).

The rationale adopted for this research was based on a quantitative approach, because this approach

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> [...] operates at the level of reality, where data are presented to the senses, and its practice is to bring to light data, indicators and trends, classifying them and making them intelligible through the analysis of variables (Oliveira; Pietri; Bizzo, 2019, p. 528, translated by us).

The instrument used in this research was an online questionnaire, made available through a form on the Google platform, with two sections: one on the profile of the participant and the other on teachers' knowledge of the use of TDICs, according to the TPACK model. The questionnaire was taken and adapted from a Ph.D. thesis (Gonçalves, 2018).

The first part of the instrument consists of 11 questions. The second part, proposed by Gonçalves (2018), consists of 29 questions on a 5-point Likert scale: (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, and (5) strongly agree. There was also a consent form, and respondents were informed whether or not they could participate in the survey.

The questionnaire was sent to graduates of the Emerging Technologies project who took the courses between 2015 and 2021, a total of 548 professionals. The questionnaire was available to respondents from August 15 to August 31, 2023. The questionnaire included an Informed and Free Consent Form (TCLE), which ensures that the participant is aware of the risks and benefits of the research, as well as how the data will be processed. All graduates who agreed to participate were included in the study, and 28 of them responded to the questionnaire. From these, 8 work in areas related to education, such as coordinators (3), counselors (1), and principals (4). This resulted in a real sample of 20 participants.

The online courses offered by the project in 2021 were: (1) Introduction to Emerging Technologies and (2) Collaborative Tools. It should be noted that completion of the first course was a prerequisite for participation in the second. The syllabi of the courses offered by the project can be seen in Chart 1.

Chart 1 - Project course syllabus

COURSE	**SYLLABUS***
Introduction to Emerging Technologies	Education and learning in the information society. Public policies for TDIC in the school context. New information and communication technologies. Using digital resources to prepare online questionnaires, online interaction, creating graphics to represent data (infographics and mind maps)".

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Collaborative learning	Pedagogical strategies for using open educational resources. Use of resources for collaborative work (Google Drive). Planning and use of new information and communication technologies in the classroom and virtual classrooms".

Source: Own authorship (2024). *Syllabus translated by us.

In the proposed courses, the pedagogical model used is collaborative and different strategies and resources were used, as detailed by Matta and Furlani (2020). This approach favors student integration and participation, promoting a more dynamic and engaging learning environment.

4 RESULTS AND DISCUSSIONS

Twenty teachers who graduated from the teacher training courses offered by the "Emerging Technologies" project and were working as classroom teachers in 2023 took part in the survey. From the data collected, it was possible to trace the sociodemographic profile of the participants in the research.

In terms of gender, 60% (12) are female and 40% (8) are male; in terms of age, 25% (5) are between 25-35 years old, 25% (5) are between 36-45 years old, 35. 0% (7) are between 46-55 years old and 15% (3) are over 55 years old; regarding the level of education, 5% (1) have a doctorate, 40% (8) have a master's degree, 25% (5) have a specialization degree and 40% (6) have a bachelor's degree; all teachers have a bachelor's degree; regarding the state of origin, 5% (1) are from Bahia, 35% (7) are from São Paulo and 60% (12) are from Minas Gerais.

The five statements used to understand teachers' perceptions of TPK development are presented in Chart 2.

The TPK dimension encompasses how technologies can be used strategically in the school environment to enhance the process of knowledge construction (Mishra; Koehler, 2006). TPACK is a theoretical model used to understand the process of developing the skills necessary for teachers to use TDIC in their teaching practice to provide effective instruction to students (Mishra; Koehler, 2006).

Chart 2 - Parameters of the TPK dimension

TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (TPK)	
Statement 1	I'm able to appropriate technologies that boost the approach to a subject in class.

