

## WEAVING THE HARMONY OF CULTURES INTO THE INFINITE TAPESTRY OF MATHEMATICS



<https://doi.org/10.56238/arev6n1-013>

Submitted on: 08/27/2024

Publication Date: 09/27/2024

Raimundo Santos de Castro<sup>1</sup>.

### ABSTRACT

This study explores Ethnomathematics as an innovative and transformative approach to mathematics education, highlighting its potential to promote inclusive and culturally relevant education. Ethnomathematics challenges the traditional view of mathematics as a neutral and universal science, proposing it as a cultural construct that reflects the practices, values, and needs of different social groups throughout history. By integrating students' cultural realities into the school curriculum, this approach not only enriches mathematics education, making it more accessible and meaningful, but also serves as a catalyst for social inclusion and educational equity. Ethnomathematics promotes a dialogue between formal academic knowledge and diverse cultural practices, suggesting that mathematics teaching should be deeply contextualized and connected to students' everyday experiences. This transforms mathematics education into something more relevant and engaging, while valuing and acknowledging the cultural traditions that shape students' identities. This integration is seen as a form of social justice, as it challenges the hegemony of Western mathematical knowledge and values the contributions of other cultures. To understand how Ethnomathematics can be effectively incorporated into the school curriculum, the study resorts to a rigorous bibliographic analysis, based on works by renowned authors, such as Ubiratan D'Ambrósio, Milton Rosa, and Daniel Clark Orey. This detailed analysis allowed us to identify the main theoretical and practical contributions of Ethnomathematics, as well as to highlight pedagogical strategies that value the cultural traditions of students and adapt teaching materials for a more inclusive mathematics education. The study points to Ethnomathematics as a promising path for an education that respects and values cultural diversity, promoting the development of critical and socially engaged citizens. This approach contributes to building a more just and egalitarian society, where all forms of mathematical knowledge are recognized and celebrated.

**Keywords:** Ethnomathematics, Mathematics Education, Cultural Diversity, School Curriculum.

<sup>1</sup> Doctor of Education

Full Professor of the Department of Mathematics of the Federal Institute of Education, Science and Technology of Maranhão - IFMA, Campus São Luís – Monte Castelo

Orcid ID: <https://orcid.org/0000-0001-6762-836X>

Email: [raicastro@ifma.edu.br](mailto:raicastro@ifma.edu.br)

## INTRODUCTION

In recent years, Ethnomathematics has emerged as an innovative and profoundly transformative approach to mathematics education, especially in educational contexts that value cultural and social diversity. Developed by Ubiratan D'Ambrósio, this revolutionary perspective of mathematics is not restricted to a set of universal truths or a homogeneous body of knowledge, but recognizes mathematics as a cultural construction, forged by the practices, values, and needs of different social groups throughout history. Such a view subverts the traditional conception of mathematics as a neutral, objective and universal science, proposing instead a rereading that integrates the cultural, historical and social realities of students (D'Ambrósio, 2002).

Ethnomathematics, as highlighted by Rosa et al. (2017), proposes a constant and enriching dialogue between formal academic knowledge and diverse cultural practices, suggesting that mathematical teaching should be deeply contextualized and connected to students' daily experiences. This dialogue not only transforms mathematics education, making it more relevant, accessible, and engaging, but also promotes the appreciation and recognition of the cultural traditions that shape students' identities. By placing culture at the center of the educational process, Ethnomathematics makes room for a curriculum that not only teaches mathematical content, but also reinforces the importance of respecting and preserving cultural diversity, acting as a catalyst for social inclusion and educational equity.

Furthermore, this approach transcends the mere application of mathematical concepts in specific cultural contexts, proposing a critical reflection on the very nature of mathematics and its role in society. D'Ambrósio (1998) suggests that Ethnomathematics questions the power structures implicit in the traditional teaching of mathematics, which often privileges a Eurocentric view and disregards the contributions of other cultures. By integrating the mathematical practices of different peoples, Ethnomathematics not only challenges this hegemony, but also broadens the horizon of possibilities for the understanding and application of mathematics, promoting a teaching that is at the same time global and local, universal and particular.

The importance of Ethnomathematics is also reflected in the formation of more critical and socially engaged citizens. Rosa et al. (2017) state that, by contextualizing the teaching of mathematics in the cultural realities of students, Ethnomathematics fosters the capacity for critical reflection on the world, allowing students to develop a deeper understanding of the relationships between mathematical knowledge and the social and

political issues that surround them. This educational approach prepares students to become active citizens, able to use mathematics not only as a technical tool, but as a means to understand and transform their communities.

