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ETHNOMATHEMATICS IN THE INDIGENOUS SCHOOL CURRICULUM: COUNTING AND TRADITIONAL KNOWLEDGE OF THE ASSURINI PEOPLE, MUNICIPALITY OF TUCURUÍ, PARÁ

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ABSTRACT

This article analyzes how ethnomathematics can be incorporated into the school curriculum of the Warara'awa Assurini School, located in the Trocará Indigenous Land, in Pará. Based on qualitative research, with observation and interviews with the elders of the Trocará village, the study seeks to understand how the traditional knowledge of the Assurini people can dialogue with the teaching of formal mathematical concepts, contributing to a differentiated school curriculum. The approach explores cultural practices such as counting in the mother tongue, body painting, and handicrafts, highlighting the educational potential of valuing indigenous knowledge. The results indicate that ethnomathematics can enrich mathematical learning, strengthen cultural identities, and promote more contextualized teaching.

Keywords: Ethnomathematics. Indigenous Education. School Curriculum. Assuring people. Cultural Mathematics.

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INTRODUCTION

Indigenous school education in Brazil is inserted in a context of historical, political, and cultural challenges. Since the beginning of colonization, the Brazilian educational system has been conceived with a Eurocentric bias, disregarding the knowledge and practices of native peoples. However, the Federal Constitution of 1988 (BRASIL, 1988) and subsequent legislation, such as Law No. 11,645, of March 10, 2008 (BRASIL, 2008), and the National Curriculum Guidelines for Indigenous School Education, Resolution CNE/CEB No. 5, of June 22, 2012 (Brazil, 2012), reaffirmed the right to differentiated and specific education for Indigenous peoples, promoting the recognition of their cultures, languages, and traditions.

In the case of the Assurini people, inhabitants of the Trocará Indigenous Land (TIT), in Pará, the issue of differentiated education becomes even more relevant when one observes the distance between the standardized school curricula and the cultural experiences of the community. Traditionally taught in an abstract and decontextualized way, Mathematics presents a significant challenge for indigenous students. In such a way that many contents do not connect with the reality of the village, which leads to demotivation and loss of meaning in the teaching-learning process.

Given the above, this article is based on the assumption that ethnomathematics, as a research and teaching proposal, can be a powerful tool to bring school content closer to the Indigenous cultural reality. Introduced by Ubiratan D'Ambrosio (2001), the concept proposes that Mathematics should be seen as a cultural phenomenon, capable of dialoguing with the traditional knowledge of communities. In the context of the Warara'awa Assurini School, this means working on school mathematics based on everyday practices of the village, such as counting in the mother tongue, geometric shapes, present in paintings and handicrafts, and the measurement of gardens and houses.

Thus, this study analyzes how ethnomathematics can be incorporated into the school curriculum of the Warara'awa Assurini School, promoting a contextualized teaching that values traditional knowledge and strengthens the cultural identity of students. Based on qualitative research, seeks to understand the cultural practices related to Mathematics and propose didactic materials that integrate scientific knowledge and local knowledge. In addition to contributing to the discussion on indigenous education, the article intends to offer a reflection on the importance of valuing traditional cultures in the Brazilian educational system.

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Concepts such as enculturation and acculturation, discussed by Bishop (1999), highlight the processes of interaction between cultures and the impacts of this on learning. In this sense, ethnomathematics was approached as a research and teaching proposal, following the definitions of D'Ambrosio (1993), who understands it as a way of valuing the ways of explaining, knowing, and dealing with reality in cultural contexts.

Methodologically, this research used a qualitative approach, based on action research, which proved to be adequate for the indigenous educational context, since it allows an active involvement of the researcher with the community and seeks to transform the reality studied. According to Ludke and André (1986), qualitative research prioritizes direct and prolonged contact with the study environment, valuing the perspective of the participants and cultural specificities.

Data collection was carried out based on observation, semi-structured interviews, and informal conversations with the elders of the Trocará village, recognized as the guardians of traditional knowledge. These interactions were essential to understanding counting systems, the meanings of geometric shapes in paintings and crafts, and the community's relationship to numbers and measurements. Participant observation was also used, since it enables the recording of daily practices involving Mathematics, such as the construction of straw houses and the sharing of food.

