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Articles Section

Epistemological Dimension of Ethnomathematics: A bibliographical survey of doctoral theses from a counter-hegemonic perspective

Dimensão Epistemológica da Etnomatemática: Um levantamento bibliográfico em teses de doutorado sob uma perspectiva contra-hegemônica

Dimensión epistemológica de las etnomatemáticas: Un estudio bibliográfico de tesis doctorales desde una perspectiva contrahegemónica

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Abstract

This paper analyzes how epistemological dimension of ethnomathematics has been addressed in research in the field of Mathematics Education from a decolonial perspective. A bibliographic survey of theses and dissertations was conducted in the CAPES Thesis and Dissertation Catalog and the Digital Library of Theses and Dissertations (BDTD). Based on Content Analysis, it was possible to identify the following categories that highlight the modes of conceptualization and mobilization of Ethnomathematics: Traditional epistemological knowledge of Indigenous Peoples; Mathematical Knowledge of the Field: An Epistemological Analysis; Theoretical Studies: Teacher Training and Curriculum; and Afrocentric Cultures: Decolonial Epistemologies. Findings indicate the predominance of descriptive approaches with limited epistemological problematization, although efforts towards intercultural dialogue and the valorization of non-Eurocentric knowledge are observed, pointing to the need for greater theoretical depth in this field.

Keywords: Mathematical Education. Ethnomathematics. Epistemology.

Resumo

Este artigo analisa como a dimensão epistemológica da Etnomatemática tem sido abordada em pesquisas no campo da Educação Matemática sob uma perspectiva decolonial. Realizou-se um levantamento bibliográfico de teses e dissertações no Catálogo de Teses e Dissertações da CAPES e na Biblioteca Digital de Teses e Dissertações (BDTD). Com fundamentação na Análise de Conteúdo, foi possível identificar as seguintes categorias que evidenciam os modos de conceituação e mobilização da Etnomatemática: Saberes epistemológicos tradicionais de Povos Indígenas; Saberes Matemáticos do Campo: Uma Análise Epistemológica; Estudos Teóricos: Formação de professores e Currículo; e Culturas Afrocentradas: Epistemologias decoloniais. Os resultados indicam a predominância de abordagens descritivas, com limitada problematização epistemológica, embora se observem esforços voltados ao diálogo intercultural e à valorização de saberes não eurocentrados, apontando a necessidade de maior aprofundamento teórico nesse campo.

Palavras-chave: Educação Matemática. Etnomatemática. Epistemologia.

Resumen

Este artículo analiza cómo se ha abordado la dimensión epistemológica de la Etnomatemática en la investigación en el campo de la Educación Matemática, desde una perspectiva decolonial. Se realizó una revisión bibliográfica de tesis y disertaciones disponibles en el Catálogo de Tesis y Disertaciones de CAPES y en la Biblioteca Digital de Tesis y Disertaciones (BDTD). Basado en el Análisis de Contenido, fue posible identificar las siguientes categorías que resaltan los modos de conceptualización y movilización de la Etnomatemática: Conocimiento epistemológico tradicional de los pueblos indígenas; Conocimiento matemático del campo: un análisis epistemológico; Estudios teóricos: formación docente y currículo; y Culturas afrocéntricas: epistemologías decoloniales. Los hallazgos indican el predominio de enfoques descriptivos, con una problematización epistemológica limitada, aunque se observan esfuerzos hacia el diálogo intercultural y la valorización del conocimiento no eurocéntrico, lo que apunta a la necesidad de una mayor profundidad teórica en este campo.

Palabras clave: Educación Matemática. Etnomatemáticas. Epistemología.

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1. Introduction

The interest in understanding and conceptualizing how human development occurs, as well as the construction of knowledge about it, is the subject of study. Knowledge is understood as a field under construction, a product of the social and cultural relations of subjects throughout history, and as an activity of its own and an action of the subject on himself and his environment.

Considering knowledge as a historical and cultural construction, it is unjustified to choose a single form of knowledge as more valid than others, especially when a single cultural group defines validation criteria. However, Europe defined itself as the civilization that determines the development process, claiming the right to impose it, sometimes through violence and oppression, which it considered necessary. Thus, European culture began to be imposed as the most developed and superior to other cultures (Oliveira, 2016). Slaughtering and oppressing civilizations, this movement intensified with the invasion of the Americas and enslavement of African peoples.

In this sense, taking into account the need to conceive scientific knowledge beyond the colonizer's gaze and to value and respect the knowings and doings of different cultures, a counter-hegemonic posture is defended. In this sense, D'Ambrosio's (1993) perspective conceptualizes ethnoscience and ethnomathematics as a more adequate epistemological alternative, through the lens of different sociocultural realities rather than only the dominant science and mathematics, with a European hegemonic base that continues to govern the curriculum, sometimes delegitimizing other knowledge.

Even before the 1970s, researchers were dedicated to investigating the mathematical aspects present in peoples' cultures. This movement occurred mainly due to the expansion of anthropological studies, which came to understand mathematics as a historical and human construction, developed in different ways between different social groups. Following this assumption, Ubiratan D'Ambrosio, in his cultural studies, coined the term ethnomathematics.

D'Ambrosio (1993) explains the concept of ethnomathematics from the etymology of the word, understanding it as the art or technique (*tica*) of explaining, understanding, and performing in reality (*matema*), within a cultural context of its own (*etno*), recognizing that these *ticas* of *matema* are present in all cultures.

Ethnomathematics aims to recognize other ways of thinking beyond mathematical knowledge, seeking to understand the knowledge-construction process as transdisciplinary (D'Ambrosio, 2018) from historical, cognitive, social, pedagogical, and epistemological standpoints.