This study, therefore, proposes to explore in depth how Ethnomathematics can be effectively integrated into the school curriculum, with the aim of promoting a mathematics education that is inclusive, critical and socially relevant. The research seeks to identify pedagogical strategies that value the cultural traditions of students, while developing their mathematical skills in order to enable them to face the challenges of the contemporary world. Ultimately, Ethnomathematics presents itself as a promising path for building an education that respects and values diversity, while forming conscious citizens who are prepared to contribute positively to society.

## **METHODOLOGY: WEAVES OF KNOWLEDGE AND A WEAVER BETWEEN BOOKS AND REFLECTIONS**

This study adopts a rigorous bibliographic methodology, characterized by a critical and systematic review of the existing literature on Ethnomathematics. The option for a bibliographic approach is justified by the vast and rich academic production on the subject, which allows an in-depth understanding of the different perspectives and debates that permeate this area of study. The research focused exclusively on books and articles by renowned authors, recognized for their significant contributions to the theoretical and practical development of Ethnomathematics. Among these authors, Ubiratan D'Ambrósio, Milton Rosa, Daniel Clark Orey, among others, whose works have shaped the field over the last decades, stand out.

The selection of works for this study was carried out based on a careful curatorship of books and articles, considering exclusively those written by prominent authors in the area. The categorization and analysis process was guided by the search for specific keywords, such as "Ethnomathematics," "mathematics education," "cultural diversity," and "school curriculum," with the objective of identifying and organizing the most relevant and coherent contents for the development of this work. This methodology ensured the inclusion of materials that address in depth the intersections between mathematics and cultural practices in different educational contexts.

The inclusion criteria adopted for the selection of materials were based on three main aspects: the relevance of the theme to the research, the methodological quality of the

studies, and the relevance of the publications. These criteria were established to ensure that the revised discussions and theories were aligned with the most current trends and debates in the field of Ethnomathematics.

After selecting the studies, a detailed and systematic analysis was carried out by means of thematically organized files. These files allowed a coherent organization of information and facilitated the identification of the main theoretical and practical contributions in the field of Ethnomathematics. The analysis sought not only to synthesize the findings of the literature, but also to criticize and discuss the implications of these contributions for the teaching of mathematics and for the formation of a more inclusive and culturally aware education.

The choice for an exclusively bibliographic methodology is also due to the recognition of the importance of basing the study on solid theoretical bases, already established by prominent researchers in the area. Through this methodology, it was possible to build a comprehensive and in-depth overview of Ethnomathematics, exploring its various facets and potentialities as a transformative approach in mathematics education.

This methodology also allowed the study to benefit from a plurality of perspectives, ensuring a rich and diversified analysis of the topics addressed. The literature review not only consolidated the theoretical understanding of Ethnomathematics, but also highlighted gaps and opportunities for future research, suggesting paths for the practical application of the concepts discussed. In short, the bibliographic methodology adopted provided the necessary basis for a critical and detailed investigation, allowing this study to contribute significantly to the field of mathematics education.

## **THEORETICAL FOUNDATION: THE FLUIDITY OF MATHEMATICS IN CULTURES**

Ethnomathematics is more than a simple pedagogical methodology; It is a perspective that redefines the understanding of mathematics, revealing it as a culturally and socially situated practice. As Rosa and Orey (2013) argue, Ethnomathematics emerges as a methodology for continuous research and analysis of the processes of transmission, diffusion and institutionalization of mathematical knowledge that originates in diverse cultural contexts. This approach challenges the idea that mathematics is a universal and neutral science, showing that it actually emerges from the specific needs, values, and practices of different cultures. According to D'Ambrósio (2002), Ethnomathematics offers a new look at how different cultural groups understand, articulate and apply mathematical

ideas, challenging the predominant Eurocentric view that dominated the teaching of mathematics for centuries.

D'Ambrósio (2001) emphasizes that mathematics, in its essence, is not a creation detached from social and cultural realities, but rather a dynamic and evolutionary practice that responds to cultural and social changes. This perspective is fundamental to understand that mathematics is not limited to abstract formulas and concepts, but is intrinsically linked to the experiences and cultural practices of peoples. As a result, Ethnomathematics promotes a more inclusive form of teaching, where students' cultural traditions are valued and integrated into the school curriculum. According to Rosa and Orey (2017), this inclusion not only enriches the learning experience, but also strengthens the connection between mathematics and the realities experienced by students.

