



THE ROLE OF ETHNOMATHEMATICS IN MATHEMATICS EDUCATION: A SYSTEMATIC LITERATURE REVIEW

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Abstract :

This study examines the role of ethnomathematics in mathematics education through a systematic literature review. The scope of the study includes an analysis of various research findings related to the integration of cultural elements in mathematics learning. The objective of this study is to identify the contributions of ethnomathematics to students' conceptual understanding, numeracy literacy, problem-solving skills, as well as their affective and cultural development. The method employed is a literature-based study involving the review of relevant scholarly articles. The findings indicate that ethnomathematics is effective in enhancing conceptual understanding by connecting abstract mathematical ideas to cultural contexts that are familiar to students. In addition, this approach supports the development of numeracy literacy and problem-solving abilities, while also increasing students' motivation and engagement in learning. Ethnomathematics further contributes to fostering cultural awareness and strengthening students' cultural identity. However, its implementation still faces challenges, particularly in terms of teacher readiness and the limited availability of culturally integrated learning materials. In conclusion, ethnomathematics is a comprehensive instructional approach with strong potential to improve mathematics learning outcomes across cognitive, affective, and social domains.

Keywords : Ethnomathematics, Mathematics Learning, Systematic Review, Literature Review

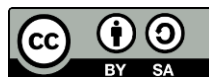
Abstrak :

Penelitian ini mengkaji peran etnomatematika dalam pembelajaran matematika melalui tinjauan literatur sistematis. Ruang lingkup kajian mencakup analisis berbagai penelitian terkait integrasi budaya dalam pembelajaran matematika. Tujuan penelitian ini adalah untuk mengidentifikasi kontribusi etnomatematika terhadap pemahaman konsep, kemampuan literasi numerasi, pemecahan masalah, serta aspek afektif dan budaya siswa. Metode yang digunakan adalah studi kepustakaan dengan menganalisis artikel ilmiah yang relevan. Hasil kajian menunjukkan bahwa etnomatematika efektif dalam meningkatkan pemahaman konsep dengan mengaitkan materi abstrak ke dalam konteks budaya yang dekat dengan kehidupan siswa. Selain itu, pendekatan ini mampu mengembangkan kemampuan literasi numerasi dan pemecahan masalah, serta meningkatkan motivasi dan keterlibatan belajar. Etnomatematika juga berkontribusi dalam menumbuhkan kesadaran dan identitas budaya siswa. Namun, implementasinya masih menghadapi tantangan, terutama terkait kesiapan guru dan keterbatasan bahan ajar berbasis budaya. Kesimpulannya, etnomatematika merupakan pendekatan pembelajaran yang komprehensif dan berpotensi meningkatkan kualitas pembelajaran matematika secara kognitif, afektif, dan social.

Kata Kunci: Etnomatematika, Pembelajaran Matematika, Tinjauan Sistematis, Kajian Literatur, Pendidikan Matematika

INTRODUCTION

Mathematics education plays a crucial role in fostering students' logical,



critical, and systematic thinking skills (Tralisno & Alfi, 2025). However, findings from various international assessments indicate that Indonesian students' performance in mathematics remains relatively low, particularly in terms of numeracy literacy (Tralisno & Alfi, 2025) (Alfi & Tralisno, 2026). These assessments reveal that many students struggle when faced with mathematical problems that require a deep understanding of concepts and their application in real-life contexts (OECD, 2022). This suggests that current mathematics instruction has not fully equipped students with the higher-order thinking skills necessary for everyday problem-solving (Novita, Tralisno, & Alfi, 2025) (Alfi & Tralisno, 2025).

One factor that may contribute to this issue is the prevailing instructional approach, which tends to emphasize procedural skills and formal symbols (Tralisno & Alfi, 2023) (Tralisno & Alfi, 2024). Mathematics is often presented as a set of formulas to be memorized rather than concepts to be understood, leading students to rely on rote learning. In fact, mathematics is closely related to sociocultural activities and should be connected to students' real-life experiences (Tralisno & Alfi, 2025). As an alternative, ethnomathematics offers a contextual approach by linking mathematical ideas to cultural practices, making learning more relevant to students' daily lives (Putra & Prasetyo, 2022). Through this approach, students can grasp mathematical concepts using familiar contexts, such as patterns in traditional crafts, structures in indigenous architecture, or local economic activities (Fadhly & Muhammad, 2025). This connection enables students to develop deeper and more meaningful understanding, as the material is directly related to their lived experiences (Abi, 2016) (Fadhly & Muhammad, 2025). Furthermore, ethnomathematics serves as a bridge between culture and education by integrating cultural values into mathematics learning, helping students understand mathematical concepts while simultaneously fostering cultural awareness from an early age (Lubis, Rizqi, & Maharani, 2023) (Aini, Hastuti, & Mariyati, 2023).

