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Educational trajectories and Pedagogical Practices in the (Auto)Biography of Mathematics Teachers

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Abstract
This article examines the educational trajectories and pedagogical practices of Mathematics teachers in Basic Education, drawing on their experiences and reflections through (auto)biographical narratives. Grounded in a qualitative approach, the study employs Discursive Textual Analysis and is informed by authors such as Freire (2021), Nacarato (2010), and Skovsmose (2022), who emphasize the importance of reflective, critical, and contextually oriented teacher education. The narratives of 12 teachers reveal gaps in initial teacher education, underscore the relevance of context-based pedagogical practices, and point to the need for ongoing professional development that addresses contemporary challenges in Mathematics teaching. The study reinforces the role of continuing education as a fundamental component in promoting effective and transformative pedagogical practices, thereby contributing to a more critical and meaningful educational process.

Keywords
teacher education; pedagogical practices; autobiographical narratives; mathematics education.

O percurso formativo e as práticas educativas nas (auto)biografias de professores que ensinam matemática

Resumo
Este artigo investiga o percurso formativo e as práticas pedagógicas de professores que ensinam Matemática na Educação Básica, considerando suas experiências e reflexões a partir de (auto)biografias. Fundamentado em uma abordagem qualitativa, o estudo adota a Análise Textual Discursiva como metodologia de análise, apoiando-se em referenciais como Freire (2021), Nacarato (2010) e Skovsmose (2022), que destacam a importância da formação reflexiva, crítica e contextualizada. A partir das narrativas de 12 professores, foi possível evidenciar as lacunas na formação inicial, a relevância de práticas pedagógicas contextualizadas e a necessidade de uma formação continuada que dialogue com os desafios contemporâneos do ensino da Matemática. O estudo ressalta a relevância da formação continuada como elemento fundamental para a promoção de práticas pedagógicas eficazes e transformadoras, contribuindo para uma educação mais crítica e significativa.

Palavras-chave
formação de professores; práticas educativas; história de vida; educação matemática.

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Itinerarios formativos y prácticas educativas en las (auto)biografías de profesores que enseñan Matemáticas

Resumen
Este artículo investiga la trayectoria formativa y las prácticas pedagógicas de los profesores que enseñan Matemáticas en la educación básica, teniendo en cuenta sus experiencias y reflexiones a partir de (auto)biografías. Basado en un enfoque cualitativo, el estudio adopta el Análisis Textual Discursivo como metodología de análisis, apoyándose en referencias como Freire (2021), Nacarato (2010) y Skovsmose (2022), que destacan la importancia de una formación reflexiva, crítica y contextualizada. A partir de las narrativas de 12 profesores, fue posible evidenciar las lagunas en la formación inicial, la relevancia de las prácticas pedagógicas contextualizadas y la necesidad de una formación continua que dialogue con los retos contemporáneos de la enseñanza de las matemáticas. El estudio destaca la relevancia de la formación continua como elemento fundamental para la promoción de prácticas pedagógicas eficaces y transformadoras, contribuyendo a una educación más crítica y significativa.

Palabras clave
formación del profesorado; prácticas educativas; historia de vida; educación matemática.

1 Introduction

The use of (auto)biographical narratives makes it possible to understand teaching in its complexity, allowing teachers to reflect on their trajectories, practices and professional identities. By narrating their stories, teachers reveal formative experiences, challenges faced and learning, enabling a critical analysis of the career trajectory of the profession. Investigating the formative trajectories of teachers who teach mathematics from (self)biographies contributes to rescuing individual memories and understanding collective aspects of teacher education, often made invisible in strictly technical research (Borges; Novaes, 2018; Nacarato, 2010).

Beyond its logical and formal structure, Mathematics contributes to the development of critical thinking and to the understanding of reality in its multiple dimensions. As an essential subject in the curriculum, it also plays a central role in the integral development of students, both for its specific nature and for its educational potential.