In addition, a bibliographic survey was carried out to support the analysis, involving authors who discuss ethnomathematics, Indigenous education, and differentiated curricula, such as D'Ambrosio (1993), Bishop (1999), and Pinto (2004). Educational legislation, such as the National Curriculum Guidelines for Indigenous School Education (BRASIL, 2012), was also used as a theoretical basis, reinforcing the right to value traditional knowledge in the school context.

The collected data were analyzed in the light of the principles of ethnomathematics, which proposes a dialogue between formal mathematical knowledge and cultural knowledge. The analysis sought to identify mathematical patterns and concepts present in the cultural practices of the Assuring people and to explore how these elements could be integrated into the school curriculum. Therefore, the research adopted a critical perspective, discussing the challenges and limitations of implementing differentiated teaching that meets the cultural and educational specificities of the community.

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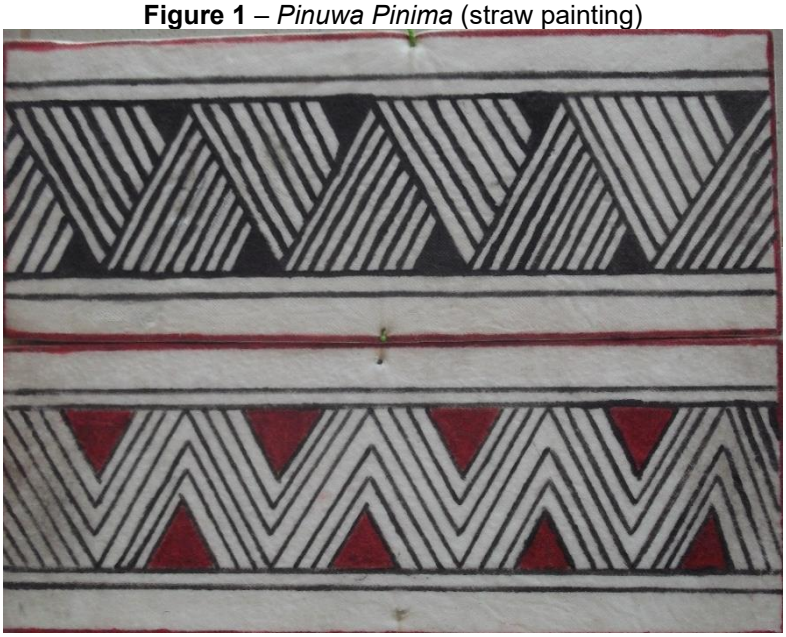
GEOMETRY IN ASSURINI BODY PAINTINGS AND HANDICRAFTS: CULTURAL KNOWLEDGE AND SCHOOL EDUCATION

The cultural expressions of the Assuring people, such as body paintings and handicrafts, are full of geometric elements that reveal an intrinsic relationship between aesthetics, functionality, and mathematical knowledge. Rooted in the observation of nature and traditional practices, this knowledge strengthens cultural identity but also offers pedagogical possibilities that dialogue with the school curriculum. In the context of the Warara'awa Assurini school, indigenous teachers have been working to integrate cultural knowledge into formal education, reinforcing the importance of a differentiated curriculum that contemplates the specificities of the community.

Assuring body paintings, such as *Pinuwa Pinima* (straw painting) and *Sautia Pinima* (tortoise painting), are clear examples of the presence of geometry in local culture. Inspired by the observation of nature, they incorporate geometric shapes such as triangles, rhombuses, and hexagons, which are arranged in repetitive, harmonic patterns. *The Pinuwa Pinima* (Figure 1) is based on the patterns of a straw fabric, while the *Sautia Pinima* (Figure 2) evokes the tortoise's carapace, showing how geometry is intuitively explored in the artistic creations of the Assurini people.

Figure 1 – *Pinuwa Pinima* (straw painting)



Source: Muretohoa Assurini (2023).

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Figure 2 – *Sautia Pinima* (tortoise painting)

Source: Muretehoa Assurini (2023).

By the sages of the Assurini people, the paintings are invaluable to the Assurini culture, as it is used on the bodies of children, young people, adults, men, and women. The Assurini paintings are created by women, who, through the observation of nature, find the forms of graphics, that they find interesting and start to use them on their bodies. These graphics, traditionally used in festivities and cultural events, transcend ornamentation, reinforcing cultural and identity values, in addition to establishing connections between the individual, the community, and the natural environment.