D'Ambrósio's (2007) proposal that Ethnomathematics should be seen as a dynamic and constantly evolving cultural practice implies a reformulation of the way mathematics is taught. Rather than being presented as a static set of universal truths, mathematics should be understood as a body of knowledge that develops in response to the specific needs and contexts of different cultures. Rosa and Orey (2013) argue that this view allows educators to integrate specific cultural practices into their lessons, making mathematics teaching more relevant and accessible to all students.

In addition, Ethnomathematics recognizes that all cultures have their own mathematical practices, which are equally valid and worthy of study. As D'Ambrósio (2002) points out, the objective of Ethnomathematics is not simply to document these practices, but to integrate them in a meaningful way into the school curriculum. This integration is seen as a form of social justice, as it challenges the hegemony of Western mathematical knowledge and values the contributions of other cultures. Rosa and Orey (2017) highlight that this approach helps to build a positive cultural identity among students, especially those from historically marginalized groups.

Ethnomathematics, therefore, is not just a methodology, but an educational philosophy that questions and challenges the power structures in the teaching of mathematics. According to D'Ambrósio (2017), by recognizing mathematics as a cultural practice, Ethnomathematics promotes a mathematical education that is critical, reflective and committed to social inclusion. This perspective is fundamental in an increasingly globalized and culturally diverse world, where mathematics education must be able to

respond to the needs and challenges of all students, regardless of their cultural background.

Rosa and Orey (2013) point out that the implementation of Ethnomathematics in the school curriculum requires continuous and reflective training of teachers. This involves not only acquiring knowledge about students' cultural practices, but also a fundamental shift in the way teachers view mathematics and their role as educators. This change is essential so that Ethnomathematics can be effectively integrated into schools, creating a learning environment that is inclusive, relevant, and respectful of cultural diversities.

The integration of cultural practices in the teaching of mathematics, as defended by Rosa and Orey (2015), has the potential to transform the learning experience of students, making it more meaningful and engaged. When students see their own cultures reflected in the curriculum, they not only learn math more effectively, but they also develop greater self-esteem and a sense of cultural identity. This connection between mathematics and culture is crucial to promoting an education that is truly inclusive and equitable.

D'Ambrósio (2002) suggests that Ethnomathematics also plays an important role in promoting critical citizenship. By integrating cultural practices into mathematics education, students are encouraged to question existing power structures and to value their own cultures and knowledge. This not only enriches the teaching of mathematics, but also contributes to the formation of critical and engaged citizens, capable of transforming the society in which they live.

The application of Ethnomathematics also challenges the traditional view of mathematics as an isolated and abstract science. As D'Ambrósio (2017) argues, mathematics is a cultural practice that is deeply rooted in the social and cultural realities of peoples. By recognizing this, Ethnomathematics promotes a mathematics education that is more connected to students' realities, making mathematics a tool for social and cultural transformation.

Finally, Ethnomathematics offers a transformative vision of mathematics education, which goes beyond the simple transmission of technical knowledge. As D'Ambrósio (2002) points out, Ethnomathematics is a way to promote social justice by valuing the different forms of mathematical knowledge that exist around the world. By doing so, she not only makes math more accessible and relevant for all students, but also contributes to building a more just and equitable society.



In conclusion, Ethnomathematics is a powerful approach that has the potential to revolutionize mathematics education. By recognizing mathematics as a culturally situated practice, Ethnomathematics offers a way of teaching mathematics that is inclusive, relevant, and respectful of students' cultural diversities. This not only enriches the learning experience for students but also contributes to building a more just and equitable society where all forms of mathematical knowledge are valued and respected.

## **DISCUSSION**

### **SONGS AND TALES: THE POETICS OF DIVERSITY IN MATHEMATICS EDUCATION**

The integration of Ethnomathematics into the school curriculum has the potential to profoundly revitalize mathematics education, by making it more accessible, meaningful, and culturally relevant for students. As noted by D'Ambrosio (2001), this approach allows mathematics to be contextualized within students' cultural experiences, transforming it from a discipline often perceived as abstract and distant into a living knowledge connected to students' everyday realities. This contextualization not only makes learning more interesting, but also facilitates the retention and practical application of mathematical knowledge.

Ethnomathematics, by valuing the traditional and cultural knowledge of students, promotes a more inclusive and equitable education. By connecting formal learning to students' cultural practices, this approach challenges the hegemonic view that mathematics is universal and independent of cultural context. Instead, it recognizes that each culture develops its own ways of thinking and doing mathematics, which are equally valid and worthy of study. This appreciation of cultural knowledge is crucial for building an educational environment that respects and celebrates diversity, while promoting equity in access to knowledge.