Thus, the teaching and learning process is interconnected with a series of factors that cover education for human formation, and mathematics can favor socialization and access to democracy and contribute to solving social challenges. For Martín, Pérez and Esteban (2017) , training should not be merely theoretical, but based on activities that

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help them become familiar with active teaching methods, learn to work in teams and develop reflective learning.

In this perspective, Rebouças, Oliveira and Bezerra (2024) point out that contextualizing mathematics to students' daily lives is an essential aspect to make learning more meaningful. The contextualized approach stands out as the basis for relating mathematics to the critical and citizen education of students. It is common to hear students express that the subject is challenging and irrelevant outside the school environment, which can result in several gaps throughout the educational process. For Pontes (2019, p. 16), "[...] difficulties in understanding mathematical concepts are extremely visible in the school performance of the students involved", which can generate dissatisfaction and demotivation among students.

In contrast to the traditional teaching model, which positions the student passively, while the teacher only transmits information, an approach that values the students' reality places them as active protagonists in the learning process (Carrijo, 2024; Skovsmose, 2012). Instead of the teaching standard "definition - examples - exercises", it begins with problem situations that reflect their experiences, challenges. In this movement, students build mathematical knowledge from their experiences, while the teacher acts as a facilitator and incentive, promoting autonomy and active engagement of students (Franchi; Ramos, 2024).

The teaching and learning process requires the teacher to reflect on strategies that help students integrate into the world in a critical and responsible way, favoring respect for diversity, democracy and equity. According to the National Curriculum Guidelines for Basic Education (DCNEB) (Brasil, 2013, p. 181), it is "[...] indispensable to promote a democratic environment in which relations between students and teachers and between students themselves are characterized by respect for others and the appreciation of diversity and difference".

Given the context presented, the objective of this study is to analyze the training trajectory and pedagogical practices carried out by teachers who teach mathematics through their (self)biographies, since, to overcome traditional education, it is essential to reassess the role of the school as a space for critical training, aiming to develop transformative attitudes in society.

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2 Methodology

This research adopted a qualitative approach and used the biographical method as data collection, which can contribute to the analysis of the education process, knowledge, teacher training, as well as the constitution of mathematics in Brazilian education. According to Borges and Novaes (2018), knowing the biography of mathematical educators allows us to understand transformations in the educational process, since many worked in reforms, textbooks, courses, magazines and other pedagogical spaces.

Thus, the (auto)biographical writing of teachers can contribute to the deconstruction of traditional beliefs and practices in mathematics teaching, as it favors reflection on the teaching and learning process from different life stories. In addition, it expands the repertoire of teaching knowledge and enables the performance in new didactic-pedagogical perspectives (Nacarato, 2010).

To collect the (self)biographies, a public call was made for teachers from the early years of Elementary School to High School who teach Mathematics. The research was published on several social networks, such as Telegram, Facebook and Instagram, in order to reach teachers from the five regions of Brazil. The invitation presented the research proposal, its objectives and participation criteria.

The inclusion criteria were: being a Basic Education teacher, having at least three years of experience in mathematics teaching and signing the Informed Consent Form (ICF). The research was approved by the Human Research Ethics Committee of the institution of two of the authors, according to Resolution No. 510/2016 of the National Health Council (Opinion Nº. 6.262.443/2023), ensuring compliance with ethical principles and the protection of participants.

In total, 12 teachers accepted the invitation and submitted their (self)biographies. In order to maintain anonymity in the present research, the participating professors received codenames identified in Table 1, below. These codenames were chosen based on the centrality of the reports of each (self)biography, that is, on the predominant themes addressed by the teachers, providing greater clarity about the coding process and its

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relationship with the research objectives. In addition to the codenames and central themes, the table also presents information about the city and state in which the professionals work, their gender and the level of education in which they teach. These data allow a broader understanding of the context of action of the participants, contributing to the analysis of the experiences and challenges reported.