Assuring handicrafts, in turn, are also marked by the presence of geometry. Tupé, a straw fabric similar to a carpet, is produced based on traditional techniques that involve precise measurements and manual skills. During its making, small rectangles are arranged to form a larger rectangle, which constitutes the final piece. The paneiro (*arawasa*), used in the storage and transportation of food, has hexagons at its base and a cylindrical shape at the top, demonstrating the intuitive use of concepts such as symmetry, proportion, and spatiality.

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Figure 3 – Tupé production by teacher Vanderleia Assurini and her granddaughter

Source: Muretehoa Assurini (2023).

Figure 4 – Production of pandeiro (*arawasa*) by the Assurini children

Source: Muretehoa Assurini (2023).

In Figures 3 and 4, it is observed that teacher Vanderleia Assurini and some children produce the utensils in the daily life of the village, loaded with fundamentals of ethnomathematics and Assurini culture. Such artisanal practices, in addition to strengthening cultural identity, are pedagogical opportunities to teach Mathematics in a practical and contextualized way. In the culture of knowledge experienced daily, according to Carraher *et al.* (l995):

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> [...] the child who learns mathematics on the street, the illiterate money changer who collects bets, the foreman trained by his father, all of them are living examples that our analyses are incomplete, need to be dismantled and redone if we want to create the true school open to all, public and free, for which we fight in the public squares. […] But the teaching of mathematics should be, without a doubt, the area most directly benefited by the knowledge of mathematics in everyday life (CARRAHER *et al.*, l995, p. 2l).

In line with Pinto (2004), valuing these practices in school education is essential to strengthen the cultural identity of students and promote dialogue between traditional and scientific knowledge. By analyzing the geometric patterns of the baskets, indigenous teachers can teach concepts such as angles, areas, and perimeters, while reinforcing the importance of artisanal tradition.

In the educational sphere, the Warara'awa Assurini School integrates this knowledge into the school curriculum, although it still faces challenges due to the lack of specific teaching materials. Teachers use elements of local culture, such as paintings and handicrafts, to teach mathematical content in a meaningful way. In these activities, seeds of nature are used to teach notions of quantity and geometric shapes, while the graphics of body paintings are explored as an introduction to geometry. Such activities guarantee the learning of scientific content and promote the appreciation and preservation of traditional knowledge.

In addition, bilingual education plays a primary role in strengthening cultural identity. Mother tongue teacher Waramuía Assurini teaches numbers in both Portuguese and mother tongue, ensuring that learning is aligned with the cultural practices of the community. This approach reaffirms the school's commitment to maintaining the Assurini culture while seeking to fulfill its function of teaching scientific knowledge.

The importance of valuing traditional knowledge in school education is widely discussed by authors such as Cifuentes (2003), who highlights ethnomathematics as a field that connects cultures, societies, and mathematics, evidencing the richness of knowledge of traditional communities. For the author, this approach is fundamental to unveil and value the interconnections between scientific knowledge and cultural knowledge. Similarly, Luciano (2006) points out that formal education, when adapted to the needs of indigenous communities, can be an ally in the struggle for cultural resistance and political and social autonomy.

Despite the challenges faced by the Warara'awa Assurini School, such as the lack of teaching materials and the precariousness of teacher training, indigenous educators have

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shown great resilience and creativity in the construction of pedagogical practices that integrate traditional knowledge with formal education. Such an approach strengthens cultural identity and prepares students to deal with contemporary challenges without losing sight of their roots.

By incorporating geometry into their shapes and patterns, the Assurini body paintings and handicrafts express the cultural richness of the people, in addition to offering a solid basis for the teaching of mathematics and other knowledge in indigenous schools. Integrating this knowledge into the school curriculum is essential to build an education that respects and values cultural identity, promoting intercultural dialogue and reinforcing the autonomy of the Assurini community.

ETHNOMATHEMATICS, COUNTING, AND TRADITIONAL KNOWLEDGE OF THE ASSURINI PEOPLE

As presented by D'Ambrosio (2001), ethnomathematics emerges as a perspective that transcends the traditional limits of formal mathematics, valuing the mathematical knowledge and practices present in different cultures. By recognizing that each community develops its methods for dealing with problems, measuring, organizing, and symbolizing the world around it, ethnomathematics becomes a link between cultural traditions and scientific modernity.

