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# Teaching and Learning of Environmental Education: teachers' perceptions on continuing education in school

*Ensino e Aprendizagem de Educação Ambiental: percepções docentes sobre a formação continuada na escola*

*Enseñanza y aprendizaje de la Educación Ambiental: percepciones docentes sobre la formación continua en la escuela*

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## Abstract

Environmental Education (EE) has been recognized as a key component in building more sustainable societies. However, its inclusion in teacher education still faces challenges, often being limited to fragmented and sporadic approaches within the curriculum of Elementary and High school education. Addressing this gap, this article, resulting from a doctoral research in Teaching, proposed a study on EE with elementary school teachers, encouraging the creation and use of educational games. The objective was to analyze how participation in

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continuing education and the development of playful materials contributed to EE teaching practices. This qualitative study, with an action-research approach, was conducted in 2023 at a municipal school in Imperatriz, Maranhão, involving 17 volunteers. The research included a diagnostic questionnaire, five training sessions, and the creation of didactic games, which were later used by teachers to teach EE to students. Semi-structured interviews were conducted, and the data were analyzed using Discursive Textual Analysis. The teachers reported significant theoretical and practical learning from the training program, highlighting the importance of experiential approaches for the creation and application of educational games. The study underscores the fragility of EE in both initial and continuing teacher education and emphasizes the need for public policies that promote the systematic integration of EE into teacher training programs.

**Keywords:** Environmental Education. Educational Processes. Pedagogical Practices. Teacher Engagement.

## Resumo

*A Educação Ambiental (EA) tem sido reconhecida como um importante eixo para a construção de sociedades mais sustentáveis. No entanto, sua inserção na formação docente ainda enfrenta desafios, muitas vezes limitando-se a abordagens fragmentadas e pontuais no currículo da Educação Básica. Diante dessa lacuna, este artigo resultante de uma pesquisa de doutorado em Ensino, propôs uma agenda de estudos sobre EA com professores do Ensino Fundamental, incentivando a criação e uso de jogos didáticos. O objetivo foi analisar como a participação na formação continuada e o desenvolvimento de materiais lúdicos contribuíram para a prática docente em EA. O estudo de cunho qualitativo, aproximou-se da pesquisa-ação, sendo realizado em 2023 em uma escola municipal de Imperatriz/MA, com 17 voluntários. A investigação envolveu um questionário diagnóstico, cinco encontros formativos e a criação dos jogos didáticos que foram utilizados pelos professores para ensinar EA aos estudantes da escola. Foram realizadas entrevistas semiestruturada, cujos dados foram interpretados por meio da Análise Textual Discursiva. Os professores relataram bom aproveitamento teórico e prático do percurso formativo, destacando a importância da abordagem vivencial para a criação e uso dos jogos. O estudo evidencia a fragilidade da EA na formação inicial e continuada dos docentes e destaca a necessidade de políticas públicas que incentivem a inserção da EA de forma contínua nos processos formativos de professores.*

**Palavras-chave:** Educação Ambiental. Processos Formativos. Práticas Pedagógicas. Engajamento Docente.

## Resumen

*La Educación Ambiental (EA) ha sido reconocida como un eje fundamental para la construcción de sociedades más sostenibles. Sin embargo, su incorporación en la formación docente aún enfrenta desafíos, limitándose muchas veces a enfoques fragmentados y puntuales dentro del currículo de la Educación Básica. Ante esta brecha, este artículo, derivado de una investigación doctoral en Enseñanza, propuso una agenda de estudios sobre EA con docentes de Educación Primaria, fomentando la creación y el uso de juegos didáticos. El objetivo fue analizar cómo la participación en la formación continua y el desarrollo de materiales lúdicos contribuyeron a la práctica docente en EA. El estudio, de enfoque cualitativo y con aproximación a la investigación-acción, se llevó a cabo en 2023 en una escuela municipal de Imperatriz/MA, con la participación de 17 voluntarios. La investigación incluyó un cuestionario diagnóstico, cinco encuentros formativos y la creación de juegos didáticos que fueron utilizados por los docentes para la enseñanza de EA a los estudiantes. Se realizaron entrevistas semiestructuradas, cuyos datos fueron interpretados mediante el Análisis Textual Discursivo. Los docentes reportaron un buen aprovechamiento teórico y práctico del proceso formativo, destacando la importancia del enfoque vivencial para la creación y uso de los juegos. El estudio evidencia la fragilidad de la EA en la formación inicial y continua de los docentes y subraya la necesidad de políticas públicas que promuevan la inclusión permanente de la EA en los procesos formativos del profesorado.*

**Palabras clave:** Educación Ambiental. Procesos Formativos. Prácticas Pedagógicas. Participación Docente.

## Introduction

This article is based on the investigation of EE practices and the urgency of sustainable societies, addressing challenging issues in the school environment. Currently, climate change represents one of the greatest socio-environmental challenges for humanity, requiring collective responses concerning the transformation of values, habits, and public policies. In view of the environmental crisis that the planet is facing, it is necessary to promote an educational process that values collective agendas and the preservation of life. In this scenario, schools play a fundamental role in the development and improvement of teaching and learning related to social, human, and environmental issues. Regarding this demand, Loureiro (2019) highlights that EE is not limited to only transmitting information about environmental problems, but fosters the systemic understanding of the relationships between society and nature, guiding subjects towards active and critical participation in mitigating climate impacts. Thus, by integrating EE into daily school life and teacher education, it is possible to create learning spaces that favor the adoption of interdisciplinary pedagogical practices, aimed at reflections and actions in the face of global climate challenges.

In this context, this research proposed the development of a study agenda focused on EE, involving elementary school teachers and encouraging the study of EE, the creation and use of educational games as pedagogical tools. According to Maia (2015), the teaching and learning processes of EE, as well as the continuing education of teachers in EE, must emerge from the reality and daily practice of teachers. The author suggests that, through their experiences, educators can be references for students and for themselves, promoting their self-emancipation. Thus, it is understood that the plurality of knowledge in the school environment is capable of favouring continuing education, allowing a broader understanding and more contextualised development of EE.

Carvalho (2002) underscores that EE in Elementary Education often occurs in a disjointed manner, being restricted to isolated initiatives of some teachers and with little insertion in the school curriculum. This scenario points to the need for methodologies that make EE teaching more robust and integrated into pedagogical practices. Given this weakness, this study highlighted the teaching protagonism, encouraging the use of interactive and dynamic approaches, such as educational games. By incorporating playfulness into educational practice, teachers can expand the possibilities of student engagement, enhancing learning through experimentation and the collective construction of knowledge. As Vygotsky (1989) highlights, games stimulate curiosity and creativity, as well as promote cognitive, social, and emotional development; all of which are elements necessary for a critical and reflective approach to EE in the school environment.