In addition, culturally contextualized learning has the potential to enhance students' motivation and engagement. When the content is closely related to their everyday experiences, students are more likely to show interest and participate actively in the learning process (Astutiningtyas, Wulandari, & Farahsanti, 2017). This approach also supports the development of numeracy literacy, defined as the ability to apply mathematical knowledge flexibly across a range of real-life situations (Fajriyah, 2018). However, the implementation of ethnomathematics in mathematics education has not yet been fully optimized. Several challenges remain, including limited availability of culturally based learning resources, insufficient teacher understanding, and the lack of comprehensive studies that systematically synthesize existing research findings (Setiani, Rahmawati, Lya, & Pramesti, 2023). Therefore, a thorough and integrative review is needed to examine the role of ethnomathematics in mathematics learning.

Based on these considerations, this study aims to conduct a systematic review of research related to ethnomathematics in mathematics education. The findings are expected to provide a comprehensive overview and serve as a

foundation for developing mathematics instruction that is more contextual, innovative, and aligned with students' needs.

RESEARCH METHOD

This study employs a Systematic Literature Review (SLR) approach, a research method designed to systematically identify, evaluate, and synthesize relevant studies in a structured manner. This approach was chosen to obtain a comprehensive understanding of the role and implementation of ethnomathematics in mathematics education based on previously published research. The review process was conducted by adapting the stages of a systematic review, which include:

- a. **Problem Identification and Research Objectives** At this stage, the focus of the study was defined, namely analyzing the role of ethnomathematics and its forms of implementation in mathematics learning.
- b. **Literature Search** Relevant articles were collected from various academic databases, such as Google Scholar and nationally indexed journals (SINTA).
- c. **Data Analysis Technique** The collected data were analyzed using thematic analysis by identifying patterns, similarities, and differences across the selected studies. The findings were then synthesized to produce comprehensive conclusions regarding the research topic.
- d. **Data Validity** To ensure the credibility of the data, source triangulation was applied by comparing findings from multiple studies across different sources.

FINDINGS AND DISCUSSION

The Role of Ethnomathematics Based on Research Findings.

Various studies conducted in Indonesia have demonstrated the implementation of ethnomathematics in mathematics education, for example through the use of batik patterns to introduce geometric concepts and traditional musical instruments to explain frequency and amplitude (Khaerani, Arismunandar, & Tolla, 2024). The analysis of the literature reveals several key findings regarding the role of ethnomathematics in enhancing the quality of mathematics learning. These findings can be grouped into several main aspects, including the benefits of ethnomathematics, its impact on students' motivation, and the challenges encountered in its implementation across different educational contexts. Overall, the literature indicates that ethnomathematics plays a significant role in supporting effective mathematics learning.

a. **Improvement of Conceptual Understanding**

Findings from various studies indicate that one of the primary strengths of the ethnomathematics approach lies in its ability to enhance students' understanding of mathematical concepts. By connecting abstract ideas to local cultural contexts, students are better able to grasp meaning and recognize the application of mathematics in everyday life (Khaerani et al., 2024) (Ismiasih & Hermanto, 2021) (Yudhi & Septiani, 2024). These results are consistent with the

findings of Sarwoedi et al. (2018), Based on research findings and indicators of understanding, ethnomathematics has a positive impact on students' mathematical abilities, as reflected in improved conceptual understanding, better interpretation of symbols, the application of mathematical ideas, and higher learning outcomes. (Sarwoedi et al., 2018). Other studies also indicate that ethnomathematics-based instruction enhances students' conceptual understanding, as the learning materials are presented in a more concrete and accessible manner (Dari & Jatmiko, 2024).

b. Enhancing Learning Motivation and Engagement

The ethnomathematics approach also contributes to improving students' motivation to learn. Learning materials connected to local culture tend to be more engaging because they are closely related to students' everyday experiences. As a result, students show greater enthusiasm when the content reflects their cultural background (Sanabila, 2026). Furthermore, contextual learning encourages active participation, where students are not merely passive recipients of information but are involved in exploration and discussion (Febriana, Hasvira, & Aulia, 2026). This aligns with the principles of active learning, which emphasize students' involvement in constructing knowledge (Mailani, Rarastika, Adventy, Juwita, & Butar, 2024). Other studies further confirm that ethnomathematics significantly enhances students' interest and motivation in learning mathematics. When instruction is culturally relevant, students become more engaged, leading to richer learning experiences and improved academic outcomes (Rizky & Nasution, 2024). Furthermore, the increase in students' motivation and interest indicates that ethnomathematics influences not only cognitive aspects but also the affective domain. Learning that is closely connected to students' real-life experiences fosters a sense of ownership toward the material, making them more enthusiastic and actively engaged in the learning process (Prasetya, Anwar, Wardani, & Satrio, 2025) (Fajriyah, 2018).