Table 1 – Data of research participants

Code name	Central theme addressed in the (auto)biography	City - State	Gender	Performance
Apprentice Teacher	Continuous learning and reflections on the teaching role	Russas - CE	Male	High School
Professor Trajectories	Professional trajectory and influences in the construction of teaching identity	Jequié - BA	Male	Final years of lower secondary education and upper secondary education
Literacy Teacher	Mathematics teaching in the early years and the process of mathematical literacy	Tianguá-CE	Female	Primary education
Teacher Experiences	Remarkable experiences in the teaching trajectory	Ubatã - BA	Male	Final years of lower secondary education and upper secondary education
Obstinate Teacher	Overcoming challenges and persistence in teaching	Garanhuns-PE	Female	Primary education
Teacher Experiences	Sharing of significant experiences in mathematics teaching	Belém - PA	Female	Final years of lower secondary education and upper secondary education
Teacher Practices	Innovative pedagogical strategies and methodologies in mathematics teaching	Nova Iguaçu - RJ	Female	Final years of lower secondary education and upper secondary education
Pedagogical Teacher	Challenges and adaptations of pedagogical practices in Basic Education	Taboão da Serra - SP	Female	Final years of lower secondary education and upper secondary education
Professor Equity	Inclusion and diversity in mathematics teaching	São Paulo - SP	Male	Final years of elementary education
Professor Caminhos	Different teaching trajectories and challenges faced	Florianópolis - SC	Male	Final years of elementary education
Professor Transformation	Impact of Mathematics Education on social transformation	Florianópolis - SC	Female	High School
Professor Reflections	Critical reflections on pedagogical practice and the challenges of teaching	Lages - SC	Male	High School

Source: Prepared by the authors (2024).

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For the analysis of (self)biographies, the Discursive Textual Analysis (DTA) method was used, which is "[...] more than a set of defined procedures, it constitutes an open methodology, a trajectory for investigative thinking, a process of placing oneself in the movement of truths, participating in their reconstruction" (Moraes; Galiazzi, 2006, p. 119). This methodology is characterized by its flexibility, allowing the researcher to be actively involved in the interpretation of the data, reconstructing meanings throughout the investigative process. According to the course of the DTA, the analysis was structured in three phases: unitarization , categorization and metatext. In the first stage, of unitarization, the fragments that emerged from the (self)biographies were identified, taking into account the purposes of this study. It is up to the researcher to make such selections, as "[...] it constitutes an effort of interpretation and personal construction of the researcher in relation to the meanings of the 'corpus'" (Moraes; Galiazzi, 2011, p. 53). This fragmentation allowed a more detailed reading of the reports, highlighting aspects relevant to the research.

The next stage of the DTA was the categorization, which "[...] proves to be an exercise in classifying the materials of a textual corpus" (Moraes; Galiazzi, 2011, p. 75). Thus, the categories emerge a *posteriori*, as a result of the researcher's interpretative process. From this systematization, two categories emerged: training of teachers who teach mathematics; and social context and learning. After completing this categorization, the final stage of the DTA involves the elaboration of the metatext, which is developed from the emerging units. This metatext provides an understanding of the narratives present in the textual *corpus*. Like this:

> Discursive textual analysis has its foundation in the exercise of writing as a mediating tool in the production of meanings and therefore, in recursive processes, the analysis moves from empirical to theoretical abstraction, which can only be achieved if the researcher makes an intense movement of interpretation and production of arguments. This whole process generates analytical metatexts that will compose the interpretative texts (Moraes; Galiazzi, 2006, p. 118).

Based on the categories that emerged from the teachers' narratives, the metatext that makes up the results and discussion of this research was elaborated. The reports and reflections of the participants reveal challenges and potentialities of the training course, as well as indicate impacts of these experiences on classroom practice.

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3. Results and Discussion

Based on the (self)biographies analyzed, we will discuss the training of teachers who teach mathematics, highlighting the need for reflective pedagogical practices for student learning, based on the different social contexts of teachers, interdisciplinarity and the appreciation of students' previous knowledge.