In this sense, ethnomathematics has, in recent decades, been consolidated as an important field of research within mathematics education by problematizing the universality and neutrality historically attributed to mathematical knowledge. By recognizing mathematical practices situated in different sociocultural contexts, ethnomathematics strains hegemonic conceptions of science and knowledge, opening space for plural and intercultural readings of mathematics (D'Ambrosio, 2001).

According to D'Ambrosio (2001), ethnomathematics comprises historical, cognitive, political, educational, conceptual, and epistemological dimensions. In this discussion, the emphasis is on the epistemological dimension, which generally seeks to understand the relationship between the doings (linked to empirical reality) and the knowings (associated with theoretical conceptions) of a given culture.

Despite the growing body of research in the field, academic publications do not always deepen the epistemological foundations of ethnomathematics (Souza, 2014). In several investigations, the concept is mobilized instrumentally or merely illustratively, without a sustained problematization of its theoretical and philosophical foundations. Souza (2014) therefore highlights the need for more rigorous investigations of these bases to prevent ethnomathematics from being reduced to a univer-

sity curriculum component or to a simplistic interpretation that views it only as the sum of '*ethnic*' + '*mathematics*'.

This study focuses on the epistemological dimension of ethnomathematics. The objective is to analyze how this dimension has been addressed in research conducted within the scope of graduate programs, from a decolonial perspective, based on a survey of theses available in the CAPES Catalog and the Digital Library of Theses and Dissertations (BDTD).

In relation to decoloniality, D'Ambrosio argues that the appreciation of origins and roots should be sought without disregarding globalization, which is a dynamic of cultural encounters that is important and necessary for society (Costa, 2021).

Thus, the article seeks to understand how the epistemological dimension is discussed in Brazilian academic production, in doctoral theses, through the prism of ethnomathematics, considering a decolonial perspective that questions the centrality of Eurocentric knowledge and values other ways of producing and legitimizing knowings. Thus, it is intended to contribute to the field's theoretical strengthening and to the expansion of the epistemological debate in mathematics education.

2. Ethnomathematics: an epistemological and decolonial look

For D'Ambrosio (2005), ethnomathematics constitutes a sub-area of the history of mathematics and mathematics education, seeking to understand the processes of constitution and development of human knowings and doings rooted in customs and rites transmitted between generations.

Moreover, in its constitution, D'Ambrosio (1993) conceptualizes ethnomathematics as a Lakatosian research program. This characterization stems from the program is broad, constantly expanding methodology, which focuses on the generation, production, organization, and construction of knowledge. Lakatos (1979) describes research programs as developments structured by a historical approach, involving communities that collaborate in the construction of knowledge. In this sense, they can be understood as expressions of epistemologies located in specific contexts.

These programs differ from isolated theories, as they have a central theoretical basis, called the hard core, which is protected by a belt of auxiliary hypotheses. These hypotheses can be transformed, improved, or adjusted, always to protect the central core (Lakatos, 1979).

In this sense, ethnomathematics constitutes "a necessarily transcultural and transdisciplinary program and uses research methods from the sciences, cognition, mythology, anthropology, history, sociology (politics, economics, education) and cultural studies in general" (D'Ambrosio, 2018, p. 190). Thus, it seeks to transmit and diffuse knowledge built and accumulated throughout human history and across different parts of the globe.

Ethnomathematics, as proposed by D'Ambrosio (2001, 2018), comprises the study of mathematical practices developed by different cultural groups in their specific historical and social contexts. This perspective breaks with the idea of a unique, universal, and neutral mathematics by showing that mathematical knowledge is produced in close relationship with culture, language, work, and forms of social organization.

The very constitution of ethnomathematics is decolonial in content, because, in its movement, it seeks to break epistemological ties, recognizing ways of doing and knowing mathematics within culturally differentiated groups. The epistemological cages, described by D'Ambrosio (2018), are a metaphor that well describes this movement, as it aims to describe systems of knowledge in which it is necessary to look outside the cage: it is not a matter of destroying the epistemological cages, but leaving thought free.

In this sense, Costa (2021) reports that, when interviewed, D'Ambrosio makes important statements about the debates on decoloniality. He believes "political decolonization has already occurred. But minds remain colonized, integrated, and reproducing the immanent thinking of European metropolises" (Costa, 2021, p. 4). He also adds that decolonization is precisely the process of eliminating the colonized mentality.

From the epistemological point of view, ethnomathematics dialogues with critical currents that question the hierarchization of knowledge and the imposition of a hegemonic model of science (D'Ambrosio, 2001). The approach to decolonial studies allows us to understand school mathematics as part of a historical project of coloniality of knowing, in which some knowledge is legitimized to the detriment of others (Quijano, 2005).

The epistemological dimension of ethnomathematics, therefore, implies recognizing the plurality of rationalities and the legitimacy of knowledge produced outside the framework of modern Western science. It is a movement that does not deny academic mathematics, but puts it in dialogue with other knowings, promoting an open, critical, and transcultural epistemological posture (D'Ambrosio, 2001).

According to D'Ambrosio (1993), ethnomathematics proposes an alternative epistemological approach, articulated with a broader historiography. Its objective is to understand the historical construction of scientific knowledge not from a privileged culture, but above all considering the processes experienced by peripheral countries, marked by conquest and colonization. D'Ambrosio conceives that "the main step in the process of decolonization of Afro-Brazilians, Indigenous people and others is to recover the historicity of their cultural roots, to be proud of them, and to honor the memory of their ancestors" (Costa, 2021, p. 5).

