revista online de extensão e cultura
REALIZAÇÃO

DOI 10.30612/realizacao.v13i24.21499
ISSN: 2358-3401

Submetido em 27 de abril de 2026
Aceito em 03 de agosto de 2026
Publicado em 25 de agosto de 2026

# ETHNOMATHEMATICS AS A PEDAGOGICAL APPROACH FOR LOWER SECONDARY EDUCATION

## A ETNOMATEMÁTICA COMO ABORDAGEM PEDAGÓGICA PARA O ENSINO FUNDAMENTAL ANOS FINAIS

## LA ETNOMATEMÁTICA COMO ENFOQUE PEDAGÓGICO PARA LA EDUCACIÓN BÁSICA EN LOS AÑOS FINALES

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**Resumo:** Esse artigo discute a importância da Etnomatemática como abordagem pedagógica no Ensino Fundamental, visando integrar conhecimentos culturais e experiências locais ao ensino da matemática. A pesquisa parte da premissa de que a educação deve considerar as raízes culturais dos alunos para promover um aprendizado significativo e inclusivo. A Etnomatemática, conceito desenvolvido por Ubiratan D'Ambrósio, valoriza as práticas matemáticas de diferentes grupos sociais, reconhecendo que a matemática não é universal, mas sim profundamente enraizada em contextos culturais específicos. A pesquisa envolveu observações, revisão bibliográfica e aplicação de questionários aos alunos, revelando que a Etnomatemática pode aumentar o interesse dos alunos ao conectar conteúdos matemáticos a suas vivências diárias. Os resultados indicam que muitos alunos reconhecem a matemática em suas rotinas, embora alguns ainda apresentem resistência. A implementação da Etnomatemática promove a valorização da diversidade cultural, favorecendo um ambiente de aprendizado mais colaborativo e respeitoso. Podemos concluir que essa abordagem não apenas enriquece o ensino da matemática, mas também contribui para uma educação mais justa e democrática, alinhada às diretrizes da Base Nacional Comum Curricular (BNCC).
**Palavras-chave:** Contextualização, Diversidade Cultural, Inclusão Educacional Valorização

do Conhecimento.

**Abstract:** This article discusses the importance of Ethnomathematics as a pedagogical approach in elementary education, aiming to integrate cultural knowledge and local experiences into mathematics teaching. The research posits that education should consider students' cultural background to promote meaningful and inclusive learning. Ethnomathematics, a concept developed by Ubiratan D'Ambrósio, values the mathematical practices of different social groups, recognizing that mathematics is not universal but deeply rooted in specific cultural contexts. The study involved observation, literature review, and questionnaires applied to students, revealing that Ethnomathematics can enhance student interest by connecting mathematical content to their daily experiences. Results indicate that many students recognize mathematics in their routines, although some still exhibit resistance. Implementing Ethnomathematics fosters cultural diversity appreciation, creating a more collaborative and respectful learning environment. The conclusion is that this approach not only enriches mathematics education but also contributes to a fairer and more democratic education aligned with the guidelines of the National Common Curricular Base (BNCC).
**Keywords**: Contextualization, Cultural Diversity, Educational Inclusion, Knowledge Valuation.

**Resumen:** Este artículo discute la importancia de la Etnomatemática como enfoque pedagógico en la Educación Primaria, con el objetivo de integrar los conocimientos culturales y las experiencias locales en la enseñanza de las matemáticas. La investigación parte de la premisa de que la educación debe considerar las raíces culturales del alumnado para promover un aprendizaje significativo e inclusivo. La Etnomatemática, concepto desarrollado por Ubiratan D'Ambrósio, valora las prácticas matemáticas de distintos grupos sociales, reconociendo que las matemáticas no son universales, sino que están profundamente arraigadas en contextos culturales específicos. La investigación incluyó observaciones, revisión bibliográfica y la aplicación de cuestionarios a estudiantes, revelando que la Etnomatemática puede aumentar el interés del alumnado al conectar los contenidos matemáticos con sus experiencias cotidianas. Los resultados indican que muchos estudiantes reconocen las matemáticas en sus rutinas, aunque algunos aún presentan resistencia. La implementación de la Etnomatemática promueve la valorización de la diversidad cultural, favoreciendo un entorno de aprendizaje más colaborativo y respetuoso. Se concluye que este enfoque no solo enriquece la enseñanza de las matemáticas, sino que también contribuye a una educación más justa y democrática, alineada con las directrices de la Base Nacional Común Curricular (BNCC).
**Palabras clave**: Contextualización, Diversidad cultural, Inclusión educativa, Valorización del conocimiento.