3.1 Training of teachers who teach Mathematics

The training trajectory of teachers who teach mathematics is essential to improve pedagogical skills, adjust teaching strategies to the needs and interests of students and promote conceptual understanding and the practical application of mathematical content. When considering the importance of contextualizing knowledge, teachers are encouraged to adopt approaches that favor meaningful learning, articulating theory and practice. Constant reflection on pedagogical practices strengthens dynamic and creative professional identities, encouraging methodologies that dialogue with the challenges of mathematics teaching and with the demands of the contemporary world (Azerêdo, 2021). Thus, Teacher Practices (2024) points out that:

> *Taking students to Mathematics, which can be used both in the classroom and in their daily lives, and that Mathematics is present all the time in our lives, is my main goal. I want to grow more and more in knowledge and be able to transmit it effectively at school.*

As for his initial training, Professor Reflexões (2024) considers that there were gaps that influenced his pedagogical practices. He realizes that some aspects could have been developed to effectively consolidate his professional performance.

> *I wouldn't say my initial training was extraordinary. I think, rather, that she managed to lay the foundations for what would one day become a mathematics teacher. In fact, I think this is exactly the function of initial training, but I want to say that it could have been much better, in terms of content and practice. This assessment I do today, more than ten years later, with some experience and identifying several gaps not filled by the degree (Professor Reflections, 2024).*

In the initial training of teachers who teach mathematics, it is not enough to address the specific contents of the discipline, it is also necessary to contemplate the

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political commitment, ethics, didactic knowledge and understanding of the teacher as a permanent learner. Such training must take place in a collaborative and reflective perspective, which favors shared practices, critical analysis of teaching performance and evaluation of the impact on student learning (Ferreira; Souza Neto; Batista, 2022).

Training environments based on learning communities favor the discussion and construction of meanings, strengthening both the specific and pedagogical knowledge of teachers (Rebouças; Oliveira; Bezerra, 2024). Thus, the importance of considering the school as a learning community stands out, understood as "[...] a proposal based on the transformation of the educational context, carried out by the educational agents of the school institution together with family members and students" (Cruz *et al.*, 2023, p. 3), where different knowledges complement each other in a shared pedagogical project.

In these learning communities, there are exchanges of knowledge, values, ideas and techniques, promoting continuous lifelong learning through interactions and everyday experiences. In this diverse context, individuals develop and build knowledge collaboratively and reflexively, which also impacts the continuing education of teachers. Factors such as understanding the context of students, the applicability of content and the exchange of experiences between teachers are essential to improve the quality of teaching, making pedagogical practice more meaningful and aligned with educational needs. In this sense, Professor Caminhos (2024) states that "*[...] it is essential to have good initial and continuing education. And yet: it is not up to teachers to seek this alone, as education systems must offer conditions for discussion and constant learning*".

According to Severino (2020), the search for changes in this scenario involves the need for initial and continuing education that offers teachers consistent theoretical and practical bases. This training should enable not only the acquisition of knowledge, but also the development of the critical capacity to question, reflect and overcome the simple reproduction of imposed guidelines.

The Literacy Teacher (2024) points out that the students' difficulties in recognizing numbers in everyday contexts reinforces the importance of teacher training that prepares teachers to develop strategies that bring mathematical content closer to the students' reality. The teacher reports that: "*[...] when directing students to carry out the activity of the Mathematics book [...], I realized that most, about 22 students, did not*

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recognize numbers in specific contexts, such as product prices, money counting and change" (Literacy Teacher, 2024). Therefore, strengthening mathematical thinking from the early years requires that educators receive training support, enabling them to go beyond the simple application of book activities and promoting more meaningful learning (Pontes, 2019).