In this sense, it is necessary to understand the epistemological dimension of ethnomathematics proposed by D'Ambrosio (1993, 2001), as it aims to articulate different knowledge systems that are elaborated by different cultural groups, explaining the evolution of knowledge, understanding how knowings and doings are related, starting from the observation of how one moves from local practices to experimentation and method, how one moves from experimentation and method to reflection and abstraction (D'Ambrosio, 2005). Thus, it seeks to understand the dynamics of knowledge generation.

This dimension seeks to understand the *knowings and doings* that start and evolve from human need, linked to the very survival and transcendence of humanity. According to Rosa e Orey (2018), these *doings* constitute empirical knowledge and observations of reality; on the other hand, knowings constitute theoretical knowledge, a set of principles that underlies a science. In this way, ethnomathematics, according to the researchers, has as its principle the understanding of the relationship between doings and knowings of a given culture.

To achieve understanding of these doings and knowings, D'Ambrosio (2005, p. 39) proposes three fundamental questions that support his explanation of the evolution of human knowledge: "1) How do we move from *ad hoc* observations and practices to experimentation and method? 2) How do we move from experimentation and method to reflection and abstraction? 3) How do we proceed for inventions and theories?"

The questions presented support the explanation of epistemology, a theory of knowledge. In this sense, D'Ambrosio (2005) proposes a knowledge cycle, formulated on the basis of the interaction between individuals from different cultural groups, immersed in their respective realities. D'Ambrosio (2005) emphasizes the need not to fragment this cycle, as it is necessary to conceive of it as a whole to understand how the development and evolution of knowledge occur; its fragmentation makes it impossible to analyze the mathematical knowledge of cultures considered peripheral.

3. Methodological assumptions

This bibliographic research is qualitative (Bogdan; Biklen, 2010), aiming to analyze how the epistemological dimension of ethnomathematics has been addressed in research developed within the scope of postgraduate programs, through a survey in the theses from the Catalog of Theses and Dissertations of the Coordination for the Improvement of Higher Education Personnel (CAPES) and the Brazilian Digital Library of Theses and Dissertations (BDTD) from a decolonial perspective. For this, a mapping was carried out according to Biembengut's (2008) understanding.

For Biembengut (2008), mapping is a methodological approach that seeks to organize and systematize the knowledge produced in a given area or theme of educational research of interest to the researcher, thereby allowing a panoramic and critical view of the field under investigation. As a research method, the mapping follows steps in the investigative process: delimitation of the theme and objectives; definition of data sources; selection of inclusion/exclusion criteria for productions; analysis and categorization of the data found; and critical interpretation of the results.

In the mapping, a survey of Brazilian doctoral theses was conducted, selected from the CAPES and BDTD repositories, covering the period up to the first half of 2025. Their relevance justifies the choice of these repositories, as it is mandatory for universities to deposit the master's dissertations and doctoral theses defended in their programs in the CAPES repository. In addition, these platforms offer free access to national scientific production, enabling students, researchers, and teachers to consult complete works from various institutions across the country.

The mapping search strategy was performed using a filter, using the search terms: "Ethnomathematics AND epistemological dimension"; "Ethnomathematics AND Epistemological"; "Ethnomathematics AND Epistemological" ["Etnomatemática AND dimensão epistemológica"; "Etnomatemática AND Epistemológica"; "Etnomatemática AND Epistemológico"]. After its application, 25 doctoral theses were identified in the CAPES database and 30 doctoral theses in the BDTD.

Following the identification phase, as presented by Biembengut (2008), the 55 productions were classified/organized. For this, the titles were read, excluding theses that appeared simultaneously with the search terms on the respective platforms; theses that appeared simultaneously on both platforms were then excluded to avoid duplication. Of the 30 theses found in the BDTD repository after applying the filter, 17 were identified as replicates. They were also in the CAPES repository, for a total of 33 theses submitted for analysis: 13 from the BDTD repository and 20 from the CAPES repository.

In the next step, the abstracts and keywords were read to identify theses that addressed ethnomathematics and explicitly presented debates on the epistemological dimension. For this, we considered terms such as *epistemologia, epistemológica* e *epistemológico* [epistemology, epistemological, and epistemological] present in the title, abstract, or keywords, as well as their recurrence throughout the work. This set of elements constituted the inclusion and exclusion criteria. In this process, 20 theses were disregarded.

The 13 selected theses, identified as T1-T13, organized chronologically, are shown in Chart 1.