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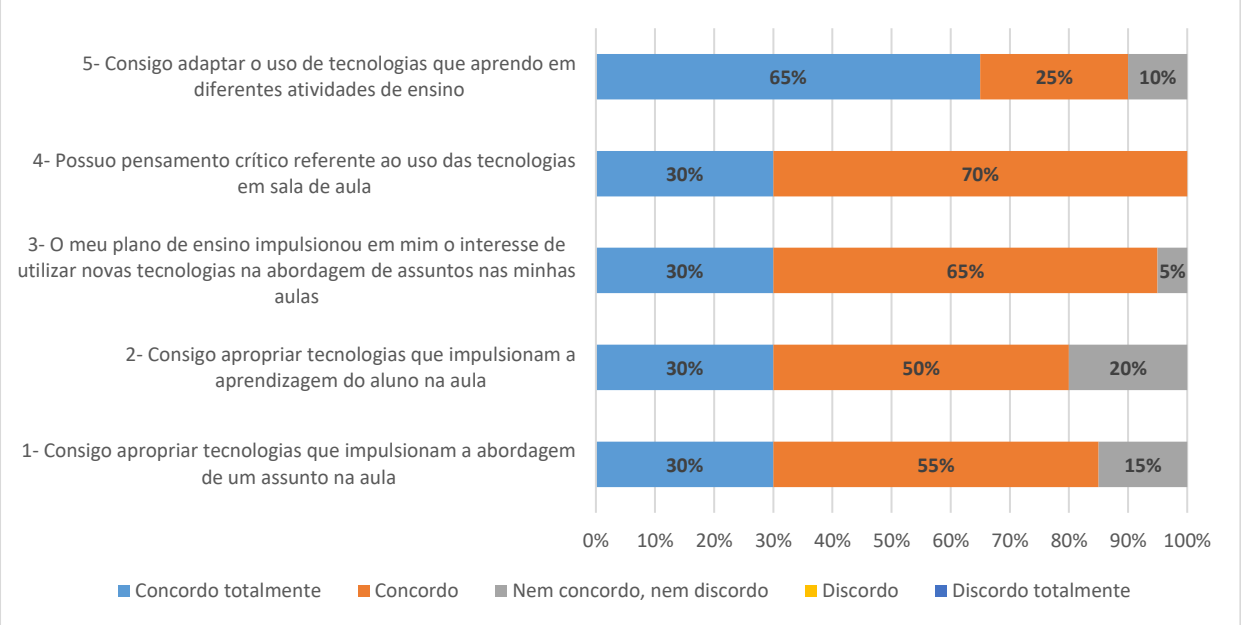
Statement 2	I'm able to appropriate technologies that boost student learning in class.
Statement 3	My teaching plan has given me an interest in using new technologies to approach subjects in my classes.
Statement 4	I am a critical thinker when it comes to using technology in the classroom.
Statement 5	I can adapt the use of the technologies I learn to different teaching activities.

Source: Own authorship (2024).

The answers provided by the teachers for each of these statements are shown and analyzed in Graph 1. The results show that the majority of teachers agree with the statements presented.

Graph 1 - Technological Knowledge of Content



Source: Own authorship (2024).

Although the incorporation of technologies in the classroom represents a challenge for teachers seeking to improve their pedagogical practices, they seek to make them meaningful and applicable in different educational contexts (Pérez et al., 2021).

It can be seen that after completing the proposed courses, most of these teachers report that they have taken ownership of these technologies and are able to use them in a way that improves the process of knowledge building. Thus, these teachers have acquired the competence to know how to use the available digital technological tools strategically, carefully, and responsibly, which, according to Marroni, Miranda and Carvalho (2022, p. 3, translated by us), "has become indispensable for

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contemporary society".

Analyzing the responses presented, it can be seen that 55% (11) of the respondents agree and 30% (6) strongly agree that they are able to effectively integrate technology into their teaching practice, making lessons more attractive, informative, and able to help students learn certain content (statement 1); and 15% (3) neither agree nor disagree.

Teachers say they can use technology in the classroom to help students learn (Statement 2). Of the respondents, 80% (16) agree or strongly agree, and 20% (4) are neutral, neither agreeing nor disagreeing with this statement.

This reflects the importance that participants place on the integration of technological resources into the educational environment. This perspective is in line with the idea that educational content becomes more attractive when it allows students to attribute meaning to what is being studied and to make connections between the content covered and other relevant topics (Domingues; Carvalho; Philippsen, 2021; Lima; Moita, 2011; Reis; Leite; Leão, 2021).

This approach favors an environment where knowledge is built through practical experience and its direct application (Mishra; Koehler, 2006). Furthermore, as highlighted by the same authors, technological tools play a crucial role in the implementation of the content, contributing to a deeper understanding of the concepts by the students. Thus, the efficient integration of technological resources not only reflects the adaptability of teachers but also enhances the learning experience of students.