Challenges are encountered daily in classrooms. The professor Caminhos (2024) comments: "*I began teaching while I was still halfway through my undergraduate degree, and it was there, inside the classroom, that I realized knowing mathematics was not enough to teach it. I found myself confronted with myself, challenged and afraid of not being able to*." This scenario highlights the importance of teacher education because, when well prepared, they can identify and address these learning gaps from the beginning, creating a solid basis for students' progress throughout their academic trajectory.

It is important to recognize that the challenges faced by teachers and students are not restricted only to the "transmission" of mathematical content, but also involve the students' relationship with knowledge. As Skovsmose (2022) points out, students should be seen as active subjects in the learning process, capable of constructing meanings and interacting critically with reality. Thus, teaching should incorporate strategies that favor a more reflective and meaningful participation of apprentices.

The Literacy Teacher (2024) comments that, in another class:

> *In an attempt to vary teaching possibilities, in the next class, I used some mathematical problems that involved the ability not yet consolidated by the students, and the result was practically the same, the students did not understand what was being proposed, so they could not solve the proposed problems.*

For Neres and Correa (2022), despite efforts to diversify teaching strategies and introduce a variety of mathematical problems, some students may still face difficulties in understanding and solving these challenges, as evidenced by the Literacy Teacher. With similar difficulties, Professor Vivências (2024) describes:

> *During my first years of teaching, I taught in some public schools in Bahia. Starting with students from Elementary School II (5th to 9th grade), I was able to work for five years with adolescents from 11 to 14 years old; on the occasion, I did hard work with heterogeneous classes and with many basic difficulties in Mathematics, especially in the four operations.*

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The challenges reported by teachers show that, even with efforts to diversify teaching strategies, difficulties persist, especially in basic mathematical concepts. However, curricular proposals, such as the National Common Curricular Base (BNCC), far from offering effective solutions, end up reinforcing a prescriptive and standardized model, unable to meet the real needs of students. By disregarding educational inequalities and the specificities of each context, these documents contribute to the perpetuation of mistakes and gaps in learning. Therefore, it is essential that teachers recognize such limitations and seek, through continuing education, more effective strategies to prevent these difficulties from consolidating and compromising learning.

Dissatisfied with the results achieved in the classes, the Literacy Teacher (2024) comments:

> *I researched more on the subject, found a report [...] that addresses mathematical literacy from an experiential perspective, stimulating the problematization, argumentation and reflection of mathematics in real contexts, using manipulable materials and interaction between the group of students. I decided, from the reflection on the practice, to direct the pedagogical planning. Perceiving the activities with pedagogical intentionality, I returned to the subject of the monetary system, now through manipulable games; the class was divided into teams of four students, each team had a different game, referencing what I understood years later to be a game circuit, where all children could experience the different stages and mathematical levels. The groups were directed from the students' reading and writing hypotheses, where each group had at least one student reader, so that the understanding of the rules and movements was guaranteed, and the experience was provided to all.*

Oliveira and Roehrs (2023) point out that, despite advances in methodologies and didactic tools, subjects such as Mathematics are still labeled as difficult by students. This negative perception, often associated with the complexity of the concepts and the language adopted, contributes to the lack of interest and the difficulties faced throughout the learning process. In agreement with this, the Pedagogical Teacher (2024) says that:

> *The subject of Mathematics is a subject historically considered as 'difficult' 'boring' , 'not understandable'. I try in all classes to break this perspective, through conversations and games, where students and I can create a pleasant and light environment, with the genuine possibility of learning.*

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Thus, the experiences shared by teachers emphasize the importance of training that transcends the mere acquisition of mathematical knowledge, encompassing, in addition, a critical analysis of pedagogical practices to promote educational effectiveness.

3.2 Social context and learning

Mathematics learning is a dynamic process influenced by the social and educational context of students (Cruz *et al.*, 2023, p. 3). By investigating the different social contexts experienced by teachers throughout the country, we can identify the specificities and challenges faced by these professionals, as well as the potentialities and learning generated with students.