The research aimed to reflect on teaching practices based on the experiences of volunteer teachers during training sessions, investigating the contributions of the continuing education itinerary and the creation of educational games for pedagogical improvement. The aim was to understand how these study moments impacted teachers' perceptions on EE, especially in its pedagogical dimension. The analysis of participants' reflections allowed us to highlight the relevance of EE in everyday school life, underscoring its role in the construction of more critical, interactive, and socially committed educational practices. Carvalho (2012) emphasises the importance of teachers' involvement in reflecting on their educational practices in EE. The author suggests that such educators, as mediators and interpreters of the world, can contribute significantly to new understandings of the experiences accumulated throughout their careers. In this way, the teacher education agenda was designed to legitimise the socio-environmental reality of teachers and the school community. Thus, existing projects at the school and topics such as curriculum, interdisciplinarity, games, and environmental issues were addressed during the study. The research problematizes that the engagement of teaching with the environmental cause can contribute to the construction of new practices and resignifications of teaching and learning processes in EE, aiming at a more critical and transformative education.

## Theoretical Framework

As an epistemological and political-pedagogical field, EE is structured on a critical perspective, aimed at educating subjects capable of interpreting and transforming socio-environmental reality (Carvalho, 2012). In Brazil, its institutionalisation occurs in the context of several documents, among which the National Policy on Environmental Education (Law No. 9,795/1999) stands out, which defines it as a permanent process, present in all levels and modalities of education. However, as Loureiro (2019) and Charlot (2020) point out, EE still faces structural challenges, often reduced to specific practices and decontextualised from everyday school life, without effective dialogue with the curriculum and with contemporary social and environmental demands.

Studies on undergraduate courses curricula indicate that EE occupies a secondary position in undergraduate teacher education programs, and is often treated superficially or in a fragmented manner (Guimarães, 2004; Loureiro, 2004; Manzochi; Carvalho, 2008). This scenario stresses the need to strengthen continuing education, ensuring that educators be prepared to address environmental issues in a critical and interdisciplinary manner. In view of this, continuing teacher education emerges as a fundamental strategy for EE to overcome this peripheral character, enabling educators to develop interdisciplinary approaches and educational practices, aligned with a transformative conception of education. Guimarães (2004) argues that EE should not be just a curricular component or a cross-cutting theme, but a structuring axis of pedagogical practices, requiring a teacher capable of problematising environmental issues in their multiple dimensions. In this sense, Maia (2015) highlights that continuing teacher education in EE can go beyond a transmissive approach, encouraging teachers to take an active role in the construction of pedagogical practices that contribute to the emancipation of subjects and the transformation of the context in which they operate. This premise is corroborated by Martins and Schnetzler (2018):

We argue the exercise of an educational practice linked to social practice contextualised in socio-environmental reality, and such practice should not be restricted to the mere transmission of knowledge or focused simply on changing individual behaviours, such as contemplative education. (Martins; Schnetzler, 2018, p. 584).

For Martins and Schnetzler (2018), EE can be rooted in social and environmental dynamics, avoiding reductionist approaches focused only on the dissemination of information or individual changes in behaviour. Ongoing teacher education should encourage critical analysis and the collective construction of knowledge, promoting a deeper relationship between subjects and environmental challenges. Thus, EE constitutes a field of continuous learning, in which critical reflection on socio-environmental relations translates into educational practices capable of articulating theory and reality. By integrating diverse knowledge and encouraging subjects' active participation, EE strengthens the role of education in the construction of a critical and socially engaged ecological consciousness.

In this regard, Carvalho (2012) has already highlighted that the teachers' involvement plays a central role in the construction of readings and reflections on EE teaching and its relationship with everyday life. The author emphasises that education is a craft, in which the teacher acts as a mediator and interpreter of the world. Thus, teachers' different perceptions become a starting point for the redefinition of experiences accumulated throughout their professional careers, allowing for a deeper and more dynamic understanding of EE.

Considering the need for training practices that strengthen EE in teaching, intentional pedagogical mediation is necessary, capable of articulating playfulness with the process of knowledge construction. As Kishimoto (2010) highlights, games should not be reduced to merely recreational instruments, but rather understood as teaching strategies that enable interaction, experimentation and the assimilation of concepts. In the context of EE, this approach allows students to experience environmental challenges in simulated

scenarios, demanding different solutions to socio-environmental problems and understanding the complexity of the relationships between society and nature.

In addition, educational games can contribute to the development of autonomy and critical thinking, as they stimulate decision-making and collaborative work. According to Vygotsky (1989), learning occurs more significantly when there is interaction between subjects, and games, by enabling this exchange of experiences, increase students' engagement in the educational process. Thus, the use of games in EE can favor the understanding of environmental content and also promote the active involvement of students, making learning dynamic and participatory.

As far as teacher education is concerned, the introduction of educational games as a pedagogical resource also represents an important means of methodological application. Studies show that teachers who experience the use of games in training processes tend to incorporate them with greater confidence and purpose in their pedagogical practices (Santos; Jacobi, 2011). Thus, by integrating games into continuing education, an environment is created that is conducive to teachers experimenting with different approaches and reflecting on their potential in EE teaching. Thus, the adoption of educational games in EE teaching is not limited to student motivation, but assumes a structuring role in learning, by enabling a critical connection between theory and practice. For this integration to be effective, it is important that the teacher understands the principles that guide the pedagogical use of games, ensuring that these resources are explored in a critical, interdisciplinary way and aligned with the educational and emancipatory objectives of EE.

Therefore, the articulation between EE, continuing education, and game development requires a pedagogical approach that goes beyond the simple adoption of new methodologies, provoking critical reflections on contemporary environmental challenges and their intersections with the educational field. As highlighted by Loureiro (2019) and Guimarães (2004), EE cannot be reduced to specific actions or fragmented initiatives, and it is essential that teachers have access to educating processes that enable them to integrate environmental issues in a robust and transversal manner into the school curriculum. In this sense, continuing education is a learning opportunity for teachers, allowing the redefinition of teaching and strengthening their role as mediators of socio-environmental knowledge.

In this context, this article contributes to the debate on continuing education for teachers in EE, analysing how this experience broadens teachers' perceptions on their pedagogical practice. In addition to promoting the critical improvement of teachers in the face of environmental and educational challenges, the study highlights gaps that still need to be overcome to consolidate EE as an essential and transversal dimension of the school curriculum.

## Methodology

This study is characterized as a qualitative investigation, adopting elements of action research. According to Thiollent (2009), action research involves conducting research closely associated with an action or the resolution of a collective problem, implying the active participation of the researcher and the subjects involved. Barbier (2002) adds that this methodology promotes interaction between the object of study and the problem addressed. In the school context, Pimenta (2011) reinforces that action research can constitute a pedagogical strategy that allows teachers to reflect on their practices and develop professionally.