Chart 1 – Theses that make up the *corpus* of analysis of this research

Doctoral thesis	Title	Author	Institution/year
T1	Objetiva(ação) da medida e da contagem do tempo em práticas socioculturais e educativas	Osvaldo dos Santos Barros	Universidade Federal do Rio Grande do Norte (UFRN)/2010
T2	O Saber/fazer/ser e conviver dos Educadores Indígenas Apinayé: algumas reflexões no campo da Teoria da Complexidade e da Etnomatemática	Sinval de Oliveira	Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP)/2013
T3	Os Artefatos e Mentefatos nos Ritos e Cerimônias do Danhono: Por dentro do Octógono Sociocultural A'uw/Xavante	Adailton Alves da Silva	Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP)/2013
T4	Etnomatemática: uma rota epistemológica rumo ao pensamento complexo	Janderson Vieira de Souza	Universidade Federal do Pará (UFPA)/2014
T5	Fatores sócio-político-culturais na formação do professor de Matemática: análise em dois contextos de formação	Roberto Barcelos Souza	Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP)/2015
T6	Marcadores de Tempo Apyãwa: A solidariedade entre os povos e o ambiente que habitam	João Severino Filho	Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP)/2015
T7	Práticas com Matemática na Educação do Campo: o caso da Redução à Unidade na Casa Escola da Pesca	Carlos Alberto Gaia Assunção	Universidade Federal do Pará (UFPA)/2016
T8	Etnomatemática no Currículo Escolar: Uma questão de Política Educacional	Berlane Silva Martins	Universidade Anhanguera de São Paulo/2019
T9	Etnomatemática na escola: a questão do sujeito	Adriano Fonseca	Universidade Estadual de Campinas (UNICAMP)/2019
T10	Etnomatemática na Educação Escolar Indígena: A mobilização entre saberes ancestrais e saberes acadêmicos para o Ensino da Matemática na Educação Profissional Tecnológica para a Etnia Satere Mawe	Darlane Cristina Maciel Saraiva	Universidade Federal de Mato Grosso (UFMT)/2022
T11	A Etnomatemática na Geometria da Cerâmica Ticuna	Francilene dos Santos Cruz	Universidade Federal do Amazonas (UFAM)/2022
T12	Giro Curricular: Decolonialidade, Epistemologia do Sul e o Programa Etnomatemática	Kleber William Alves da Silva	Universidade de São Paulo (USP)/2023
T13	Entre Escolas de Samba e o Programa Etnomatemática: em busca de caminhos de emancipação	Jéssica Juliane Lins de Souza Fernandes	Universidade Federal de Santa Catarina (UFSC)/2024

Source: Prepared by the authors

For data treatment, the content analysis proposed by Bardin (2016), a modality of text interpretation, was used.

> [...] a set of communication analysis techniques aiming to obtain, through systematic procedures and descriptive objectives of the message content, indicators (quantitative or not) that allow for the inference of knowledge related to the production/reception conditions (inferred variables) of these messages (Bardin, 2016, p. 42).

As an initial step, the research *corpus* for analysis was built, comprising the 13 selected theses. Then, a floating reading (characterized by being free, exploratory, and comprehensive) was performed to familiarize with the material. From this reading, some categories emerged and guided the analysis of the research: i) Traditional epistemological knowledge of Indigenous peoples; ii) Mathematical knowledge of the field: an epistemological analysis; iii) Theoretical studies: teacher education and curriculum; and iv) Afrocentric cultures: decolonial epistemologies.

4. Data analysis

As a first step, the objectives of the theses were mapped, as well as the cultural context in which the research is inserted, the cultural groups investigated, and the traditional knowledge addressed. For the analysis, an excerpt was prepared that specifically addressed the objectives of each thesis and their respective cultural contexts. This organization is shown in Chart 2.

Chart 2 – Identification of objectives and cultural context

Doctoral thesis	Objective	Research Locus
T1	Descrever a mobilização de práticas sócio-históricas, como o uso do Gnômon*, do relógio do sol e a leitura do movimento das constelações celestes, na elaboração de matrizes para o ensino de conceitos e habilidades geométricas relacionadas a ângulos, semelhanças de triângulos, proporcionalidade e simetria na formação de professores de Matemática	Comunidade Indígena Tembé-Tenetehara e pescadores de Vigia, no estado do Pará, que fazem uso do Gnômon e da leitura do movimento das estrelas
T2	Sistematizar uma epistemologia dos educadores indígenas Apinayé — homens, mulheres e crianças — nos seus saberes e fazeres na forma de ser e conviver, enquanto intelectuais da tradição cultural de seu povo	Educadores indígenas Apinayé, no estado do Tocantins
T3	Compreender como os saberes e os fazeres do povo estão sedimentados e articulados nos mitos, ritos e cerimônias, principalmente os relacionados ao Danhono	Aldeias pertencentes à Terra Indígena Pimentel Barbosa/Xavante, relacionadas aos mitos, ritos e cerimônias do povo A'uw/Xavante
T4	Analisar como a Etnomatemática apresenta uma rota epistemológica rumo a uma ciência complexa	Pesquisa teórica
T5	Investigar e evidenciar fatores sócio-político-culturais, no olhar do professor em formação, presentes nas inter-relações dos dois contextos de formação de professores, em uma perspectiva do Programa Etnomatemática	Pesquisa teórica — formação de professores
T6	Constituir um conjunto de estudos e reflexões sobre os conhecimentos de povos indígenas e suas epistemologias, interpretados a partir do fluxo do discurso social Apyãwa, na perspectiva do Programa Etnomatemática	Povo indígena Apyãwa, habitantes da Área Indígena Urubu Branco, situada na região do Médio Araguaia, Mato Grosso, Brasil
T7	Analisar aspectos que dão vida a um objeto de saber matemático em uma instituição escolar, ou seja, mostrar como o Método de Redução à Unidade (MRU) emerge nas práticas socioculturais com Matemática	Casa Escola da Pesca
T8	Investigar se as dimensões conceitual, histórica, cognitiva, epistemológica, política e educacional do Programa Etnomatemática, bem como os conceitos de materacia, literacia e tecnoracia do Curriculum Trivium propostos por D'Ambrosio, estão presentes nos documentos oficiais que nortearam suas ações pedagógicas	Pesquisa teórica — análise curricular do Distrito Federal
T9	Mostrar como o professor ou futuro professor da disciplina Matemática pode fazer com que a sala de aula se torne um espaço sociocultural, no qual os alunos sejam considerados seres culturais, portadores de cultura e conhecimento matemático próprios	Pesquisa teórica
T10	Analisar os processos de ensino e de aprendizagem de Matemática, na relação entre conhecimentos ancestrais e acadêmicos, ofertados para o curso Técnico Integrado EJA/PROEJA/Indígena em Agroecologia, para a etnia Satere Mawe	Etnia Satere Mawe, na Terra Indígena Andirá-Marau, no estado do Amazonas
T11	Analisar e valorizar os saberes etnomatemáticos contidos na tradição do saber-fazer cerâmico, através do pensamento ancestral do povo Ticuna, destacando as geometrias contidas na confecção de vasos (*barü*) e potes (*tüü*) de argila	Arte ceramista indígena Ticuna
T12	Compreender de que modo o Programa Etnomatemática, a teoria decolonial e a filosofia da capoeira, colocadas em composição, poderiam apontar caminhos que permitam um Giro Curricular	Grupo de capoeiristas
T13	Entrecruzar o Programa Etnomatemática enquanto Teoria Geral do Conhecimento e os desfiles de Escolas de Samba	Escolas de Samba