In such a way this approach challenges the hegemony of Western Mathematics, proposing an inclusive and pluralistic look, capable of enriching mathematical understanding by integrating ancestral and contemporary knowledge. In this sense, ethnomathematics promotes respect for cultural diversity and invites reflection on how mathematical knowledge can be an instrument of social empowerment and transformation.

Bishop (1999) points out that Mathematics, in any culture, is the product of processes of enculturation and acculturation. In the Assuring context, the traditional counting system is a form of enculturation, insofar as it preserves cultural values and modes of social organization. However, the introduction of school mathematics can be seen as a process of acculturation, which repeatedly devalues local knowledge in favor of Western scientific models. To avoid cultural disintegration, as Brandemberg (2016) points out, it is necessary to promote an intercultural education that respects and strengthens the values of the community.

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The Assurini counting system demonstrates a rich interaction between language, culture, and social organization. For example, the word *anohieté*, used to designate the number zero, goes beyond a numerical representation, since it reflects the concept of absence, a culturally significant principle in the indigenous context. The absence or "non-existence" may be related to ideas of cycle and regeneration, so present in everyday practices and indigenous cosmologies.

Even numbers, such as *irongatoeté* (four), symbolize harmony and completeness. This idea, culturally impregnated with the "perfect match", resonates in the organization of families within the village and in the use of numbers to describe relationships of symmetry and balance. Odd numbers, such as *nairoihí* (three), carry concepts of singularity and transition, emphasizing the importance of narratives that explain mathematics as a cultural phenomenon before just inserting it into a formal context.

In the interviews, the elders highlighted that the odd and even numbers have specific categories in the language, connected to the daily life of the village. The term *mia mokoi* describes odd numbers, while *ong na iroihí* designates even numbers. These classifications show how counting in Assurini goes beyond conventional mathematical concepts, incorporating meanings associated with social and natural practices, such as the measurement of swiddens and the distribution of food among families.

In Certeau's (2003) concept, the vestiges of these mathematical cultural practices are woven from the revisiting of people's memories, since it is by:

> […] "Return" or return that takes the operation from its starting point (less force) to its end (more effect), implies in the first place the mediation of knowledge, but a knowledge that has as its form the duration of its acquisition and the endless collection of its particular knowledge. […] This knowledge is made up of many moments and many heterogeneous things. It is a memory, whose knowledge cannot be separated from the times of its acquisition and unravels the singularities. […] In its practical form, memory does not have an organization already ready in advance that it would only fit there. She mobilizes herself about what happens – a surprise, which she can transform into an occasion. It only settles in one fortuitous encounter, in the other (CERTEAU, 2003, p. I57-I62).

The numbers serve as interpretive units for daily practices, such as measuring gardens, counting games, and distributing food. This practice creates a functional system of traditional Mathematics, which is already present in the student's experience and needs to be respected and incorporated into the school curriculum. This type of approach makes Mathematics more accessible and intuitive for Indigenous students, as it connects directly to the reality they experience.

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During interviews with the elders, it was found, for example, that the number six, called *he'yj*, means "abundance" or "great quantity." This concept can be explored in class to discuss ideas such as multiplication or probabilities, contextualizing everyday activities such as the collection of açaí or the measurement of harvests.

Thus, the numbers in the Assurini language are not mere translations of quantities they carry cultural meanings that reflect the relationship of the people with the environment and with their social organization. Another example is the number one (*osepesowe*) means "only one", emphasizing uniqueness and exclusivity, while *irongatoeté* (four) suggests harmony and balance, symbolizing the perfect first pair.

This culturally situated approach to counting is fundamental to creating a richer dialogue between school mathematics and indigenous knowledge. The indigenous teachers of the Warara'awa School have used narratives from the elders to illustrate counting concepts, bringing students closer to their cultural roots while learning formal mathematics, and applying contextualized activities of these practices in the classroom. As shown in Figure 5 below.

Figure 5 – Counting activity in the Mathematics discipline

Source: Sakunawia Assurini (2023).

The analysis of counting in the Assurini language reveals an intrinsic connection between numbers and cultural practices, reflecting what D'Ambrosio (1993, p. xx) describes as "a way of dealing with reality". Cifuentes (2003) also reinforces the importance of considering aesthetics and cultural context when teaching Mathematics. In the case of the Assurini count, the numbers are not just numerical symbols, but part of a cultural aesthetic that organizes social relations and daily practices.