The study was conducted in 2023 at the Santos Dumont Municipal School (ESD), in Imperatriz/MA, an institution with a significant history of EE activities, including the Bacuri Verde Project and the Meu Ambiente Program, both aimed at promoting EE in the school community. The research subjects were 17 volunteer elementary school teachers, who taught courses on Portuguese, Mathematics, Sciences, History, Geography, Art, Physical Education, and Specialized Educational Assistance (AEE), as well as other teachers who were part of the teaching and administrative staff of the teaching unit. All of them were effective employees of the municipal network, with professional experience ranging from 5 to 15 years.



Ethical considerations were strictly respected, ensuring anonymity through the use of fictitious names, and the informed consent of the participants. The research project was approved by the Research Ethics Committee (CEP, Portuguese acronym) of the institution by the Certificate of Presentation and Ethical Assessment (CAAE, Portuguese acronym): 67333323.6.0000.5310. Initially, the volunteers answered a diagnostic questionnaire on EE to obtain information about the professional and social profile of the participants. The importance of understanding the prior knowledge of the volunteers was a strategy that improved the quality of the information gathered and also helped to validate and assess the relevance of the research findings.

The training course then began, with five meetings aimed at deepening reflections on EE and its insertion in the school context through theoretical and practical approaches. The first meeting, entitled "Theoretical Concepts on EE in the School Context", held in May 2023, aimed to discuss the role and relevance of EE in teaching and learning processes. During this session, the training agendas were presented and dynamics such as "The Present" and "Trunk of Reflections" were carried out, based on EE activities developed over a decade ago at the school with the Bacuri Verde Project. In addition, a word cloud was constructed using the Mentimeter tool. The Google Classroom virtual environment was also presented, intended for storing materials and complementary activities throughout the training course.

In June 2023, at the second meeting, called "Games, Toys, Play and Teaching Environmental Education", participants were invited to reflect on the pedagogical impact of different playful strategies in consolidating knowledge in EE. The session included problematising the topic based on textual fragments, the distinction between game, toy and play, and a discussion on the relationship between EE and textbooks. As a practical activity, teachers experienced the game "Space Race", contextualised with the approach adopted at the school for teaching EE.

The third meeting, held in September 2023, entitled "Creating Educational Games to Teach and Learn Environmental Education", focused on designing games to be used as pedagogical resources for EE. The session began with a review of the topics previously discussed, using local and international news to problematize environmental challenges. This was followed by a guided debate on teacher mediation and the playful approach in EE. During this stage, teachers made collective decisions about the construction of games, aligning them with the Sustainable Development Goals (SDGs). An online game was presented to participants, using the digital tool Wordwall.

Between the third and fourth meetings, the researcher began the game production process, which lasted approximately 50 days and represented a challenging and essential stage for the consolidation of the teaching materials. During this process, detailed tests and improvements were carried out to ensure the clarity of the rules, the pedagogical suitability and the practical viability of the games. This exercise allowed for the necessary adjustments so that the materials could be used by teachers in the school context.

In November 2023, the fourth meeting was held, entitled "Experimentation of Educational Games for Teaching and Learning Environmental Education", in which the developed games were presented and tested by teachers. The card game "Combining SDGs" and the board game "Improving the Climate" were explored, followed by reflections on their relationships with the competencies of the National Common Curricular Base (BNCC). During this phase, teachers tried out the games and shared insights for application at school. In addition, the game "Recycling Circuit" proposed by the Physical Education teacher was structured, reinforcing the interdisciplinarity of EE.

Between November 2 and December 7, 2023, teachers incorporated educational games into their teaching practices, experimenting with different ways of applying and adapting them to the realities of their classes. This stage provided a concrete experience of the potential of games as an educational resource, allowing teachers to assess student engagement and the challenges of pedagogical mediation. The experiences accumulated during this phase enriched the reflections of the last training meeting, contributing to the collective analysis on the integration of games into EE teaching.

Finally, in December 2023, the last meeting was held, "Discussion Circle on the Use of Educational Games to Teach and Learn Environmental Education", aimed at analysing the experiences acquired during the application of the games with students. The teachers shared their experiences and discussed necessary adaptations for different contexts and audiences. Strategies for developing reading and interpretation skills based on the games were highlighted, as well as proposals for improving the dynamics applied. Certification regarding participation in the training journey was carried out at the end of the meeting, followed by the scheduling of individual interviews to produce research data.

After the completion of the continuing education, a semi-structured interview script was applied to all participants. This instrument allowed us to investigate the volunteers' perceptions about continuing education in EE, exploring both theoretical aspects and practical experience in the production and application of educational games. The questions addressed the appropriation of content, the challenges faced, the students' receptiveness and the impact of the study schedule on teaching practice, enabling reflections on the pedagogical approach adopted.

The interviews were recorded using a wireless microphone and a voice recording application for cell phones. The audio files were transcribed and examined using Moraes and Galiazzi's (2013) Discursive Textual Analysis (DTA), a technique that allows the interpretation and construction of new meanings about phenomena and discourses. Thus, an exercise of repeated and deeply immersive readings of all the materials from the semi-structured interviews, notes and responses obtained through the online questionnaire was undertaken. This diverse group of data sources was carefully compiled, constituting the essential corpus on which the foundations for the subsequent analytical phase of the study were laid.

Discursive Textual Analysis (DTA), as proposed by Moraes and Galiazzi (2013), guided the interpretation and systematisation of the understandings extracted from the materials produced in this research. The process occurred in three interdependent stages: disassembling the texts, establishing relationships, and capturing the new emerging information. Several detailed reading sessions of the participants' reports were held, identifying units of meaning that highlighted central aspects of the training experiences. These units were then organised and grouped into Word files with other textual fragments from the other instruments, triangulated with the study objectives. This long immersion process made it possible to structure several analytical categories, which served as interpretative axes for developing the text. However, this article proposes to discuss one of them, namely: "Perceptions on the training process in Environmental Education: a learning opportunity for educators".

## Perceptions on the training process in Environmental Education: learning opportunity for educators

In this category, we analyse the perceptions of elementary school teachers who participated in continuing education meetings focused on the creation of educational games for teaching environmental education. Based on the question: "Did the theoretical context of the training contribute in any way to learning about the topic of environmental education?", excerpts were selected that demonstrate the impacts of the training on pedagogical practice and on the teaching and learning processes of environmental education.