This diversity of experiences can provide a unique opportunity to understand how pedagogical practices are influenced by individual and collective factors, as well as to explore ways to strengthen them to promote a quality Mathematics Education that values the inclusion of all. Therefore, it is crucial that teachers reflect on their pedagogical practices, considering the complexity of the social contexts in which they operate (Vieira; Zaidan, 2013).

By considering pedagogical practices adapted to different educational realities, we seek to understand how educators can adjust their teaching strategies to meet the individual needs of students, promoting critical and meaningful education. In addition, valuing the knowledge brought by students is essential to build an inclusive and contextualized pedagogical approach that recognizes the diversity of experiences and knowledge present in the classroom (Cruz *et al.*, 2023).

Thus, instead of simply transmitting concepts, mathematics classes that work with the reality of students promote a more contextualized and meaningful approach, allowing learners to understand the relevance of the discipline in their lives and become responsible and committed agents with their societies, placing them as assets in the construction of their own knowledge. Thus, Teacher Apprentice (2024) comments that:

> *In this sense, I believe in Mathematics classes that are based on transversal themes, problems that arise from the student's own local reality and walk in the perspectives of a learning theory with a sociocultural approach called the Theory of Objectivation, which values collective learning, highlighting joint work through*

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> *the formation of discussion groups, instituting a community ethics that considers the principle of responsibility, commitment to joint work and care for the other.*

The Apprentice Professor's comment is in line with Skovsmose's Critical Mathematics Education (CME) (2012, 2022), which highlights mathematics not only as a technical discipline, but as a tool for social and political implications. In it, the author argues that Mathematics is not neutral, that its applications and practices can influence society. "In this sense, it is essential to open up to dialogues and cooperation in the context of approaching Mathematics, aiming mainly at not disregarding its historical connection with developmental aspects and aspirations in society" (Silva; Carvalho, 2024, p. 19).

As for pedagogical practices, Teacher Apprentice (2024) comments that, "*[...] they have been transfigured in relation to several aspects, but in evidence I highlight the social and political function of Mathematics and its contributions to the formation of subjective subjects who position themselves critically in relation to mathematical practices*". As discussed in the previous subsection, it is essential to comprehensively address the components of the Mathematics curriculum, highlighting social justice, collective ethics, and issues crucial to environmental and social sustainability. Thus, Teacher Experiences (2024) comments on a project in which she participated during her initial training:

> *During the course, I was able to participate in some projects that gave me the opportunity and preparation to work in Basic Education. Initially, I was a member of the project 'Women Mathematicians of Lower Tocantins', which was developed in classes of the 3rd year of High School (Teacher Experiences, 2024).*

The teacher explains that the project saw as a need "*[...] to encourage high school students to arouse interest in mathematics; she also stressed that mathematics is not a capacity only for men*" (Teacher Experiences, 2024). Thus, when working with everyday information, students can be challenged to apply mathematical concepts to identify different problems or social inequalities and thus propose solutions to the various existing demands. By applying practical and critical activities in mathematics, students can realize that they are part of an unequal system, encouraging them to reflect on the importance of equity and equal access to education (Skovsmose, 2022). Faced with this, Professor Experiences (2024) also comments:

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> *Even with the focus on girls, we took it upon ourselves to pay attention to everyone. I was able to live amazing experiences. There were two visually impaired students in the class, and these students fascinated me by the effort and desire to learn, in addition to serving as inspiration to the girls, so I could feel the emotion of being a teacher, understand that the teacher and education are capable of transforming lives.*

In the Brazilian educational context, however, there are challenges that directly affect learning and equity in education. Issues such as socioeconomic inequality, unequal access to educational resources, high dropout rates, and low investment in public school infrastructure remain pressing obstacles. It is in this scenario that Professor Equidade (2024) points out:

> *In parallel to my volunteer work at the NGO, I participated as an early-career researcher in a research program on equity in education. In this program, I better understood the statistics of Brazilian public education and noticed the glaring inequality of learning (whether by socioeconomic level, race/color, gender and territory) present in the various municipal networks that are partners of the program.*