Note. * From the Greek gnōmōn, meaning *indicator*, or *one who knows*. It is a small vertical rod that forms the sundial, which casts a shadow as the sun moves across the sky, allowing time to be measured.

Source: Prepared by the authors.

In the first stage of the analysis, we observed that Indigenous culture was the most recurrent among the groups investigated. Research focused on ethnic-racial and decolonial issues also appeared, highlighting capoeira and samba schools. In addition, theoretical works appeared, and only one study on peasant culture. The following categories emerged from this set.

4.1 Traditional epistemological knowledge of Indigenous peoples

Of the theses analyzed, six address knowledge of Indigenous culture: T1, T2, T3, T6, T10, and T11. These studies investigated groups in the North region, especially in Pará, Amazonas, and Tocantins, as well as the Apyãwano people in Mato Grosso and the Ticuna people in Letícia (Colombia) and Tabatinga (Brazil). In each practice analyzed, the interaction of the subjects with their natural, social, and cultural environment is observed, advancing according to needs, whether in obtaining food, in religious rites, or in the production of handicrafts.

T1 addresses knowledge related to spatial location and time counting, highlighting that mathematical representations arise as reflections of each cultural group's mathematical thinking and are passed down from generation to generation. The cyclical movement of flora and fauna, the movement of celestial bodies, and the water cycle are adopted as markers that allow the Indigenous people of Tembé-Tenetehara and fishermen of Vigia to create calendars, allowing them to establish the appropriate period for planting and to locate themselves in the territory, including during fishing (Barros, 2010).

In epistemological terms, the research does not present a specific category that directly discusses the epistemological dimension. However, knowledge is produced through observation, reaching specifications that are distinct from Eurocentric/academic knowledge, such as constellations, which are observed and taken as references to be located during the navigation of riverside dwellers, but are named differently, such as constellations called *barquinho constellation*, *Winaru constellation* (Barros, 2010).

T2 covers an investigation in the Apinayé Indigenous village, in the state of Tocantins. Apinayé Indigenous education is analyzed, revealing the marks of an epistemology developed by Indigenous educators of this ethnicity. The study is ethnographic, and the researcher spent 140 days in Indigenous villages, immersing themselves in local culture. In T2, it is highlighted that an epistemology of Indigenous knowings becomes vivid as knowledge of the past, an eminently practical knowledge, or even a science of the imbroglio among the practical/mythical/magical, which cannot be validated by the Western scientific paradigm (Oliveira, 2013).

The epistemological debates in T2 draw on Morin's (2000) theory of complexity to understand and itemize the epistemology of the Apinayé group of indigenous educators. The theory consists of a paradigm that seeks to understand phenomena in their entirety, amid multiple relationships, uncertainties, and contradictions, and is a way of thinking that holds that social and cognitive systems are dynamic, complex, and interdependent (Oliveira, 2013).

In T3, ethnographic research is presented on the process of generation, systematization, and diffusion of the knowings and doings of the A'uw/Xavante, based on the celebration of one of the main rituals of the people, the Danhono (Silva, 2013). This ritual marks the passage of boys and girls into adulthood and social life and consists of a set of rites, ceremonies, and tests of various types. In these activities that make up the Danhono, the traditional knowings and knowledge of the A'uw/Xavante people are disseminated to the youngest.

In relation to mathematics, T3 points out that in the A'uw/Xavante language there is no specific word for this term. However, these people have their own understanding/conception of what mathematics is, which they consider a mathematical theory (Silva, 2013). They have specific and differentiated procedures/understandings of counting, measuring, ordering, classifying, inferring, quantifying, divi-

ding, and reality itself, i.e., a know-how of their own. These mathematical knowings are present in their traditions and daily practices, distinct from Euro-Western mathematics (Silva, 2013).

Thesis T6 presents the knowings and doings of the Apyãwa people, focusing on Indigenous time markers that express ancestral knowledge of their environment, going beyond the simple counting of days, months, and years (Severino Filho, 2015). These markers span different stages of life (from birth to death) and reflect experiences that mark maturation, learning, and social and family commitments. Each stage is symbolically characterized by specific rituals.

Another relevant time marker for the Apyãwa is that observed in nature itself, both on earth and in the sky of the territory they inhabit. These signals are divided into terrestrial markers, such as butterflies, which indicate the drought period, and fish, whose color change announces the floods (Severino Filho, 2015).

T10 is a study that addresses the Satere Mawe ethnic group in the Andirá-Marau Indigenous land. In epistemological terms, it is based on the ideas of Boaventura de Sousa Santos (2007), discussing the Epistemology of the South and Ecology of Knowings. Thus, the research is also permeated by confrontation with the dominant Eurocentric thinking (Saraiva, 2022).