## INTRODUCTION

Today's world is marked by tensions and challenges. Diverse perspectives attempt to explain the role of the school in constructing a fair and democratic society. There is growing consensus that the cultural dimension is a fundamental component of contemporaneity and is present in educational processes, making it impossible to conceive of a school detached from culture.

Considering that "to develop" means "to uncover" and "to bring something to light," it is important to recognize that educational processes, under an intercultural perspective, help deconstruct patterns that belittle and devalue the knowledge and practices of social groups marginalized during Brazilian colonization. Therefore, it is essential to consider cultural differences in the design and implementation of school Mathematics curricula to promote

genuine interculturality.

In this perspective, we advocate for Ethnomathematics as a trend in Mathematics Education that values Brazil's cultural diversity in all its dimensions. The theoretical framework proposes a living, dynamic, participatory, and non-static education, emphasizing the importance of interculturality in the teaching-learning process. In this sense, Ethnomathematics is an emerging trend of great importance to the school community; thus, we pose the following guiding question: how can Ethnomathematics contribute to a more effective teaching-learning of Mathematics?

Furthermore, this research aims to understand the importance of Ethnomathematics in Lower Secondary Education, highlighting the bridge it creates between Mathematics teaching and regional culture. The hypothesis is that the lack of observance of Ethnomathematics in schools can jeopardize students' teaching-learning process in the classroom.

To achieve these objectives, a literature review was conducted in specialized publications, alongside observations of cultural practices, seeking scientific literature on Ethnomathematics and its contribution to the teaching and learning process. Accordingly, the development of the research encompassed the concept of culture and interculturality, the discussion surrounding perspectives in this area, and the exploration of the relationship between Ethnomathematics and Education, focusing on teaching and learning.

The objective of this work is to analyze the contributions of Ethnomathematics to Mathematics teaching, valuing the cultural knowledge present in the community and promoting more meaningful and contextualized learning. By integrating school mathematical knowledge with students' cultural practices, the aim is to strengthen the relationship between school and community, demonstrating Mathematics as a human construct linked to different sociocultural realities. Teixeira (2018) reinforces this idea, emphasizing that the cultural contextualization of mathematics can increase student interest and participation in class.

Ethnomathematics recognizes that mathematics is present in various human activities, such as arts, architecture, music, dance, and engineering. Each culture has its own ways of working with mathematical concepts, and all knowledge produced by social groups is valid. The discipline must be understood within the sociocultural context of the learners, taking into account distinct cultural groups.

Therefore, Ethnomathematics offers an enriching perspective for mathematics teaching, promoting the appreciation of different cultures and the practical application of mathematical knowledge.

## THEORETICAL FRAMEWORK

According to Cabrera (2004), the expression Ethnomathematics emerged in the 1970s through Brazilian professor and researcher Ubiratan D'Ambrósio, who is the main thinker and theorist of this trend in Mathematics Education. Its international recognition occurred in August 1984, at the 5th International Congress on Mathematical Education, held in Adelaide, Australia.

D'Ambrósio, as the leading authority on this subject, gave meaning to the term "Ethnomathematics" by combining the elements "techné" (practical knowledge), "mátema" (formal knowledge), and "ethno" (culture). The proposal is not to create a teaching method, but rather to recognize the mathematics experienced by different social groups and to consider its historical and political construction.

Curricular Mathematics in educational institutions in Brazil, originating from Europe and known as classical mathematics, frequently neglects the important mathematical contributions of other peoples. Mathematical knowledge originating from different social contexts rarely receives deserved recognition and is seldom considered in school planning, resulting in its absence from classrooms.

However, this reality is changing with Ethnomathematics. According to theorist Fiorentini, Ethnomathematics proposes an approach that values the mathematical knowledge present in the daily activities of different cultures and peoples.