Faced with these challenges, it is essential that teachers reflect and analyze their teaching practices, renewing and adjusting pedagogical approaches to contemplate the social and political function of the mathematics discipline. Skovsmose (2022) highlights that EMC is intrinsically linked to social justice, politics and the socio-political structuring of education, emphasizing its role in the formation of critical citizens. From this perspective, Araujo, Ferreira and Vieira (2023, p. 19) comment that “[...] Mathematics can be an instrument of liberation that empowers and enables the reading of the world through it”. This understanding also emerges in Professor Equidade's report (2024), when he states that: “*As a teacher of the state public network, I consider the mathematics classroom as a space of great potential, which consolidates a cultural and social diversity. It is a political space, of production of knowledge and subjectivities*”. Thus, the Apprentice Teacher (2024) corroborates this perspective by highlighting that "*These practices present constant changes, especially due to the particularities of the new generations of young people existing in society, curriculum reforms and the insertion of technology in family and school environments*".

The act of teaching goes beyond the simple “transmission” of knowledge; the teacher must provide students with the opportunity to build and produce their own

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knowledge. Freire (2021) proposes a dialogic and problematizing approach, in which knowledge is collectively constructed and situated in the reality of students (Rocha; Lima, 2021). In this sense, teaching cannot be reduced to the mechanical reproduction of content, but must foster critical reflection, intellectual autonomy and the active participation of students in the learning process. Thus, Professor Caminhos (2024) points out:

> *I tested various teaching methodologies such as problem solving, mathematical investigation, games, projects and technologies. I thought I had to figure out which one was the most effective to use always, but over time, I found it didn't work that way. In fact, I consider that first it is necessary to know the students, the available resources, the previous experiences to, only in this way, delimit a methodological path. The guy comes first!*

In order to promote quality teaching and the integral development of learners, it is important that teachers reflect and seek to diversify their pedagogical practices, which implies seeking new methodologies and strategies that enrich learning. Corroborating this idea, Professor Trajectórias (2024) comments: "*So, I adjusted my practice a little so that I was in a position to provide my students with more different elements or with more quality than what was already offered*".

Likewise, it is important to think of the classroom as a shared cross-cultural communicative environment, as proposed by Severino Filho and Silva (2021), in which several worldviews interact, expanding the repertoire of ways of existing and relating to the world. Improving educational practice is crucial to creating conditions that contribute to student development. This is what the Apprentice Teacher (2024) describes:

> *In this context, among the numerous Mathematics classes taught, I mention the development of an activity that involved the mathematical knowledge of a group of horticulturalists from a local community, the use of a paradidactic of mathematical literature as a way to develop the skills pertinent to problem solving, the study of some Mathematics contents through the construction of a school model and the use of an online platform for the teaching of financial mathematics.*

Freire (2021) comments that one of the central responsibilities of the school, as a locus of knowledge, is to critically work on the intelligibility of things and facts, as well as their communicability. Therefore, it is essential that the school stimulates the student's curiosity, instead of "softening" or "domesticating" it.

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Apprentice Teacher (2024) states that "*[...] there are numerous challenges experienced in the classroom as a high school mathematics teacher*", mentioning "*[...] learning difficulties, since students reach this stage of teaching still needing to develop basic skills in the area*".

For Malheiros, Forner and Souza (2021), the active participation of students, through dialogue, listening and problematization, combined with the development of autonomy and pedagogical practices that place them at the center of their own learning, can contribute to overcoming difficulties in the discipline of Mathematics. This is what Professor Transformation (2024) explains:

> *I recognized that, as a teacher, I could not limit myself to an automatic transmission of knowledge, as this would result in an approach that would only contemplate a specific group of students, thus perpetuating learning inequalities. I wanted to escape from banking education, which, in Freire's view, is only an act of depositing knowledge and the student would only be a receiver.*

Dialogic education in mathematics, inspired by the principles of Freire (2021), promotes a collaborative and inclusive environment in which students are encouraged to participate actively. This model breaks with the traditional conception of banking education, enabling a more horizontal relationship between teachers and students, in which knowledge is collectively constructed through reflection and questioning. Franchi and Ramos (2024) highlight that dialogue, by promoting the active participation of students, contributes to a more democratic education, in which students are encouraged to develop autonomy and critical thinking.