In the epistemological biases, T10 presents the relationship between man and reality, offering as an epistemological contribution dialectical-historical-social materialism, aiming to explain the contradictions and correlations of forces that permeate society and the integral formation of the subject, reinforcing the ethnic and cultural roots of each ethnicity. This element is based on the precepts of Indigenous school education (Saraiva, 2022).

T11 investigates the mathematical knowledge present in the ceramic art of the Ticuna Indigenous people, produced in the Triple Border of Brazil, Colombia, and Peru. The knowledge reveals a localized epistemology proper to the community, which initially begins with the study of the arts and then extends to mathematics (Cruz, 2022). In the pedagogical context, this approach enables students to learn about the traditional knowledge of their own region, which is often undervalued, deepening the culture of local Indigenous peoples.

Recognizing and understanding cultural transformations over time enables human beings to establish more open, respectful, and prejudice-free social relations, favoring dialogue among different forms of knowledge. In this process, it is essential to cultivate respect and dialogue among different forms of knowledge production arising from cultural diversity.

Bhabha (1998) notes that cultural diversity is an epistemological object, showing that knowings reflect not only social practices but the constitution of its ways of understanding and interpreting the world. This category reveals this plurality precisely: a diversity of doings and knowings rooted in the original peoples, whose epistemology is intrinsically linked to the worldview. It is a system that articulates beliefs, values, symbols, and knowledge, shaping ways of existing, seeing, and feeling the world: an epistemology that is not separated from life but manifests in the cultural experience.

4.2 Mathematical Knowings of the Field: An Epistemological Analysis

In the peasant context, knowings reflect forms of knowledge built from experience and daily practices, such as planting, harvesting, fishing, crafts, and religious rites. These experiences, transmitted between generations, articulate ancestry and customs, configuring their own ways of understanding the world, solving problems, and organizing life. It is an epistemology that integrates cultural, symbolic, and technical dimensions, but that often remains invisible or devalued by mainstream science.

In the research, a thesis dedicated to peasant culture was identified: T7. The study addresses field education, articulating practices related to fishing and defending the use of mathematics at Casa Escola da Pesca (CEPE). This institution seeks to respond to political, social, and educational demands

for the integral education of fishermen, relating school and scientific knowledge to the theoretical and practical elements of local reality. In this context, the unit reduction method (URM) is investigated, a mathematical tool used daily outside school to address issues related to the production and commercialization of fisheries and aquaculture (Assunção, 2016).

The URM is a mathematical strategy for solving proportionality problems, especially those involving the simple or compound rule of three. Its logic is based on reducing a compound quantity to a single unit, allowing us to calculate other values more directly and accessibly. Historically, URM has been used in the daily practices of merchants, artisans, and fishermen, configuring itself as implicit knowing across different contexts. In the case of fisheries and aquaculture, as presented by Assunção (2016), this method is indispensable to solve issues related to production and commercialization.

The research emphasizes that, at CEPE, the URM is used implicitly, without being recognized as a formal mathematical object in the curriculum. In this context, the URM is a social practice that emerges from everyday use as a tool for the realities of fishing and aquaculture. Mathematical knowing, therefore, assumes an essentially practical character, aimed at professional purposes. Thus, the teaching of mathematics in this institution is conceived as a cultural practice, directly linked to the experiences and needs of the community (Assunção, 2016).

Thus, we recognize the existence of an epistemology of mathematical practices, which emerges from what Santos (2007) calls the *ecology of knowings*, manifesting in the mathematical objects mobilized in the context of field education. This epistemology is built on the experience and concrete needs of the community, revealing its own ways of producing and applying knowledge. However, it is observed that, in the analyzed work, ethnomathematics is not treated in a transversal way: the term does not even appear in the final considerations, which causes strangeness, since it constitutes one of the theoretical pillars of the proposed investigation. This absence highlights a gap between the social practice of mathematics, recognized as legitimate knowing, and its academic systematization in mathematics education.

Peasant knowings, from an epistemological perspective on ethnomathematics, express legitimate forms of knowledge built from daily experience, work with the land, and traditions, thereby founding their identity as peasant subjects. Therefore, it reveals a plurality of rationalities present in cultural practices that need to be recognized within school spaces as well.

In dialogue with this perspective, Paulo Freire (2005, p. 33) emphasizes that "it is in culture that we become human", reinforcing the defense of the recognition and appreciation of culture, in this case, the peasant culture, which must be respected. Thus, all knowledge produced in concrete contexts of life must be considered in the search to legitimize and value popular knowings, which is a political-pedagogical act.

Understanding the epistemology of ethnomathematics in peasant spaces means advancing efforts to confront the hegemonic logic that often disqualifies non-academic knowledge. It is about promoting a critical, sensitive, and inclusive approach to teacher education linked to field education, contributing to curriculum construction that recognizes and integrates local knowings. In this sense, legitimizing mathematical practices rooted in peasant culture, in addition to expanding the pedagogical repertoire, also strengthens the resistance against processes of invisibility and cultural marginalization.

4.3 Theoretical Studies: Curriculum and Teacher Practices

The theses that make up this category are T4, T5, T8, and T9, which present a theoretical approach to ethnomathematics. Although not exclusively dedicated to the epistemological dimension, these studies bring reflections that problematize what is meant by mathematical knowledge. The epistemological perspective they present seeks to highlight the plurality of mathematics, revealing different contexts of knowledge production and their implications for the classroom and curriculum. In this

way, they contribute to expanding the understanding of mathematics as a cultural practice, situated and diverse, in dialogue with multiple social and educational realities.