> Ethnomathematics initially meant non-academic and non-systematized mathematics, that is, oral, informal, "spontaneous," and sometimes hidden or frozen mathematics, produced and applied by specific cultural groups (indigenous people, slum dwellers, illiterate individuals, farmers...). That is, it would be a very particular way for specific cultural groups to perform the tasks of classifying, ordering, inferring, and modeling (Fiorentini, 1994, p. 59).

This understanding highlights that knowledge is acquired through the search for answers to various everyday situations. This knowledge is intrinsically linked to the political, social, and cultural history of each group. In this context, by exploring the mathematical characteristics related to society, we direct our attention to mathematics in practice, establishing links with the mathematics taught in schools. The intersection between these two domains enriches our understanding and values the mathematical knowledge present in different cultural contexts.

The goal is to enable students to understand their role in absorbing mathematical knowledge within their cultural context, sharing knowledge, and disseminating mathematical understanding. According to D'Ambrosio (2019), this knowledge is present in all social groups. This highlights the importance and appreciation of the mathematics present in these cultural environments within educational institutions. Accordingly, the National Curriculum Parameters (PCNs) (1998) state that:

> Still regarding the connections between Mathematics and Cultural Plurality, a work stands out in the field of Brazilian mathematics education that seeks to explain, understand, and coexist with mathematical procedures, techniques, and skills developed in the specific sociocultural environment of certain social groups. This is the Ethnomathematics Program, with its proposals for pedagogical action (Brasil, 1998, p. 33).

In addition to the PCNs, the National Common Curricular Base (BNCC) also reinforces this perspective by highlighting the importance of considering cultural diversity in mathematics teaching, promoting an education that values students' repertoire, their social contexts, and their ways of thinking and learning. It is through these social groups that research, such as scientific articles, is conducted through direct contact between the researcher and the community, interacting with these cultures and sharing their ways of life and cultural knowledge.

Ethnomathematics not only recognizes but also respects the history, tradition, and mathematical thinking of different cultures. Unfortunately, in our society, these perspectives are often excluded from conventional mathematical practice. Grounded in this context, however, we can observe and explore the social practices present in the daily life of students at the school where the work will be developed. In doing so, we open space for a more inclusive, diversified, and contextualized mathematics education that values cultural knowledge and promotes a broader understanding of mathematics itself.

According to Fernandes (2023), Ethnomathematics breaks away from the idea of a single, universal mathematics, defending the existence of different ways of doing mathematics, which develop from the specific needs and cultural contexts of each people. Thus, practices such as land measurement by farmers, calculations by informal traders, and geometric constructions in indigenous communities are legitimate examples of mathematical production.

According to Teixeira and Fernandes (2023), in the study titled: "The use of Dev C++ for converting land area and length measurements used by farmers to the International System of Units (SI)," in the context of modern agriculture, the possible adoption of the International System favors standardization, resource efficiency, and the valuation of non-academic

mathematics, demonstrating the importance of technology in modernizing the agricultural sector and in building popular knowledge through the use of technology.

It is worth noting that the measurements used by farmers will not cease to exist, given that they represent a transmission of knowledge from generation to generation. In this sense, we can use technologies for conversion or as a pedagogical approach in the classroom through lectures. Teixeira and Nery (2023) present a chart showing farmers' conversions to the SI, meaning there is a possibility for this to be addressed theoretically in the classroom.

This understanding proposes a redefinition of the traditional school curriculum, which for a long time disregarded these cultural expressions. As highlighted by Silva and Freitas (2021), the mathematics taught in schools was historically shaped by an Eurocentric logic that ignores the mathematical contributions developed by African, Asian, Latin American, and Indigenous peoples. In this sense, Ethnomathematics emerges as a proposal of epistemological resistance, seeking to recover, recognize, and value knowledge that has been marginalized.

The BNCC, a normative document guiding basic education curricula in Brazil, points to the importance of a pedagogical approach that considers students' sociocultural contexts. This document establishes as one of the general competencies of basic education the valuation of cultural diversity and respect for different expressions of thought, which includes recognizing mathematical practices developed in distinct social and cultural realities (Brasil, 2017).