*DAVI: It was very, very enlightening for me, right? Because I had a lot of difficulty! I had never worked on these topics like that. Even though I work with Science, I always worked in ninth-grade Science. For me, it was very enlightening, very rewarding, I learned a lot of things that I didn't know, right? So, for me, this theoretical part was very good.*

*MARIA: Very! Even though we are a school that already works with this topic, right? And environmental care, sustainability, through the Bacuri Verde project and also through work that is developed here at the request of the Municipal Department of Education, it was a very positive moment! So, for those of us who have information, have knowledge to share, but often we don't have the opportunity to stop and talk about it, like we did in the training, right?*

*PEDRO: At first it was an impact, right? Everything that is new, for the professional, is impactful! But after you see that you're going to find new skills, new methodologies, you also start to be dazzled by what's being applied! I was delighted, I'm not going to lie to you! I think that's what made the school, right, embrace the way of working with the new tools, the new methodologies.*

*SARA: Yes, it helped! It's a topic that I already really like, I always have. Then I took a technical course on the environment, but there's always something more to be added, right? And so, in that sense, yes! It helped, it brought some new things. This part of working in a more playful way with the students on the topic is interesting!*

*ROSE: Definitely! It was a great learning experience for all the teachers. I personally saw it like, I don't know, I grew wings to fly with my class! It was really good!*

The perceptions expressed by the interviewees indicated that continuing education in EE had an impact on teaching, especially with regard to expanding the methodological repertoire and strengthening the commitment to including environmental issues in everyday school life. These reports show that the teachers recognised the training experience as significant for their performance, associating theoretical and practical learning with the redefinition of their teaching activities. However, it is important to highlight that this validation occurred at the level of the participants' perceptions, indicating the acceptance and engagement of teachers with the pedagogical proposal of the training.

It is important to contrast teachers' perceptions with the pedagogical objectives outlined for the training. To this end, it is worth highlighting that the training itinerary sought to expand knowledge about EE, stimulating pedagogical practices, with the creation and use of educational games, enabling more interactive and contextualised approaches to environmental education. Previous research emphasises that continuing education is a process that can go beyond the assimilation of content, but is an opportunity capable of helping to build strategies for the resignification of teaching in its critical, reflective and transformative dimensions. In this sense, Maia (2015) emphasises the importance of EE training programs that transcend specific and naïve approaches, promoting an effective commitment to EE at both the political and environmental levels. Thus, the positive impact of this training experience can be understood by the engagement of teachers and the potential resonance of these practices in the education of students and in the school's curricular dynamics.

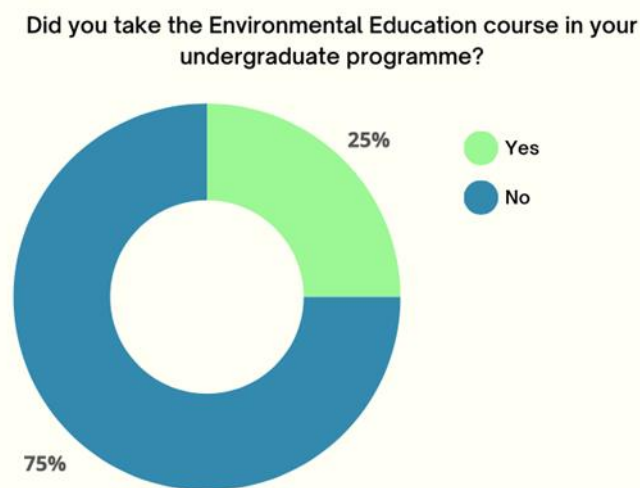
The category also highlights the importance of continuous improvement on the part of teachers, who see training and peer exchanges as an essential way to strengthen pedagogical practice. Gatti (2016) argues that teaching professionalism is forged from initial training, daily experience and interactions in the school environment, understood as integrative dimensions of knowledge, values and attitudes that drive both teaching and the personal growth of the educator. In this regard, he links the teaching of Paulo Freire (2000, p. 58): "No one is born a teacher or marked to be a teacher. We are formed as educators permanently, through practice and reflection on practice". Relating this idea to EE, we realize that this field of knowledge also requires a commitment to the continued training of educators.

Environmental education is not just a set of concepts to be taught, but it also constitutes, from a pedagogical point of view, an approach that involves the complex understanding of the interactions between human beings and the environment. In this regard, Carvalho and Ortega (2024) analyse how the COVID-19 pandemic context has heightened awareness of environmental and social risks, highlighting human fragility and the urgent need to revisit how we relate to the environment. They understand that environmental education is capable of adapting and facing the challenges arising from global transformations and ongoing crises. Therefore, educators working in contemporary times at all levels of education may be more aware of environmental issues, teaching methodologies, and strategies to engage students. Continuing education promotes teacher qualification and allows educators to remain alert, develop or improve skills and strategies and, above all, reflect on their pedagogical practice, providing new ways of understanding educational practice.



Furthermore, it is important to consider a piece of information regarding the initial training of the teachers participating in this research. In the online diagnostic questionnaire, participants reported that 75% of the group did not have the opportunity to study the EE discipline during their undergraduate training (Figure 1).

**Figure 1** – Percentage of teachers who took the Environmental Education course in their undergraduate programme



Source: Field research.

The findings of this research corroborate what has already been widely diagnosed in the literature: environmental education occupies a marginal place in initial teacher training (Guimarães, 2004; Loureiro, 2004; Manzochi; Carvalho, 2008). This finding reveals a discrepancy with the provisions of Article 225, Clause VI, of the 1988 Federal Constitution, which assigns to the Government the responsibility of guaranteeing environmental education at all levels of education. The vast majority of participants reported not having taken the subject in their undergraduate degree, which highlights a training gap with direct implications for pedagogical practice. This absence compromises the critical and interdisciplinary approach to environmental issues, hindering student engagement and the qualified pedagogical treatment of the complex relationships between society and nature.

This research, therefore, reveals this weakness in the teaching of environmental education in initial teacher training and highlights the need for improvements in this area in order to ensure more comprehensive and qualified training for teachers in relation to environmental issues. At the time of writing this article, some other questions arose: "Could the creation of a specific undergraduate degree in environmental education to train teachers to teach environmental education instead of teaching it transversally be a response to this pressing need?; Would an academic training dedicated exclusively to this area allow future teachers to develop a more in-depth knowledge of environmental issues, as well as acquire more refined pedagogical skills to address them more effectively in the classroom?; Could an undergraduate degree in environmental education train teachers who are more qualified and committed to teaching environmental education?"