According to the results, 65% (13) of the participants expressed their agreement with the statement that the curriculum stimulated their interest in incorporating new technologies in their approach to the topics during the lessons (statement 3); 30% (6) expressed their complete agreement with this statement; while 5% (1) did not have a clear position, neither agreeing nor disagreeing. This trend suggests that the pedagogical proposal outlined in the project's curricula had a positive impact, stimulating participants' interest in exploring and integrating technological tools into their teaching practices.

This relationship between receptiveness to the curriculum and interest in adopting new technologies is in line with the public policies mentioned above, such as PROINFO, PROUCA, and PNDE, which aim to guide the implementation of TDIC in the classroom to support the process of knowledge building. In this way, these public policies play an essential role in promoting this integration.

Regarding the use of technology in the classroom, all participants indicated that they think

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critically about the use of technology (Statement 4). Within this group, 70% (14) agreed with this statement, while the remaining 30% (6) strongly agreed. This suggests a significant level of reflection and evaluation on the part of the respondents concerning the integration of technology into educational practice. Critical thinking is essential as it allows teachers to use TDIC consciously, through a more reflective and autonomous approach in the classroom, promoting "the formation of children and young people capable of making more conscious, critical and participatory choices in this information society" (Custódio; Rodrigues, p. 3, 20-23, translated by us).

Regarding the adaptation of technologies (statement 5), 65% (13) of the participants strongly agree and 25% (5) agree that they can adapt the use of technologies they have learned in different educational activities. This suggests that respondents have considerable confidence in their ability to effectively integrate technologies into educational contexts. In addition, 10% (2) do not have a clear position, either agreeing or disagreeing with this statement.

Adapting to the use of technology is consistent with the dynamic and ever-evolving nature of these tools. As Palis (2010) points out, technological literacy is not just about acquiring information, but also about the ability to continuously learn and adapt to new technologies as they emerge.

In this sense, teachers play a crucial role in selecting and organizing digital resources to improve teaching and learning. This is even more important when trying to combine these digital resources with methods that involve active student participation (Paim; Paim., 2022).

The perceptions of the teacher researchers, in line with the ideas of Mishra and Koehler (2006), highlight the importance of considering different factors when planning and presenting content in educational contexts. The emphasis on students' knowledge and their difficulties with the content stands out, reinforcing the need for a pedagogical approach that is sensitive to students' individual characteristics. Teachers need to evaluate their practice, taking into account their ability to adapt to new technologies as well as their approach to topics, strategies, and teaching methods. This includes the design of exercises and assessments (Masetto, 2003).

In this way, it is crucial to understand the impact that the use of technological resources can have on the teaching process, and it is extremely important to adopt a critical approach when integrating technologies, considering their potential impact on the process of knowledge construction (Costa; Prado, 2015). The ability of participants to adapt to the diverse use of technology reflects not only their current competence but also their willingness to evolve and explore technological innovations in the future.

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5 FINAL CONSIDERATIONS

The aim of this article was to present a snapshot of a study that analyzed the perceptions of teachers, graduates of a continuing education course, about technological pedagogical knowledge, one of the seven dimensions of the TPACK model.

By analyzing the perceptions of teachers who have completed the courses proposed in the "Emerging Technologies" project between 2015 and 2021 in relation to the development of TPK, using a questionnaire based on the dimensions of the TPACK model, the results obtained provide a comprehensive view of the teachers' progress in developing the TPK dimension, highlighting crucial aspects of their development during the period analyzed.

It can be seen that the teachers who participated in the courses have a good understanding of this dimension of knowledge since most of them claim to have critical thinking in relation to the use of TDIC, as well as being able to adapt them to be used in different contexts, appropriating them in such a way that they can help teach specific content in the classroom, as well as claiming to be interested in using new technologies in the classroom.

By analyzing the responses, it was possible to better understand how educators have incorporated emerging technologies into their teaching practice, taking into account not only their familiarity with the tools but also the effective and appropriate integration of these technologies to support student learning.

The results help us understand the perceptions of these teachers after completing the training courses in which they reported having acquired the skills to use TDIC to support the teaching of specific content in the classroom. In this sense, according to the perceptions of the course graduates, they have knowledge of how TDICs can have a positive impact on the teaching-learning process of certain content.

One limitation is that this research only reflects the perspective of the teachers who completed the project. It is suggested that future studies adopt complementary approaches, such as conducting surveys with the students of the participating teachers, using data collection methods appropriate to this objective, in order to obtain a more comprehensive understanding of the development of this dimension of knowledge.

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