By valuing knowledge stemming from their lived experiences, traditions, and cultural practices, Ethnomathematics promotes an identity recovery that directly contributes to strengthening students' self-esteem, especially those belonging to historically marginalized groups excluded from full access to science and formal school culture.

When students realize that their daily lives-with their family, community, and professional experiences-are a fertile field for mathematical production, they not only feel recognized but also become more engaged and motivated to learn (Guerra, 2024). This sense of belonging to the educational process is essential for building meaningful learning that respects diversity and promotes inclusion.

Furthermore, according to Pacheco (2020), one of the great virtues of Ethnomathematics is precisely its capacity to dialogue with the territory, local culture, and knowledge constructed outside school walls. This proposal aligns with the principles of contextualized education, aimed at solving real problems and developing students' critical autonomy.

In this context, the teacher's role is redefined. The teacher becomes a mediator of knowledge, responsible for articulating academic knowledge with community knowledge. This requires continuing education, pedagogical sensitivity, and a willingness to listen to and learn from students and their lived experiences. Fernandes (2023) highlights that teacher training needs to include discussions on identity, culture, and knowledge so that teachers are prepared to handle the cultural diversity present in schools.

Moreover, working with Ethnomathematics allows curricular content to be addressed in an interdisciplinary manner, connecting mathematics with history, geography, art, and science. This approach fosters a broader understanding of phenomena and contributes to building meaningful and critical learning. Guerra (2024) reinforces that mathematics, when taught in an integrated manner and connected to the real world, stimulates reflective thinking and strengthens ties between school and community.

The plurality of knowledge and cultural practices thus becomes a didactic resource. Students' daily routines, family traditions, and social experiences must be valued in the school environment. By recognizing these experiences as a starting point for teaching mathematics, the school strengthens students' sense of belonging and promotes a more equitable education.

In summary, Ethnomathematics should be understood not merely as a teaching methodology, but as an educational philosophy that values the plurality of knowledge, respect

for cultures, and the pursuit of a fairer and more equitable education. Its integration into the curriculum, as noted by contemporary authors, represents a significant step forward toward the democratization of knowledge and the overcoming of educational inequalities.

## METHODOLOGICAL PROCEDURES

The methodology adopted in the research project on Ethnomathematics as a Pedagogical Approach for Lower Secondary Education involved a series of carefully planned steps. Initially, a literature review on Ethnomathematics was conducted, investigating studies, research, and pedagogical practices related to this approach, thus understanding the theoretical foundations and key concepts supporting Ethnomathematics.

Next, we proceeded to ethnographic data collection. We conducted field work, mak-ing contact with farmers from the rural community and school students. Observations were made regarding how mathematical knowledge is used in the daily life of these groups, sto-ries and narratives related to the use of Mathematics in daily social relations, as well as pre-vious studies to record a video for an evaluative activity in the Mathematics Teaching Methodology discipline. The analysis and contextualization of collected data were funda-mental in seeking to understand how this knowledge can be integrated into formal teaching.

Based on the analyses, a questionnaire was designed and administered to students, alongside the development of pedagogical proposals aligned with Ethnomathematics, considering contextual diversity and the reality of rural school students, based on the works of Georges (2016) and Teixeira (2018), who discussed non-standardized land measures and applications in rural communities. Finally, we validated the proposals with students by implementing classroom activities related to the Quantities and Measures Strand, aiming to enable students to understand the mathematical knowledge practiced by different social groups.

The project and research were developed with 120 students from the 6th, 7th, and 8th grades of Lower Secondary Education at Escola Municipal Clarismundo Alves Aragão, lo-cated in the rural zone of the municipality of Granja - CE. Mathematical knowledge was explored across various societal nuances regarding cultural knowledge, experiences, and habits, leading to inferences drawn from observed sociocultural experiences to be shared and developed in the work.

In the first stage, action planning was conducted. Following this process, video les-sons were used to address mathematics present in the fields and countryside, presenting problems involving units of length, area, measurement units, time measurement, mathemat-ics in art, mathematics in soccer, and mathematics in music, consistently highlighting gen-eral aspects of Ethnomathematics. This sparked student curiosity, and through the presented and discussed videos, readings, and presentations on the topic, associations were made be-tween these contexts and their sociocultural practices.