Regarding these questions, Carvalho's article (2020) problematizes that the introduction of the transversal approach of EE in the educational scenario over the decades resulted in its marginalisation. This means that EE has been consolidated in a secondary position as a project, an occasional and discontinuous activity, without central importance in the training process, in the curriculum and in the structure of the school. With this reflection, the renowned researcher opens space to discuss and perhaps reconsider the feasibility of including EE as a curricular component in Basic Education. To this end, it would be necessary to have teachers who have graduated specifically to work in the area. These questions, which involve issues

such as the challenge of transversality and the processes of implementing EE in teaching, awaken in-depth analyses and emerge as highly relevant issues that deserve to be investigated in further studies, contributing to the expansion of understanding and decision-making about educational policies in Brazil and their implications in the current context. Given this scenario of weaknesses and questions, the importance of government initiatives that promote the effective inclusion of EE in teacher training curricula, as well as continuing education programs that enable teachers to consolidate the knowledge, skills, and attitudes necessary to approach EE in a more structured manner in the classroom, has become clear in contemporary times. Nunes Neto (2019) addresses this issue by highlighting the importance of strategies for incorporating EE into teaching, emphasising the need for continuing education that is aligned with national policies and that promotes sustainability, environmental awareness, and critical thinking in society. We believe that these measures are necessary to meet the guidelines established by the 1988 Constitution, which recognises the importance of EE and establishes the State's responsibility to promote it at all levels of education. We will continue the analysis exercise using another group of excerpts that report on the theoretical contributions arising from the EE continuing education meetings, according to the perception of the participating teachers.

*SAMUEL: Yes, it contributed a lot! Because, with this training, we were able to take and make a connection, right? Between the games, between this playful aspect, an aspect that already goes beyond the traditional education classroom. We can take and make a connection and make a more dynamic, less boring class.*

*ELZA: We see that a lot of knowledge was added that we didn't have before, right? Mainly about the SDGs, which some didn't know about. It also favoured the search for more knowledge. They went to research more about it. What we see here in the hallways, in the teachers' lounge, like: "There's going to be a next meeting, right? What do we have to study? What do we have to look for to be contributing?"*

*SABRINA: It definitely contributed! And I see the enthusiasm of the teachers, right? Organising themselves, preparing to work on the theme. In the WhatsApp group, talking about the theme, what have they already worked on in class and so on? So it really got the school going. ALICE: It helped a lot, okay! Everything was well presented through slides, as were the activities! We know that the dynamics are already practical, but the theoretical part was also. It helped a lot so that we could do different work in the classroom. It wasn't like, "Oh, let's do that little dynamic, and now we'll answer that little sheet." Thank goodness it wasn't!*

*MAITÉ: Of course! The topics covered were all very relevant to what we need to learn about Environmental Education.*

*LIZ: The training provided information that I didn't know about, right? Not only related to Brazil, but worldwide. And it added a lot to me, because there was some information that you brought that I wasn't aware of.*

Samuel saw the training as an opportunity to break away from the traditional classroom logic, linking games to the pedagogical proposal in a playful and engaging way. This connection meets the students' interests and has made EE teaching more dynamic. Elza highlighted the group's access to new topics, such as the SDGs, and valued the informal exchanges between colleagues. For her, the training fostered a culture of collaboration and continuous updating among teachers. Sabrina highlighted the collective enthusiasm after the meetings, evidenced by the organisation and constant sharing in the school's WhatsApp group. This collaborative space strengthened bonds between teachers and expanded the applicability of the strategies discussed. Alice considered the meetings productive and well-conducted, with materials and activities that integrated theory and practice. According to her, the training was useful for planning more creative and contextualised pedagogical proposals. Maitê acknowledged that the topics discussed in the meetings contributed significantly to her education. For her, the relevance of the content

promoted critical reflections on educational practice in EE. Liz emphasised the gain in repertoire, with access to information about the Brazilian and global context. According to her report, the training expanded her understanding of environmental issues and strengthened her teaching commitment.

Loureiro (2019) emphasises that EE should be a dialogical social process, not restricted to the transmission of ready-made models, but focused on problematising and searching for alternatives to face socio-environmental challenges. The interviews analysed demonstrate adherence to this perspective, evidencing the appreciation of collaborative and contextualised practices. The reports point to an understanding of EE as a dynamic construction of knowledge and actions, implying the need to foster critical and engaged approaches in everyday school life. Regarding the relevance and impact of continuing education in the teaching profession, Paulo Freire (2013) highlights that the teacher's confidence, competence, and autonomy in the classroom are intrinsically linked to their commitment to training and their continuous effort to improve their skills and knowledge.

The certainty with which the teaching authority operates implies another, which is based on its professional competence. No teaching authority is exercised without this competence. The teacher who does not take his training seriously, who does not study, who does not strive to be up to his task does not have the moral strength to coordinate the activities of his class. [...] What I mean is that professional incompetence disqualifies the teacher's authority. (Freire, 2013, p. 89-90).

Based on Freirean reflection, the voices of the teachers interviewed show an appreciation of training as a basis for the legitimate exercise of pedagogical authority. The participants associate continuous improvement with the strengthening of teacher autonomy, showing that innovative and committed practices emerge from consistent training processes. Samuel, for example, associates training with the construction of more engaging practices, aligning openness to new things with professional responsibility. The other statements reiterate the centrality of training in the qualification of pedagogical practice.

Furthermore, the participants' perceptions are in line with the findings of Santos and Jacobi (2011), who, when analysing a continuing education program for teachers in the final years of elementary school in schools in the city of Guarulhos, São Paulo, observed that the training process favoured both the construction of new knowledge and the review of pedagogical practices. In both studies, the training proved to be a unique space for teachers to rethink their teaching strategies and strengthen the connection between theory and practice, favouring a more contextualised and interdisciplinary approach to EE.

Thus, the data corroborate the importance of continuing education as a fundamental axis for the qualification of EE teaching, promoting greater teacher engagement and encouraging pedagogical practices that favor citizenship and critical reading of the social and environmental environment. Furthermore, the volume presenting the cross-cutting themes of the National Curricular Parameters (1997) already addressed the importance of continuing and systematic teacher education, in addition to initial education. It highlighted the need for constant educational investment in the professional development of educators, aiming to improve teaching. The document, without normative attribution, suggests that the required training should not be limited to a mere compilation of courses and techniques, but rather constitute a reflective and critical process in relation to educational practice.

[...] In addition to consistent initial training, it is necessary to consider continuous and systematic educational investment so that the teacher can develop as an education professional. The content and methodology for this training need to be reviewed so that there is a possibility of improving teaching. Training cannot be treated as an accumulation of courses and techniques, but rather as a reflective and critical process on educational practice. Investing in the professional development of teachers also means intervening in their real working conditions. (Brasil, 1997, p. 25).