In thesis T4, Souza (2014) surveyed books and articles that discuss ethnomathematics or mathematics as a cultural product. In addition, he interviewed five teachers who use ethnomathematics in their pedagogy to identify the need for reform in mathematics teaching. The study defends the incorporation of ethnomathematics as an axis of pedagogical practice, articulating theory, epistemology, and practice. In this sense, teacher education is approached from the perspective of ethnomathematics in dialogue with complex thinking, highlighting the importance of understanding mathematics as a cultural and plural practice.

Souza (2014) argues that ethnomathematics is an epistemological route aimed at constructing a complex science capable of offering a reading of the world that favors new forms of understanding and fosters the transformation of thought in teacher education. Souza's (2014) results show that, in the practice of the five teachers investigated, they seek to overcome the traditional teaching model. In this movement, the presence of transdisciplinarity stands out as a possibility to break with the fragmentation of knowings, revealing mathematics as a cultural, situated, and plural expression.

In T5, Souza (2015) investigates teachers' continuing education and the potential social, political, and cultural dimensions as a focus of discussion within the Programa Etnomatemática, proposing a rethinking of teacher education that incorporates these factors. For this, observations are made in two subjects offered at the postgraduate level -specialization and master's degree- combined with questionnaires and interviews with students.

Souza (2015) shows that the teacher education process goes beyond the technical and curriculum dimensions, being crossed by historical, social, and cultural conditions that influence the constitution of the teaching professional identity. Regarding epistemological discussions, the data are approached through what the author identified as epistemological factors: in-service or prospective teachers participating in formative courses, in their positions, articulate a new perspective on the production and dissemination of knowledge.

T5 shows that prospective teachers experience a rupture of paradigms, realizing that transdisciplinary education can also help them overcome the limitations of disciplinary education and better respond to the real needs of a citizen's education. The Programa Etnomatemática fostered a dialogue with the reality of the school context, taking into account sociocultural contexts, diversities, and different knowings and doings. In this sense, Souza (2015) indicates the need for an epistemological change in formative courses, from a critical-reflexive perspective, aligned with transdisciplinary and multicultural work.

In T8, a survey is conducted on the high school curriculum in the Federal District, to identify the presence of ethnomathematics and its dimensions, as well as the concepts of mathemacy, *literacy*, and *technocracy* in the *Curriculum Trivium,* proposed by D'Ambrosio (1999). They are found in these basic education documents, which guided pedagogical actions from 2000 to 2008.

Regarding the epistemological dimension, Martins (2019) included an analysis section entitled *Conversations with the Epistemological Dimension*, in which he proposed identifying, in the pedagogical proposals, mathematical knowing and doing that can help students read, interpret, evaluate, and infer (mathematize) the proposed problems and solve them.

In thesis T9, Fonseca (2019) proposed to understand the relationships between the field of curriculum theories and contemporary philosophy. The study argues that the discourses triggered and/or resignified by the researchers, when developing pedagogical practices based on ethnomathematics, as well as the power dynamics that support and circulate them, contribute to the constitution of certain subject positions. These positions are not restricted to teachers and students; they also extend to mem-

bers of the sociocultural groups involved in the educational process, revealing how the curriculum and pedagogical practice become spaces for dispute, negotiation, and the production of identities.

In the epistemological dimension, it is evident that mathematics cannot be understood as unique and universal. The challenge is to recognize how this understanding manifests itself in different sociocultural contexts, thus proposing an epistemology of the diversity of knowledge. This perspective seeks to legitimize diverse practices in both academic research and teachers' classroom experiences, as well as to reflect on current curricula. In this movement, ethnomathematics emerges as a fundamental reference by valuing plural and situated knowings and expanding the understanding of mathematics as a culturally and socially constructed practice.

4.4 Afrocentric Cultures: Decolonial Epistemologies

In this category, two theses were identified: T12 and T13, which develop discussions from an Afrocentric approach. Both are based on the Epistemology of the South, as proposed by Santos (2007), understood as a critical theory opposed to colonialist knowledge impositions. This perspective seeks to value historically marginalized knowings, especially those from colonized countries in the southern hemisphere.

The Epistemology of the South, in denouncing the monoculture of Western scientific knowledge, proposes the construction of a decolonial thought and practice, capable of legitimizing plural epistemologies and promoting the recognition of subalternized cultures (Santos, 2007). In this sense, the analyzed investigations contribute to expanding the debate on ethnomathematics and education by showing that knowledge is not neutral but crossed by power relations and historical disputes of legitimacy.

According to Santos (2007, p. 85), "As an ecology of knowings, post-abyssal thinking is premised on the idea of the inexhaustible epistemological diversity of the world, the recognition of the existence of a plurality of forms of knowledge beyond scientific knowledge". These Epistemologies of the South point to the urgency of breaking with the monoculture of knowledge and scientific rigor characteristic of modern Western thinking, proposing an education that aims to recognize cultural diversity. Thus, it can establish relationships with ethnomathematics, which seeks to recognize internally produced knowings from different cultural groups, valuing and enhancing respect for difference.

In thesis T12, capoeira is considered a central cultural element. Five master's degree holders (one from each region of Brazil) were interviewed, enabling the identification, in the intertwining of the knowings of the philosophy of capoeira, ethnomathematics, decolonial theories, and the Epistemology of the South, of some ways to think about a curriculum organization committed to cultural diversity. This proposal aligns with the legal frameworks of Laws 10.639/2003 and 11.645/2008, which mandate the teaching of Afro-Brazilian and indigenous history and culture in school curricula (Silva, 2023). Thus, Silva's research (2023) shows capoeira not only as a bodily and artistic practice but as a space for the production of knowledge, capable of contributing to a critical, plural, and decolonial education.