In the second stage, field research was carried out, featuring instructional videos on how to conduct field research and read about the topic, while exploring mathematical knowledge present in the distinct social groups of the students' local environment. Regar-ding this research modality, Gil states,

> In field study, the researcher carries out most of the work personally, as emphasis is placed on the importance of the researcher having direct experience with the study situation. The researcher is also required to remain in the community as long as possible, as only through this immersion in reality can one understand the rules, customs, and conventions governing the studied group (Gil, 2002, p. 57).

Through observation and practice, we better understand the presence and behaviors across different cultures; the way mathematical knowledge is utilized and explored should be valued in every sense.

The direct participants in the Ethnomathematics research were 6th, 7th, and 8th-grade students. These classes were selected because they represent the direct target audience of the

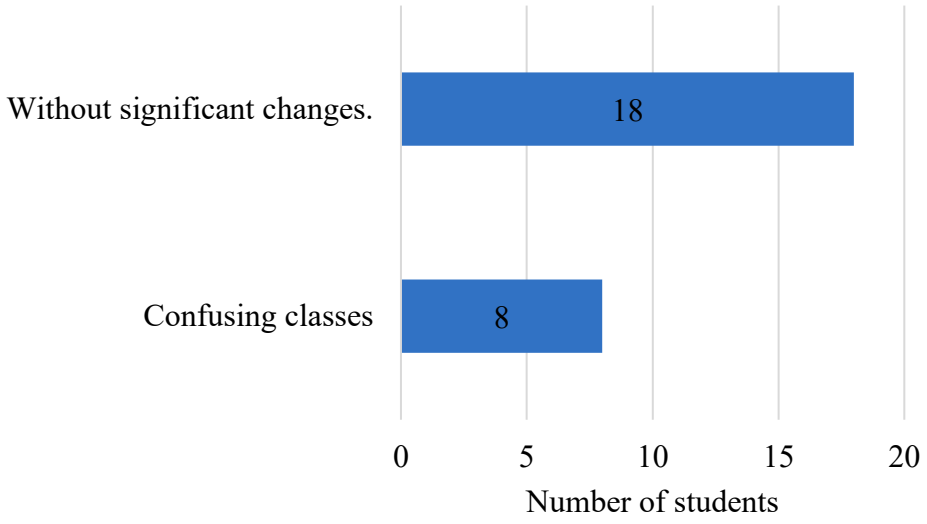
pedagogical approach in question, making it essential to understand how Ethnomathematics influences their learning and perception regarding Mathematics.

## RESULTS AND DISCUSSION

The analysis of data obtained through didactic activities and questionnaires administered to students and teachers revealed relevant information regarding the perception of Ethnomathematics as a pedagogical approach in Lower Secondary Education. Based on these data, significant progress was identified in understanding and valuing mathematics as knowledge present in students' daily lives and culture.

The questionnaires developed from informal interviews with farmers and studies by Georges (2016) and Teixeira (2018) were administered to 118 students, allowing an initial assessment of whether they recognize the presence of mathematics in their daily experiences. As shown in Graph 1 – Student Recognition of Mathematics in Daily Life, a significant majority of students recognize the applicability of mathematics outside the school environment, while a minority does not identify it in their routine.

**Graph 1 –** Student recognition of mathematics in daily life.




Source: Research data (2025)

The graph shows a predominant trend toward the applicability of mathematics in daily life, indicating progress in the teaching and learning process. However, it also points to the importance of specific actions promoting engagement for all students, ensuring that this perception is broadened more equitably. Approximately 100 students demonstrate recognition of mathematics in daily life, whereas about 18 students state they do not perceive this presence. This discrepancy reveals a very positive scenario from an educational standpoint, suggesting that the majority of students can relate mathematical content learned in class to practical experiences, which is fundamental for constructing meaningful learning.