The analysis of the excerpt highlights the recognition, by the PCN, of the relevance of continuing teacher training in the context of EE, conceived beyond a technical update, but as a reflective exercise. By proposing a critical approach, the PCN indicate the need for teachers to articulate theoretical knowledge

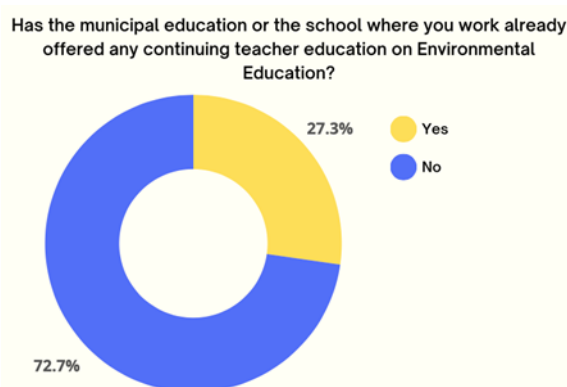
with the concrete conditions of educational practice, considering its ethical, social and environmental implications. This perspective reinforces the role of training as an agent of pedagogical transformation and promoter of an education committed to criticality. With regard to continuing training in EE, it is worth highlighting the understanding of Guimarães (2004), who addresses this aspect in an expressive manner.

A critical education that does not occur only in a moment, but that in a permanent way can provoke the breaking of the paradigmatic trap on the part of these educators, overcoming the fragility of naive practices, perpetuating a conservative environmental education, which has been consolidating in the daily school routine. (Guimarães, 2004, p. 158).

The author emphasises the importance of investing in training processes that extend throughout the educator's career, providing constant and in-depth updates on the challenges and demands of this area of knowledge. Guimarães emphasises that continuing education should not be seen as isolated events, but rather as an integral part of a permanent journey of professional development. Thus, by promoting critical and in-depth reflection on pedagogical practices in EE, such training contributes to strengthening the performance of educators and improving the quality of teaching. A relevant aspect to be addressed in the analyses is the gap in the promotion of thematic continuing education in EE by the education system. The data obtained from the group investigated highlighted the scarcity of training opportunities offered to in-service teachers (Figure 2). This reality reflects a lack of effectiveness in implementing what is advocated both by the Federal Constitution and by other normative documents, such as the National Environmental Education Program (PRONEA).

The implementation of the BNC-Continuing Education in the Brazilian context is structured around the establishment of national guidelines for the training of professionals working in basic education. However, when it comes to including EE in this context, substantial challenges arise. EE requires a cross-cutting and interdisciplinary approach, which often does not find adequate space in curricula and continuing education programs for teachers. In addition, there is a need for greater emphasis on raising awareness and qualifying teachers to effectively integrate the environmental dimension into their pedagogical practices, which requires considerable investment in initial and continuing education, as well as in specific teaching resources and materials.

**Figure 2** – Percentage of teachers who reported continuing education in Environmental Education offered by the City Secretary of Education



Source: Field research.

The BNC-Continuing Education adopts a model based on the development of general teaching skills, with a strong generalist character. Since its preliminary formulation in 2018, it has been the target of criticism linking it to technocratic concepts, aligned with neoliberal values and a logic of instrumental

training (Albino; Silva, 2019). Such criticisms point to the risk of superficial training, focused more on adapting the workforce to the market than on critical and transformative teacher training.

In view of this, it is necessary to problematize these training guidelines, revealing discourses that, under the guise of valuing teachers, can reinforce teaching models aligned with productivist rationality. It is in this scenario that training in EE presents itself as a counter-hegemonic possibility, by promoting pedagogical practices rooted in socio-environmental ethics and a commitment to social transformation. When articulated with the school context, EE expands the possibilities of teaching practice, favouring the development of critical awareness and the construction of educational bonds with the community.

Data analysis reveals contrasts regarding teachers' intention to participate in continuing education in EE. While 41.7% of teachers showed interest, 33.3% have never participated in training activities in the area, indicating structural gaps and the absence of effective policies. Although 16.7% expressed a desire to participate in the future, the data indicates a repressed demand for training. Those who declared disinterest indicate the need for specific investigations into their motivations and possible barriers. In view of this, it is essential to expand the training offerings in EE, strengthening teacher qualifications and promoting critical and transformative pedagogical practices. Investing in continuing education at all levels of education means enhancing environmental citizenship and preparing educators and students for contemporary socio-environmental challenges for the consolidation of resilient schools. When we consider the demands and potential inherent in the demands of continuing education and the teaching of EE in the school context, it is pertinent to resort to Cascino's reflection (2000, p. 67).

Our goal today is to be bearers of transversalising capabilities, which allow us to navigate through contradictory locations and events at the same time. Our environmental language needs and desires the whole, in the awareness of its impossibility/unfeasibility. Seeking the whole... goal, objective, desire... the satisfaction of playing, without ever knowing when the game will end, nor if that end will exist.

Cascino's (2000) conception highlights a central feature of environmental education: the need to build transversal skills capable of operating in complex and contradictory contexts. The proposal to reach "the whole" through environmental language reinforces the urgency of a systemic and integrated vision of reality, in which environmental phenomena are articulated in multiple dimensions. This approach challenges traditional teaching by requiring an education that transcends disciplinary boundaries and promotes the articulation of knowledge.

However, the very search for the "whole" reveals the limits of this endeavour, marked by uncertainty and incompleteness of knowledge in times of rapid transformations. In this scenario, environmental education can stimulate critical and complex thinking, capable of dealing with the various environmental challenges. In this sense, Krenak (2019) reinforces the urgency of practices of existence that do not only aim at the preservation of resources, but also guarantee the continuity and balance of all forms of life. Deepening the discussion on the absence of EE in teacher training moments in school institutions, it is relevant to highlight the reflections of Neves and Tozoni-Reis (2014, p. 65).

Environmental education has been institutionalised and is present in school programs and projects, but it is still absent in the form of critical discussions during teacher training sessions, which end up relying on and restricting their environmental education practice to the material intended for their students. [...] Environmental education will only become critical if teachers themselves can question and reflect on their own practice: what is the objective of the environmental education practices we have implemented in our school? Whose interests do they serve? How do these practices influence our students? How can we move forward?

The authors' ideas highlight the weaknesses of continuing education for teachers in environmental education. Although it is present in school programs and projects, its critical and reflective approach is still neglected. This situation reveals a mismatch between the institutionalisation of environmental education



and its effective integration into educational practice. By limiting themselves to the available teaching materials, schools can only reproduce superficial and prescriptive approaches to environmental issues, generally focused on neoliberal ideals, failing to explore its transformative and critical potential. In this sense, the lack of critical discussions about environmental education in teacher training contributes to the persistence of a fragmented and decontextualised approach, making it difficult to promote an emancipatory environmental education. Neves and Tozoni-Reis (2014) draw attention to the underlying purpose of environmental education practices, and it is necessary to understand what interests lie behind them and assess how they impact students and the environment around them.