Dialogue, from the EMC perspective, is not limited to a simple exchange of information, but constitutes an interactive and participatory process in which educational subjects recognize themselves as protagonists of their learning (Franchi; Ramos, 2024; Rocha; Lima, 2021). Dialogical communication implies the collective construction of knowledge, allowing teachers and students to share experiences, question concepts and develop a critical look at mathematical contents and their application in society. More than a means of transmitting knowledge, dialogue enables the development of skills such as argumentation, critical thinking and group problem solving, while valuing the experiences and socio-cultural diversity of learners. Thus, dialogue in mathematics classes becomes a tool for the democratization of knowledge and the construction of a

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more equitable and meaningful education (Rocha; Lima, 2021). Thus, Professor Equidade (2024) states that his motivation to continue acting as a mathematics teacher is "*[...] to know the importance of my work to change the reality of students who see education as the driving force for social advancement, whether or not these students are easy with mathematics*".

For Skovsmose (2000), it is essential that students and teachers collaborate in identifying appropriate paths between the various learning environments. The definition of the ideal route should not be done rashly, but should be the result of a joint decision between students and teachers. These transformations in approaches to mathematics over the years are evident in reports such as that of the Obstinate Teacher (2024), who comments:

> *In my childhood, in the mid-1990s, Mathematics Education was something mechanical, decorated, robotized and without any immersion in playfulness or even with daily interaction. I believed that Mathematics was just memorizing rules, formulas and plastered methods and completing the questions proposed by the teacher without any contextualization, I mean, boring, methodical and without any perspective of satisfaction in learning.*

The Obstinate Teacher exemplified the Skovsmose (2012) exercise paradigm, in which the teacher only transmits knowledge, as mentioned above. Professor Transformation (2024) describes that it is necessary to "*[...] seek innovative strategies and alternative pedagogical methods that stimulate the construction of knowledge in a differentiated way for each student*". Thus, a decontextualized approach is avoided, promoting more meaningful learning. Therefore, it is important to consider the social context of students in the process of teaching and learning mathematics. Reflections on teachers' pedagogical practices stand out, emphasizing the need to establish connections between reference knowledge and students' context to promote a more appropriate and effective approach.

FINAL CONSIDERATIONS

The results revealed fundamental aspects for the understanding and improvement of pedagogical practices in this area, such as the importance of initial teacher education, emphasizing the need to develop not only technical skills, but also a

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critical and reflective awareness of teaching practice. The relevance of creative and contextualized pedagogical practices to arouse students' interest in the subject was evidenced, as well as the need to address learning difficulties from the initial stages of undergraduate degrees, in order to create a solid basis for students' progress throughout their academic trajectory. In addition, the importance of educators recognizing the complexity of human reality and the world in general was emphasized, avoiding excessive simplifications that could compromise the understanding of mathematical contents.

The appreciation of cultural and social diversity in the classroom was another relevant aspect, emphasizing the importance of considering the contexts experienced by students in the process of teaching and learning mathematics. Interdisciplinarity and the appreciation of the previous knowledge of these students were pointed out as essential strategies to promote a more inclusive and meaningful Mathematics Education.

The research highlighted the need to rethink public policies for continuing education, considering working conditions and the reality of schools. The promotion of partnerships between universities and schools, as well as the encouragement of research with teachers, was pointed out as a way to strengthen teacher training and the quality of mathematics teaching.

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DATA AVAILABILITY

The entire dataset supporting the results of this study has been published in the article itself.

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