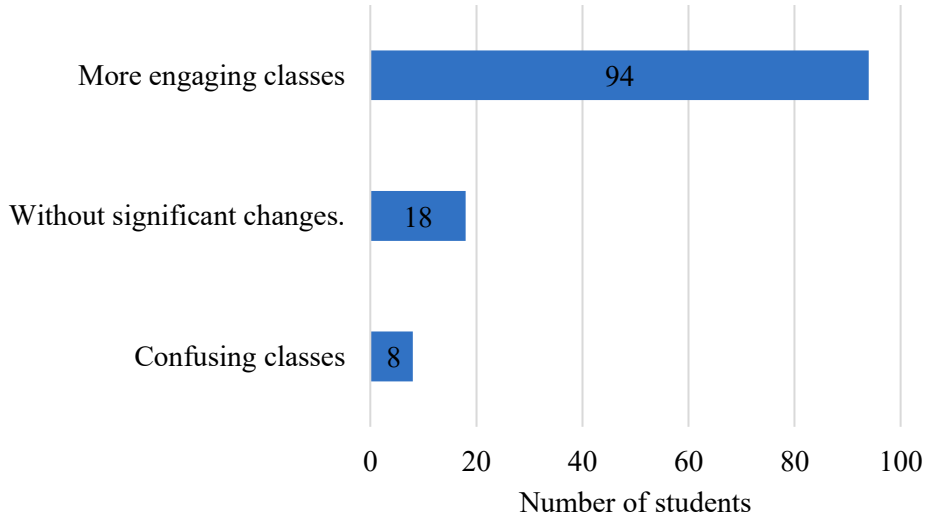
This recognition may be related to teaching methodologies that contextualize mathematics using practical examples, real-world problems, and interdisciplinary activities. However, the fact that a significant number of students still do not recognize this applicability warrants attention. This may indicate a need for more inclusive pedagogical strategies tailored to diverse learning styles, aiming to engage students who have not yet perceived the relevance of mathematics in their routines.

The results, represented in Graph 2 – Students' Perception of the Ethnomathematical Approach, reflect responses from 120 students, of whom 94 considered classes more interesting

and closer to their reality. This positive response demonstrates that Ethnomathematics can function as an effective engagement mechanism, sparking greater student interest by connecting mathematical content with cultural, social, and daily life aspects. This recognition of the relevance and applicability of mathematics contributes not only to student motivation but also to building more meaningful and contextualized learning.

Conversely, a smaller group of 18 students stated they noticed no significant changes in the way of teaching and learning, which may relate to different learning styles, individual expectations, or even how the approach was implemented in the classroom. Meanwhile, the 8 students who reported feeling confused by the new content indicate that, although the proposal is well received by the majority, it still demands special attention regarding methodological and didactic clarity.

**Graph 2 –** Students' Perception of the Ethnomathematical Approach




Source: Research data (2025)

The graph shows that Ethnomathematics is well received by most students, contributing to making classes more interesting and engaging. At the same time, it highlights the importance of reflecting on the challenges of its practical application to reach all learner profiles. This distribution shows that the Ethnomathematical approach has the potential to increase student interest in mathematics classes, likely because it is aligned with their cultural backgrounds and concrete experiences.

The presence of a segment that did not notice changes, or found the classes harder to understand, points to the need for careful implementation. It is fundamental that teachers are properly trained to apply this approach clearly and systematically, ensuring pedagogical objectives are met without causing confusion.

In open-ended comments, students mentioned various everyday situations where they began to perceive the presence of mathematics more clearly and meaningfully, particularly in family practices. Examples cited included measuring ingredients while preparing recipes in the kitchen, calculating distances during agricultural activities in the fields, and applying notions of time and speed in sports. These accounts indicate that, by connecting mathematical content to concrete experiences close to their reality, students were able to give greater meaning to what they were learning.

Students themselves described that these connections made mathematics feel more "real" and "understandable," revealing a shift in how they view the discipline. Rather than viewing it merely as a set of formulas and abstract calculations, they began to see it as a useful tool present in various dimensions of daily life. This reframing of mathematical knowledge

contributes to strengthening academic self-esteem, as students recognize themselves as capable of understanding and applying mathematics outside the school environment.

The comments also reveal the positive impact of the Ethnomathematical approach in promoting more contextualized, inclusive, and culturally relevant learning. By allowing students to value their own knowledge and social practices, the school moves closer to their realities, becoming a more welcoming and meaningful space. This reinforces the idea that mathematics teaching can, and should, go beyond textbook limits, connecting with students' real experiences and expanding the reach and effectiveness of the educational process.