This critical reflection is often limited by the lack of adequate spaces and opportunities for continuing education for teachers. The lack of time dedicated to discussing environmental educational practices can make it difficult to develop a truly analytical and autonomous approach to EE. To conclude the analysis exercise, some excerpts will be used in which teachers pointed out differences between the training experience provided by the research and other continuing education provided outside of school:

*MARIA: The fact that the training takes place within our routine is positive, because we are already here, so it guarantees the participation of a greater number of people, right? Except for those colleagues who are on leave and sometimes are not available to come. I think there could have been more meetings. We could have worked more, for more days. The content is extremely relevant, right? For us as teachers, for our students, for society in general, but it was very good!*

*FELIPE: I noticed a huge difference. The effect is much more promising and has better results, because you are interacting better with those who are there.*

*SARA: I noticed differences. I believe that because it was a single topic, for a longer period of time, that is already a positive point. It is... the smaller group as well. I think that ends up contributing, because it is easier to get everyone's comments. So, in that sense, I liked this training.*

*DAVI: It brings more interaction for the teachers than the one provided by Semed, which comes with everything already packaged. It was better here because we were the ones who practically set up the training, right? Everyone, everyone together!*

*SAMUEL: The other courses are more formal, and here only the school teachers are there, so we feel more at ease, right? To talk, participate in games, even jokes... to smile... Than in other courses. Because sometimes we don't know the trainer, or because there are more people we don't know. But I thought it was really cool too, because when we feel more at ease, things flow better!*

*ELZA: The team was able to follow closely! I feel this distance, in this training where they go there and I don't know what's going on. And sometimes when they arrive, they don't go through it and we don't have time, because the routine is very busy, right? There's no way for the teacher to stop and say, "hey, it was this, this, this". And I can't leave here and follow all the teachers there. And here it was perfect! Inside our school, in our space, the teaching team was able to closely monitor the teachers, what they were saying, what difficulties they had, what concerns they had, what fears they had, right? The proposal here was much better. I always thought about that. This training that takes place outside is wonderful, but we are kept up to date. The team that will be monitoring the teacher later usually doesn't know if he or she will be implementing what was taught there!*

Maria values the provision of training in the school environment, recognising that this arrangement has an integrative power that favours teacher engagement by articulating training with the daily pedagogical practice, as Maia (2015) argues, emphasising that training processes should emerge from the social experiences of educators. Even so, the teacher points out a recurring obstacle: the incompatibility of schedules, which prevented the full participation of the teaching staff, compromising the collective reach of the initiative. She advocates for more frequent and in-depth training, understanding that regularity and theoretical-practical density are decisive for consolidating knowledge and transforming practices in teaching EE. She recognises the content covered as pertinent to professional practice, student learning, and broader

citizenship development. This view echoes the contributions of Krasilchik (2006), Imbernón (2010) and Carvalho (2005), who converge in arguing that formative itineraries supported by teaching experiences favor the creation of collaborative projects and the strengthening of a critical, situated and socially committed EE. In this context, it is relevant to emphasise the following passage:

Teacher education involves a dimension that transcends the programmatic objectives of the courses and training methodologies. It involves the formation of a personal and professional identity. Thus, whatever these programs and methodologies may be, they must engage with the world of teachers' lives, their experiences, their life projects, their living conditions, their social expectations. [...] Thus, teacher training in EE, more than a training aimed at adding a new pedagogical skill, challenges the formation of an ecological subject (Carvalho, 2005, p. 13).

The discussion on EE training brought up by Maria reflects Carvalho's (2005) point of view on the importance of a teaching approach that goes beyond transmitting knowledge, seeking to integrate the educator's personal and professional training. EE, therefore, aims to generate a transformative impact on pedagogical practices and also on the communities where it operates. Carvalho and Maria, therefore, agree that EE training can be seen as an integral and continuous process that contributes to the development of both individual teachers and teaching as a whole. The voices of Felipe, Sara and Davi support the idea that training carried out at school, adapted to local characteristics and needs, is better received and successful. The possibility of interacting in a familiar environment, with a focused group, and the ability to collectively construct the content of the training emphasises performance, in addition to enhancing the impact of learning. Mucharreira (2016) corroborates this thought:

School-centered education institutionalises a continuous learning process in its context, envisaging reflective and formative initiatives that allow teachers to question their practices, which can contribute to the quality of teaching and thus, ultimately, to students' effective and lasting learning. (Mucharreira, 2016, p. 44).

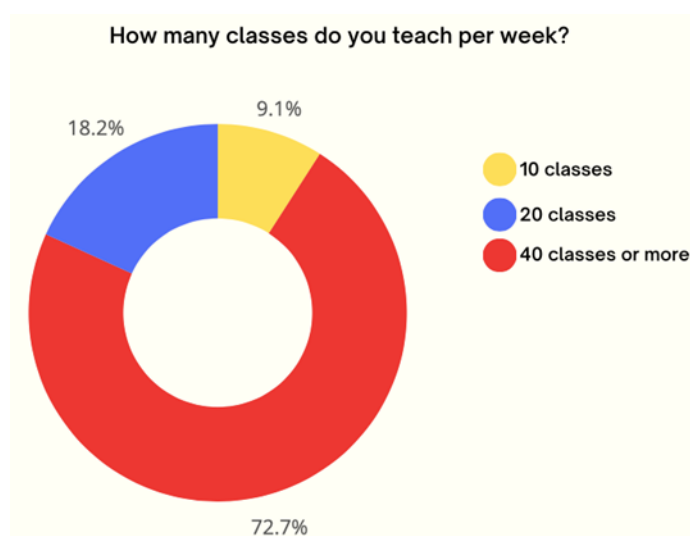
The excerpt from Mucharreira and the reports from Felipe, Sara and Davi highlight the importance of considering the context and peculiarities of the school community when planning and implementing training processes, especially in essential fields such as EE. These practices encourage collective responsibility, interactivity and local relevance, essential elements for transformative teaching that is effectively integrated into the daily lives of educators and students.