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PROPOSAL OF DIDACTIC MATERIALS CONTEXTUALIZED TO THE TEACHING OF MATHEMATICS

The production of didactic materials for the teaching of Mathematics in the Warara'awa School should be based on the principles of interculturality, as defended by Marin (2009) when he states that interculturality recognizes the nature and context of the life of traditional knowledge, allowing it to be associated with scientific knowledge without hierarchies.

A concrete proposal would be the elaboration of a thematic notebook that combines narratives of the elders with practical activities, such as, for example, students could create graphs based on counting fruits or measuring baskets, connecting these activities to concepts of statistics and geometry. D'Ambrosio (2012) emphasizes that ethnomathematics does not replace formal knowledge, but broadens students' understanding by offering multiple perspectives on the same phenomenon.

Additionally, including traditional games and play, such as counting while collecting seeds or organizing parties, can help develop math skills while students connect with their culture. These materials can also include reflections on the environmental impact on community life, such as changes in the availability of seeds and fruits, and integrating sustainability concepts into mathematics teaching.

The creation of teaching materials for the teaching of Mathematics at the Warara'awa School should prioritize the strengthening of the link between the Assurini culture and school mathematical concepts. Some more detailed suggestions include:

i. **Thematic notebook on traditional counting:** prepare a material that presents the Assurini counting system with tables and comparative tables between the numbers in Assurini and Portuguese. Activities could include identifying patterns in odd and even numbers and quantity translation exercises between the two systems;
ii. **Mathematical games based on cultural practices:** develop educational games that use counting and measuring. An example would be a collection game, in which students must calculate the optimal amount of fruit or seeds needed to serve different families;
iii. **Geometric exploration in the arts:** propose exercises in which students draw geometric patterns used in baskets and body painting. These drawings can be analyzed in terms of symmetry, area, and proportion; and

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iv. **Mathematical stories based on local narratives:** incorporate stories of the elders, who use mathematical concepts, such as organizing a feast or dividing food. From the narratives, students could solve related mathematical problems.

In addition, activities may include measurements of physical structures, such as straw houses, encouraging the use of practical geometry concepts. The division of tasks for construction, such as the calculation of required materials, can be used to work on addition, multiplication, and division problems.

Thus, ethnomathematics becomes a pedagogical tool and a way to promote a new transcultural and transdisciplinary world (D'AMBROSIO, 2001). In the context of the Warara'awa School, this means creating an educational space in which scientific and cultural knowledge coexist in harmony, valuing both traditional and formal knowledge.

FINAL CONSIDERATIONS

As proposed by Ubiratan D'Ambrosio, ethnomathematics enables the inclusion of traditional knowledge in the teaching of Mathematics and acts as a tool for cultural appreciation and resistance. By incorporating the mathematical knowledge of the Assurini people into the curriculum, teachers promote students' self-esteem, showing that mathematics is not only a knowledge imposed from outside, but also that which is part of their cultural heritage.

Such an approach dialogues with the National Curriculum Guidelines for Indigenous School Education, whose premise defends the right to a differentiated education, which considers traditional knowledge as a basis for the strengthening of ethnic and cultural identities. By connecting ethnomathematics to public educational policies, the study reinforces the importance of thinking about curricula that integrate and celebrate cultural diversity.

The research highlighted the need for contextualized didactic materials, which associate mathematical content with the daily lives of students. The initial proposal indicated the creation of a didactic notebook, which included activities based on Assurini cultural practices, such as counting seeds, building houses, and measuring objects. The production of such materials is essential to make the school curriculum more relevant and motivating for Assuring students, promoting the learning of Mathematics while strengthening cultural identity.

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The results of this study indicate that ethnomathematics offers a promising way to integrate traditional knowledge into the teaching of Mathematics at the Warara'awa Assurini School. Valuing cultural practices, such as counting in the mother tongue and geometry in handicrafts, strengthens students' cultural identity and promotes more meaningful and contextualized teaching.

The research also indicates the need for public policies that support the construction of differentiated school curricula and the production of specific teaching materials for Indigenous communities. Future investigations may explore other dimensions of ethnomathematics in the Assuring educational context, expanding the possibilities of connection between traditional and scientific knowledge.

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