The results obtained corroborate the propositions of D'Ambrosio (2019), who defends Ethnomathematics as a way to humanize teaching and integrate mathematical knowledge into students' daily understanding. They also align with the guidelines of the National Common Curricular Base (Brasil, 2017), which directs instruction to value students' sociocultural experiences as a starting point for learning.

Proposed activities, such as using mathematics in street market situations, farming, music, and soccer, demonstrated that school content gains greater meaning when starting from the students' repertoire. By proposing mathematical applications based on familiar realities, we observed not only more efficient learning but also a shift in student attitudes toward the subject. Many began to believe in their ability to comprehend mathematics, strengthening their self-esteem and school identity.

From the analysis of the graphs and questionnaires, Ethnomathematics is observed to transform mathematics teaching into a more dialogic, culturally sensitive, and motivating process. As D'Ambrosio (2019) highlights, Ethnomathematics is not merely a methodology, but a teaching philosophy that values community knowledge and advocates respect for multiple ways of producing knowledge.

This conception is reinforced by Knijnik et al. (2012), who argue that introducing Ethnomathematics into the curriculum breaks with the hegemony of Eurocentric knowledge, offering students a pluralistic and critical view of mathematics. By recognizing cultural practices as legitimate sources of mathematical knowledge, this approach helps combat symbolic exclusion and the invisibility of historically marginalized populations.

Finally, the analyzed data reinforce the importance of investing in teacher training, developing appropriate materials, and building curricula sensitive to cultural diversity. As shown by the graphs and collected accounts, Ethnomathematics can be a powerful pathway toward a more inclusive, critical mathematics education committed to students' reality.

## FINAL CONSIDERATIONS

The research conducted on Ethnomathematics as a pedagogical approach for Lower Secondary Education provided a deeper understanding of the multiple ways mathematical knowledge can be accessed, understood, and valued by students based on their sociocultural realities. The results showed that integrating mathematical knowledge into students' daily lives and cultural experiences promotes not only cognitive development, but also identity valuation, stronger school belonging, and respect for diversity.

The classroom experience and empirical data gathered through questionnaires and observations confirmed the central theoretical premise of Ethnomathematics: mathematics is neither neutral nor universally homogeneous, but deeply rooted in the cultural contexts of each people.

This recognition is essential in a country like Brazil, marked by deep social and cultural inequalities, where schools often continue to perpetuate exclusionary teaching models. By breaking away from traditional instruction based on the mechanical repetition of abstract algorithms and formulas, Ethnomathematics paves the way for a more dialogic and transformative education.

During the execution of the research, students began to see themselves as producers of knowledge rather than passive recipients. Many expressed pride in sharing their informal knowledge, such as calculations used by their families in agriculture, trade, or popular music. This appreciation of local knowledge produces a direct positive effect on student self-esteem and engagement. This represents a significant shift; when students see themselves reflected in school content, they feel that the school respects, listens to, and values them, which directly impacts their retention and success in the educational environment.

This movement requires not only personal commitment but also institutional support, continuing education, and, above all, a shift in how curriculum is conceived. As seen in the results, the main challenges faced were the lack of specific training and the absence of instructional materials that dialogue with this approach. This highlights the urgent need for investment in public policies that encourage culturally contextualized pedagogical practices.

Faced with these challenges, the research contributed to the school by fostering moments of collective reflection on pedagogical practice, encouraging the valuation of students' cultural knowledge, and developing didactic strategies contextualized to the local reality. As an outcome of the actions taken, activities involving non-standardized length measures were implemented with 6th, 7th, and 8th-grade Lower Secondary students, providing the school with a didactic proposal that can be incorporated into pedagogical practices.

In addition to direct pedagogical gains, another key aspect to highlight is the interdisciplinary potential of Ethnomathematics. Throughout the research, it became clear that the topics addressed could easily articulate with Geography, History, Science, Art, Physical Education, and Portuguese Language, enabling integrated approaches and pedagogical projects that develop multiple skills synchronously. This favors collaborative work among teachers and the construction of a more coherent pedagogical framework closely aligned with student realities.

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