Samuel's voice points out that the training sessions held at the school, involving only known colleagues, allowed for a level of complicity that facilitated active participation. This more unpretentious environment promotes greater freedom to express oneself and fully participate in the proposed activities. This scenario, therefore, is seen by Samuel as fundamental for a more fluid and functional learning process, suggesting that emotional and social comfort is important for ongoing training. "It is up to the education professional, integrated and concerned with the articulation of effective processes of transformation of pedagogical practices, to recreate the spaces/means - curricular action environment (Cascino, 2000, p. 84). Elza identifies a preeminence visualised in the training developed in the school context: the capacity for close monitoring by the pedagogical team. This method promotes a more complex involvement and a more promising implementation of learning, contrasting with the limitations observed in training carried out externally. The training process can assume disruptive postures in favor of the construction of the school collective. In agreement, Nóvoa (2002) states that:

Continuing education should contribute to educational change and the redefinition of the teaching profession. In this sense, the relevant space for continuous training is no longer the isolated teacher, but rather the teacher integrated into a professional body and a school organization. (Nóvoa, 2002, p. 38).

The analysis of Elza's voice and Nóvoa's thinking suggest that schools should consider integrating professional development activities into the school environment itself as a strategy to improve communication, the practical application of acquired knowledge, and the quality of teaching. Thus, local and personalized training emerges as a preferred practice to promote a EE that holds teaching and learning processes capable of transforming and infecting the school community. In line with this ideal, the results obtained through the diagnostic questionnaire found that 45.5% of the teachers involved in this study perform their activities in two or three different educational institutions. This finding highlights the persistent devaluation of teaching, reflected in the need for multiple employment relationships to ensure a dignified livelihood. Work overload and insufficient financial recognition emerge as obstacles to teacher participation in training processes. The high weekly workload (Figure 3) can compromise both the quality of life and the involvement of teachers in professional development and critical reflection actions.

**Figure 3** – Volunteers' workload



Source: Field research.

The data reveal that more than 70% of the members of the group investigated face the arduous workday of 40 or more classes per week, a circumstance that can compromise both the possibility and the quality of engagement in continuing education activities aimed at teachers. This scenario reflects a negative impact, undermining professionals' interest in a teaching career and contributing to the precariousness of both teaching and the professional trajectory of educators themselves. It is undeniable that the excessive workload imposed on teachers determines severe limitations on their ability to participate in training initiatives and to remain available in relation to new pedagogical practices and educational content. In addition, this reality discourages new talents from entering the profession, since the prospect of facing such an exhausting workload drives away potential interested parties. In this sense, let us see what Dias-da-Silva and Fernandes (2006, p. 247) argue:

[...] We are convinced that there is a deep correlation between salary, working conditions and teachers' involvement with schools and projects. If not, why do many (good) teachers double their working hours in public schools to include classes in private schools? Why do (good) teachers leave public schools as soon as they get a more lucrative job in private schools? Is there any political or ideological commitment to this choice?

The analysis of the diagnostic questionnaire, in light of the study by Dias-da-Silva and Fernandes (2006), shows a significant correlation between the working conditions of teachers and their ties to public

schools. The overload faced by more than 70% of the participants confirms the authors' warning about the impact of remuneration and professional demands on career commitment. This scenario compromises adherence to continuing education and limits the qualified inclusion of EE in the daily school routine. The search for extended working hours or migration to private schools in search of greater stability illustrates a context of precariousness that weakens the retention and engagement of teachers in public education. Gatti and Barreto (2009) address preponderant issues, impasses and challenges inherent to research conducted in Brazil on the dynamics of continuing education. They elucidate problems that permeate this field, highlighting the complexity and diversity of factors involved:

- a) continuing education is organised with little alignment with the needs and difficulties of teachers and schools;
- b) teachers do not participate in decisions about the training processes to which they are subjected;
- c) trainers are not familiar with the school contexts and the teachers they are training;
- d) programs do not provide systematic monitoring and support for teachers' pedagogical practices, who find it difficult to understand the relationship between the program developed and their actions in daily school life;
- e) even when the effects on teachers' practices are evident, they find it difficult to continue with the new proposal after the program ends;
- f) the discontinuity of the system's policies and guidelines makes it difficult to consolidate the progress achieved;
- g) there is a lack of better compliance with the legislation that guarantees teachers the right to continuing education (Gatti; Barreto, 2009, p. 221).

Gatti and Barreto (2009) highlight persistent obstacles in continuing education, especially with regard to EE. The disconnect between programs and the real demands of teachers compromises their relevance, affecting engagement and hindering the practical application of the content covered. The lack of protagonism of teachers in defining training itineraries weakens their autonomy and reduces the effectiveness of the proposals. The lack of knowledge on the part of trainers about school contexts and the subjects of training further compromises the relevance of training actions. Added to this is the lack of systematic post-training monitoring, which hinders the incorporation of creative practices and the strengthening of critical methodologies, such as those required by EE. The discontinuity of educational policies worsens this scenario, making investment in more consistent proposals unstable. Given this situation, the construction of continuous, dialogical and contextualised training paths capable of fostering effective transformations in pedagogical practice becomes urgent.

## Concluding Remarks

The analysis of the perceptions of teachers participating in continuing education in EE revealed significant contributions to professional development and the improvement of pedagogical practices. The training experience, by incorporating the creation and use of educational games, promoted a dynamic, dialectical and collaborative environment, favouring interdisciplinarity and expanding the possibilities of teaching and learning. The exchange between educators proved essential to strengthen collective work and foster more critical and creative pedagogical practices.

A relevant aspect identified was the teachers' preference for training carried out within the school environment itself. This choice is not justified only by practicality, but also by the direct effect on the applicability of the knowledge acquired, favouring a more organic integration between theory and practice in the school routine. By experiencing the training in their professional routine, the teachers were able to experiment and adapt the practices to the reality of their classes, redefining the teaching of EE and incorporating several layers of more contextualised strategies aligned with the demands of the school territory.

However, the study also revealed challenges that need to be considered, such as the limited time for the development of the training journey and the pedagogical planning of teachers. Other limitations relate to the extensive workload of teachers and the pressure to complete an extensive curriculum, which can restrict the in-depth discussions and the implementation of EE. Furthermore, the lack of institutional spaces for reflective exchanges and collective planning can hinder the consolidation of a more interdisciplinary school culture, compromising the effective integration of EE into the curriculum.

The research reinforces the need for continuing education opportunities that encourage dialogue, experimentation, the sharing of experiences and, above all, the problematisation of socio-environmental relations and structural inequalities that impact the ecological crisis, recognising the need for an approach that integrates political, cultural and social dimensions. This training process, in addition to expanding teachers' understanding of EE, also highlights the importance of establishing educational policies that ensure its effective presence in initial and continuing education programs.

Given this scenario, it is urgent to invest in strategies that make EE viable as a guiding principle for basic education, promoting its integration into the curriculum in a robust and transversal manner. Continuing education in EE, when planned based on the needs of teachers and combined with diversified methodologies, contributes to consolidating environmental knowledge as a field that goes beyond the transmission of content, enabling an education committed to the development of critical, autonomous subjects who are engaged in socio-environmental transformation and in improving their own teaching practice.

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