c. Developing Numeracy Literacy Skills

Strengthening mathematical literacy can be achieved through innovative instructional strategies, one of which is the integration of ethnomathematics. This culturally grounded approach makes mathematics more relevant to students' lives by connecting it to their cultural contexts. In addition, it creates a more engaging, innovative, and meaningful learning environment that supports the development of literacy skills (Fajriyah, 2018). The OECD (2019) emphasizes that numeracy literacy involves not only computational ability but also the capacity to understand and apply mathematics to solve real-world problems. Research findings indicate that integrating ethnomathematics enhances both conceptual understanding and students' numeracy skills. Students tend to grasp mathematical concepts more easily when they are linked to familiar cultural contexts, such as traditional weaving patterns or local mathematical games (Endu, Menge, Range, & Wewe, 2024) (Calista, Susanto, Hartati, & Setiawan, 2022) (Dari & Jatmiko, 2024). Moreover, ethnomathematics contributes significantly to the development of higher-order thinking skills, as

students are encouraged to interpret contextual problems, analyze situations, and apply mathematical concepts in everyday life (Kencanawaty, Febriyanti, & Irawan, 2020).

This is particularly important in meeting the demands of 21st-century education, which emphasize critical thinking and problem-solving skills. However, the implementation of ethnomathematics still faces several challenges. Teacher readiness remains a key factor in the successful application of this approach (Putri, Alpusari, Fendrik, Fkip, & Riau, 2024). Therefore, professional training and continuous development are essential to enable teachers to design culturally integrated learning effectively. In addition, the development of ethnomathematics-based instructional materials needs to be enhanced to better support the learning process (Fitri, Mujahidawati, & Falani, 2025).

d. Fostering Cultural Awareness and Identity

Ethnomathematics influences not only the cognitive domain but also plays a crucial role in fostering students' cultural awareness and identity. Integrating cultural elements into mathematics instruction helps students recognize that mathematical concepts are closely connected to everyday activities within their communities (Abi, 2016) (Fajriyah, 2018) (Abi, 2016). This makes the learning process more meaningful while strengthening the connection between academic knowledge and local culture. Recent studies also indicate that ethnomathematics is an effective approach for developing cultural identity through contextualized learning. Ma'sumah et al., (2025), This approach bridges formal mathematical concepts with students' cultural experiences, thereby enhancing both their understanding and their awareness of cultural contexts. This result is supported by Febriana (2026), who notes that culture-based instruction can increase students' appreciation of cultural heritage and reinforce their identity as members of their cultural community.

Furthermore, the application of ethnomathematics can foster a sense of pride in local culture. When mathematical concepts are presented through contexts such as batik patterns, traditional weaving, or indigenous games, students not only understand the content but also recognize the cultural values embedded within it. This, in turn, strengthens their cultural identity and encourages the preservation of cultural heritage among younger generations (Fajriyah, 2018) (Wardani, Suarni, Margunayasa, & Hamzanwadi, 2023) (Jainuri & Haryadi, 2025). Furthermore, the integration of ethnomathematics also contributes to enhancing students' multicultural awareness. Through this approach, students not only gain a deeper understanding of their own culture but also learn to appreciate the diversity of others. This is essential for fostering tolerance and respect for differences within a pluralistic society (Famella, Panggabean, & Harahap, 2025) (Asmaarobiyah, Riska, Rosmilawati, Sultan, & Tirtayasa, 2025) (Nursanti et al., 2024).

Overall, ethnomathematics can be regarded as a comprehensive instructional approach, as it not only focuses on improving academic achievement but also on shaping students' character and cultural identity.

Culturally based mathematics learning offers more contextual and meaningful experiences, contributing to the development of cultural awareness and strengthening students' sense of identity in the face of globalization. Therefore, ethnomathematics supports not only cognitive development but also students' affective and social growth. Through culture-based learning, students are expected to develop a strong cultural identity and an awareness of the importance of preserving cultural heritage in modern life.

CONCLUSION

Based on the findings of the literature review, it can be concluded that ethnomathematics plays a significant role in improving the quality of mathematics education. This approach has been shown to enhance students' conceptual understanding by linking abstract mathematical ideas to cultural contexts that are more concrete and closely related to their daily lives. In addition, ethnomathematics contributes to increasing students' motivation and engagement, as learning becomes more meaningful, relevant, and interesting.

From the perspective of numeracy literacy, the integration of ethnomathematics supports the development of critical thinking, problem-solving skills, and the application of mathematical concepts in real-life situations. This aligns with the demands of 21st-century education, which emphasize the importance of mathematical literacy. Beyond cognitive development, ethnomathematics also fosters students' cultural awareness and identity. Through culturally based learning, students are encouraged to appreciate local heritage, develop a sense of pride, and build tolerance toward cultural diversity.

However, its implementation still faces several challenges, particularly related to teacher readiness and the availability of culturally integrated learning materials. Therefore, efforts to enhance teachers' professional competence and to develop relevant instructional resources are essential. Overall, ethnomathematics can be regarded as a comprehensive approach, as it not only improves academic achievement but also supports students' affective, social, and cultural development, making it highly valuable for future mathematics education practices.

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