It is not the contempt or replacement of the knowledge of the sciences of the North that is defended, but the overcoming of monoculture through an ecology of knowings that goes beyond the walls of the school and reaches society. This perspective invites reflection on the curricula, which often legitimize epistemicide by privileging some knowledge to the detriment of others, reaffirming the curriculum as a space for dispute. Breaking with practices that hierarchize class, race, language, gender, and cultures becomes essential. In this scenario, capoeira emerges as a power of Afro-Brazilian culture, linked to resistance, history and blackness, and, in the circles, materializes the urgency of epistemological and political changes that inspire critical pedagogical actions, opposing structural racism from the perspective of decoloniality, ethnomathematics and Epistemology of the South (Silva, 2023).

In thesis T13 (Fernandes, 2024), the samba school is highlighted as an expression of the Brazilian Black movements, being understood as a space for the production and systematization of knowings and doings that emerge from the socio-racial experience. The author argues that these groups have educational potential for society as a whole, operating in a dialectical tension between attempts at regulation and struggles for emancipation (Fernandes, 2024). The research is grounded in an unsubmissive black decolonial feminist epistemology, presenting the samba school as a cultural and political practice that resists hegemonic impositions and affirms the power of Afro-Brazilian knowledge.

In the chapter titled *Epistemological Key*, the research seeks to understand how knowledge and practices developed in the sheds of samba schools are structured and transformed during the construction of parades, thereby revealing the problem-solving strategies experienced by samba musicians and shack artists (Fernandes, 2023). The parade is conceived as a *tica* of *matema*, in which knowledge is presented as a path between the not knowing and the understanding, configuring different epistemologies. Although samba schools represent Afro-Brazilian culture, the coloniality of knowledge persists, expressed in the hypersexualization of the bodies of Black women and in the media appropriation of white women as school *queens*, occupying prominent positions, as stated by Fernandes (2024). This dynamic shows the permanence of Eurocentrism and structural racism, even in spaces of cultural resistance.

In interviews with carnival directors from different shacks, when asked about the presence of mathematics in their practices, they do not recognize the mathematical knowings involved. "These episodes reveal the widespread perception that the production of knowings and mathematics is confined to specific contexts and completely separated from the life of communities" (Fernandes, 2024, p. 135). This view, which restricts mathematics to formal environments, reflects developments in the coloniality of knowing and echoes the so-called epistemological cages that limit the recognition of cultural practices as legitimate forms of knowledge. In this sense, D'Ambrosio (2005, p. 37) states:

> The criticism I make of epistemology is that it focuses on established knowledge, defined by paradigms accepted over time and in the moment. However, the dynamics of knowledge generation, its intellectual and social organization, its diffusion, and, consequently, the return of this knowledge to those responsible for its production constitute an indissoluble cycle, and attempts to study this cycle by isolating its components are inadequate for non-Western knowledge systems.

In general, epistemology is understood as the set of knowings and knowledge systems elaborated by specific cultural groups, built from their existential needs and their longings for transcendence and continuity. It cannot be linked exclusively to a universalizing perspective, because it hurts the very logic of the constitution of knowledge. The valorization of these cultural expressions linked to racial issues is a form of struggle and resistance against structural racism. It gives visibility and voice to the bodies that resist and build the Brazilian nation.

5. Final considerations

This article aimed to analyze how the epistemological dimension of ethnomathematics has been addressed in research developed within the scope of postgraduate programs from a decolonial perspective, based on a survey in the CAPES Catalog of Theses and Dissertations at BDTD. The bibliographic survey revealed a plurality of understandings and approaches to the epistemological dimension of ethnomathematics in the context of mathematics education. The studies investigated focused on valuing and recognizing the knowings produced in different cultural contexts, reinforcing the prominence of ethnomathematics in confronting hegemonic colonialist cultures.

The survey showed that only a small number of studies explicitly address the epistemological dimension of ethnomathematics and, even among those that do, the discussions tend to be superficial. A production that recognizes the importance of valuing cultural knowings and diversity predominates,

but without deepening its epistemological bases, treating them implicitly. Still, evidence of a counter-hegemonic posture emerges, especially when the authors question the centrality of Eurocentric mathematics and defend the legitimacy of other knowledge systems.

From a decolonial perspective, some theses articulate ethnomathematics with Epistemologies of the South. They raise debates that justify rethinking the structure of knowledge itself that constitutes school curricula, thinking of mathematics as a cultural practice, opposing the *neutrality* of the curriculum, demonstrating that it is a space of power relations that intend the multiplicity of ways of knowing and producing mathematics.

In addition, the survey highlights the search for intercultural dialogue and the appreciation of cultural practices, revealing a movement that recognizes the academic dimension and goes beyond the boundaries of formal, Eurocentric mathematics. This process helps integrate historically invisible subjects and contexts, often relegated to the margins of formal knowledge production.

Regarding the limits of this study, it is important to highlight that the analysis carried out is restricted to a specific excerpt of academic productions, limited to the theses available in the CAPES Catalog and in the BDTD, which may not include all the research developed in the field of ethnomathematics, especially those disclosed in other spaces. Thus, we emphasize the importance of proposing new research published in other spaces, such as journals, books, or other channels of scientific dissemination.

Finally, this bibliographic survey points to the need to deepen epistemological discussions in ethnomathematics, inviting new research that expands the dialogue among universities, communities, and schools, with respect for differences. It is not about opposing formal and informal knowledge, nor denying scientific knowledge, but about critically recognizing the diversity of knowings and questioning monoculture. These paths strengthen mathematics education and the struggle for a fairer, plural, and decolonial education.

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