In addition, Rosa and Orey (2013) argue that Ethnomathematics plays a vital role in promoting social justice in mathematics education. By challenging traditional power structures that have historically privileged certain forms of mathematical knowledge over others, Ethnomathematics offers a way to recognize and legitimize the knowledge of students coming from different cultural contexts. This legitimization not only empowers students but also creates a space for their voices and experiences to be heard and valued in the classroom, contributing to more democratic and inclusive teaching.

However, the effective implementation of Ethnomathematics in the school curriculum is not without challenges. One of the main obstacles is the need for continuous training of teachers, who must be prepared to deal with cultural diversities in a sensitive and effective way. Educators need to develop a deep understanding of their students' cultural practices and learn how to integrate those practices into math teaching in a meaningful way. This requires not only technical training, but also a change in mindset, where teachers recognize and respect the richness of cultures that their students bring to the classroom.

In addition to teacher training, the adaptation of teaching materials is also crucial for the implementation of Ethnomathematics. The materials used in the teaching of mathematics should reflect the cultural plurality present in the classrooms, incorporating examples and problems that are relevant to the different realities of the students. This can include creating new educational resources that value local and traditional mathematical practices, as well as adapting existing materials to make them more inclusive and culturally sensitive.

The reformulation of curricula is another fundamental aspect for the implementation of Ethnomathematics. School curricula should be flexible enough to allow for the integration of diverse cultural practices, recognizing that mathematics is not a monolithic discipline, but a field of knowledge that can and should be adapted to different cultures. This redesign may include revising learning objectives, incorporating new teaching methodologies, and creating spaces for students to explore and share their own cultural mathematical practices.

Finally, it is essential that the implementation of Ethnomathematics is accompanied by continuous reflection on its practices and impacts. The adoption of this approach should be seen as a dynamic and evolving process, which requires constant adjustments and adaptations to respond to the needs and challenges of students and school communities. This reflection should include regular evaluation of pedagogical practices and teaching materials, as well as incorporating feedback from students and teachers to ensure that Ethnomathematics remains a relevant and effective approach in promoting diversity and social justice in mathematics education.

## **ANALYSIS**

### **FABRICS OF MEANINGS: UNRAVELING THE WEAVING OF ETHNOMATHEMATICS**

The analysis of the data extracted from the literature on Ethnomathematics reveals that, when applied in a contextualized way, this approach significantly facilitates the



understanding of mathematical concepts by students. Ethnomathematics, by incorporating local cultural examples into mathematics classes, validates students' knowledge and involves them in a deeper and more meaningful learning process. Rosa et al. (2017) highlight that this validation of students' cultural knowledge not only enriches the learning experience, but also contributes to the construction of an education that respects and values differences, promoting a more inclusive school environment.

The application of ethnomathematical methodologies allows students to understand mathematics not only as an abstract academic discipline, but as a cultural tool that can be used to understand and transform the world around them. This understanding transforms mathematics into a living and relevant knowledge, which makes sense in the context of students' lives. As a result, students become more engaged in the learning process and more motivated to apply mathematical knowledge in everyday situations, which can lead to better educational outcomes and a greater interest in mathematics.

Despite the clear benefits of Ethnomathematics, the analysis also points to the challenges inherent in its implementation. One of the most significant challenges is the need for a significant curricular reformulation, which allows the integration of students' cultural practices in the teaching of mathematics. This redesign requires a coordinated effort among educators, policymakers, and school communities to ensure that curricula are flexible and inclusive, reflecting the cultural diversity of students. In addition, the creation of appropriate teaching materials and the continuous training of teachers are fundamental for the success of this integration.

Ethnomathematics also highlights the importance of promoting a mathematics education that is both critical and reflective. By empowering students to question existing power structures and value their own cultures, Ethnomathematics contributes to the formation of more aware and socially engaged citizens. This critical and reflective education is essential to prepare students to face the challenges of the contemporary world, where the ability to think critically and independently is increasingly valued.

In addition, Ethnomathematics opens space for students to recognize and value the mathematical contributions of their own cultural contexts. This not only strengthens students' sense of cultural identity but also promotes more engaged and meaningful teaching. When students see their own cultures reflected in the mathematical content, they feel more connected to the learning process and more motivated to actively participate in

classes. This connection between mathematics and culture is crucial to promoting an education that is truly inclusive and equitable.

However, the practical application of Ethnomathematics requires a careful and well-planned approach. It is essential that educators are aware of the complexities involved in integrating cultural practices into mathematics teaching and that they are prepared to face the challenges that may arise. This includes not only the technical training of teachers, but also the development of a cultural sensitivity that allows them to address cultural differences in a respectful and effective manner.

Finally, the analysis of Ethnomathematics as an educational approach reinforces the need for a holistic view of mathematics education. Mathematics should not be seen only as a set of technical skills, but as a field of knowledge that can be used to promote social justice, inclusion, and the appreciation of cultural diversity. Through Ethnomathematics, educators have the opportunity to transform mathematics education into a process that empowers students to become critical and engaged citizens, prepared to contribute positively to their communities and society as a whole.

## **FINAL CONSIDERATIONS OR HORIZONS OF WISDOM AND THE FUTURE OF MATHEMATICS IN THE MIRROR OF CULTURE**

This study reaffirms the central importance of Ethnomathematics as a truly transformative approach to mathematics teaching. Throughout the research, it became evident that Ethnomathematics, by integrating cultural practices into the school curriculum, not only enriches students' mathematical learning, but also promotes an education that is deeply inclusive and socially engaged. This approach challenges traditional conceptions of mathematics as an abstract and universal field of knowledge, revealing it as a culturally situated practice rooted in the experiences and realities of different communities around the world.

The potential of Ethnomathematics to promote social inclusion cannot be underestimated. By valuing and integrating the diverse cultural and mathematical practices of students, it creates an educational space where all forms of knowledge are recognized and respected. This not only reinforces students' self-esteem and cultural identity but also prepares them to be active and critical citizens in an increasingly multicultural society. Ethnomathematics, therefore, is not only a pedagogical methodology, but an educational philosophy that promotes equity and social justice in the school environment.

For the future, it is imperative that new strategies are explored and developed for the effective implementation of Ethnomathematics in diverse educational contexts. This includes the need for continuous teacher training, the adaptation of teaching materials, and the reformulation of curricula so that they can adequately reflect the cultural diversity present in classrooms. These strategies must be flexible and adaptable, able to respond to the specific needs of different communities and to incorporate the voices and experiences of learners themselves into the educational process.

In addition to practical implementation, it is equally crucial to carry out a continuous and critical evaluation of the impact of Ethnomathematics on the training of students. This assessment should go beyond traditional academic outcomes and consider the development of competencies such as critical reflection, cultural empathy, and the ability to act ethically and socially responsibly. Only through a robust and multifaceted assessment will it be possible to fully understand the benefits and challenges of Ethnomathematics, adjusting pedagogical practices as necessary to maximize its positive impact.

The construction of a mathematical education that values different cultures not only reinforces the relevance of mathematics in the daily lives of students, but also contributes significantly to the formation of a more equitable society that respects cultural diversities. When students see their own cultures and experiences reflected in the content they study, they feel more connected to the learning process and more motivated to actively participate in school and community life. This, in turn, strengthens the social fabric, promoting greater cohesion and understanding between different cultural groups.

However, the full realization of the potential of Ethnomathematics depends on an ongoing commitment on the part of educators, policymakers, and school communities at large. This requires not only the implementation of ethnomathematical practices in the curriculum, but also a broader transformation of the attitudes and values that guide mathematics education. Ethnomathematics invites us to reconsider what it means to teach and learn mathematics, making room for an education that is both profoundly humanistic and rigorously academic.

Ultimately, Ethnomathematics offers a horizon of possibilities for mathematics education in the twenty-first century. By reflecting on the future of mathematics in the mirror of culture, we envision an education that is not only technically competent, but also culturally rich, socially just, and ethically aware. This study, by reaffirming the importance of

Ethnomathematics, contributes to the construction of this future, pointing out ways for an education that is truly inclusive, equitable and transformative.

## REFERENCES

1. D'Ambrosio, U. (2002). *Etnomatemática: Elo entre as tradições e a modernidade*. Belo Horizonte: Autêntica.
2. D'Ambrosio, U. (1998). *Etnomatemática*. São Paulo: Ática.
3. D'Ambrosio, U. (2017). *Uma história concisa da matemática no Brasil*. São Paulo: Summus.
4. Rosa, M., & Orey, D. C. (2017). *Ethnomathematics and its diverse approaches for mathematics education*. New York: Springer.
5. Rosa, M., et al. (2020). *Current and future perspectives of ethnomathematics as a program*. New York: Springer.