

Ethnomathematics in Mathematics Learning: Trends, Impacts, and Best Practices

Deya Reta Renggayoni ¹, Irma Aryani ², Elizar Elizar³

Mathematics Education Dapartement, Teacher Traning and Education Faculty, Abulyatama University, Aceh, Indonesia ^{1,2}

Mathematics Education Dapartement, Teacher Traning and Education Faculty, Syiah Kuala University, Aceh, Indonesia³

Email Korespondensi: irmaaryani_pmtk@abulyatama.ac.id²

Abstract: Mathematics learning often faces challenges such as poor understanding of abstract concepts and lack of student motivation. The ethnomathematics approach offers an innovative solution by integrating mathematical concepts into the local cultural context, which is expected to increase the relevance and meaningfulness of learning. This study aims to identify and analyze publication trends related to ethnomathematics in mathematics learning, as well as examine its impact on various aspects of mathematics education, including the research methods used, key results, and mathematical concepts often associated with local culture. The method used is a Systematic Literature Review (SLR), which is expected to be a valuable reference for educators, researchers, and curriculum developers. The results of the study show the positive impact of ethnomathematics on mathematics learning, so that it can be used by teachers to create effective and enjoyable learning, as well as improve students' mathematical abilities and love for their own culture.

Keywords: Ethnomathematics, Mathematics Learning

1. Introduction

Mathematics is often considered an abstract, difficult to understand, and irrelevant subject to everyday life by most students. This results in low interest, motivation, and learning outcomes for students at various levels of education [1]. One of the main causes is the lack of connection between mathematical material and the cultural context and students' social environment [2]. Learning that is too oriented towards theory and formal formulas makes it difficult for students to understand mathematical concepts comprehensively and meaningfully [3].

To address these challenges, the ethnomathematics approach has become an innovation in mathematics education that offers contextual, meaningful, and life-affirming learning for students. The term ethnomathematics was first introduced by Ubiratan D'Ambrosio in 1985, referring to the way certain communities understand, organize, and explain their experiences through mathematical symbols and concepts associated with their culture [4]. This approach encourages the involvement of local culture in the learning process as a means of bridging formal mathematical understanding with students' real-life experiences. The ethnomathematics approach combines local cultural elements with mathematical concepts to bring learning materials closer to students' real lives [5].

Recent studies have shown that an ethnomathematics approach can improve students' motivation and understanding in mathematics learning. For example, learning based on local culture, such as traditional architecture [6], regional dances [7], or batik motifs [8], has proven effective in enriching students' learning experiences. Furthermore, this approach supports cultural preservation and builds student identity through the integration of local values into formal education [9]. In the context of Acehnese culture, exploration of Rumoh Aceh also shows

great potential in teaching the concepts of geometry, number, and transformation through architectural and philosophical elements rich in cultural values [5][10][11].

In addition to the practical side, research trends on ethnomathematics also show significant growth. Through a bibliometric study, noted that publications on ethnomathematics are increasing, especially in 2022, which was the year with the highest number of publications [12]. This shows that this approach is not only developing in learning implementation, but also in the field of research and development.

Hence, it is important to further examine the trends, impacts, and best practices of implementing ethnomathematics in mathematics learning. The purpose of this research is to analyze various studies conducted on ethnomathematics and to develop recommendations for contextual, effective, and culturally-rooted learning practices.

In this regard, understanding the development of ethnomathematics research is essential for identifying gaps, mapping potential applications, and formulating strategies for effective integration into mathematics education. A comprehensive analysis of existing literature will not only provide insights into how ethnomathematics has been applied across different cultural settings but also highlight the challenges, limitations, and opportunities for future innovation. Such an analysis is particularly relevant in ensuring that mathematics learning remains both academically rigorous and culturally resonant, ultimately fostering a deeper connection between students, their culture, and the mathematical knowledge they acquire.

2. Literature Review

2.1 The Concept of Ethnomathematics

The term ethnomathematics was first introduced by Ubiratan D'Ambrosio in 1985. He defined ethnomathematics as the way certain societies understand, organize, and explain their world through culturally integrated mathematical practices [5]. In the educational context, ethnomathematics is an approach that links formal mathematical concepts with local cultural practices, so that students can understand mathematics in their real-life contexts [2].

2.2 Ethnomathematics in Mathematics Learning

Many studies have shown that ethnomathematics can be an effective alternative in improving the quality of mathematics learning. This approach makes learning more concrete, contextual, and meaningful, and encourages active and participatory learning. A previous study implemented local culture-based mathematics learning and found significant improvements in student learning outcomes and engagement [13]. This is in line with social constructivism theory, which states that learning is more effective when linked to the socio-cultural context of students.

2.3 Trends in Ethnomathematics Research

The trend of ethnomathematics research shows a significant increase, especially in the last five years. A bibliometric study analyzed publications on ethnomathematics from 1995–2023 and found that the peak of publications occurred in 2022 [12]. Indonesia is one of the countries with the most contributions to this topic. The most discussed themes include cultural geometry, contextual learning, traditional education, and student identity. This includes aspects of exploring local culture such as Rumoh Aceh as a contextual medium for mathematics learning. Recent research examined how the structure, pattern, and philosophical values in Rumoh Aceh

architecture can be linked to mathematical concepts such as geometry, symmetry, numbers, and transformations [10][5][11]. The focus of the research is not only on the visual aspects of the building, but also on the traditional and social values contained within it. Although the scope of space is still limited to architecture, this trend opens up great opportunities for the development of ethnomathematics studies based on other Acehnese cultures, such as traditional dances, woven motifs, folk games, and daily activities of Acehnese people that are rich in mathematical values. This shows that Acehnese culture has strong potential to be developed as a contextual learning resource that supports the meaning of learning and cultural preservation through mathematics education.

2.4 Impact of Ethnomathematics Implementation

Research shows that the ethnomathematics approach has a positive impact in several aspects: (1) Academic: Improving problem-solving skills, mathematical literacy, and learning outcomes [14][15]. In the Acehnese cultural context, several studies have also linked numeracy literacy to local cultural elements. For example, Acehnese number names such as satee (one), dua (two), tulo (three), and so on, are used to introduce basic number concepts and sequencing contextually to elementary school students [5]. In addition, the daily activities of the Acehnese people, such as measuring wood in the construction of Rumoh Aceh, calculating the number of odd steps, and the proportional system of dividing space in the house, reflect mathematical principles such as comparison, units of length, patterns, and symmetry. This shows that local culture can not only be used as a teaching tool, but also as a means of improving culturally based numeracy literacy, so that students can understand mathematical concepts in a more contextual and meaningful way.; (2) Affective: Increase student learning motivation and engagement [16][9].; (3) Socio-cultural: Strengthening students' understanding of local culture and the preservation of cultural values [6][8].

2.5 Best Practices for Implementing Ethnomathematics

Various forms of ethnomathematics applications have been developed, ranging from the use of traditional houses, batik, traditional toys, to regional dances as teaching media. Developed an ethnomathematics module, while [18] developed a culture-based student worksheet [17]. Even developed a learning video which was stated to be very effective in improving conceptual understanding [19].

Furthermore, this approach aligns with the principles of the Independent Curriculum, which emphasizes differentiated and real-life-based learning. Consequently, ethnomathematics is not only an innovative approach but also a contextual, relevant, and strategic choice for advancing mathematics education in Indonesia.

3. Method

This research employed a systematic literature review (SLR) to examine and analyze various scientific publications discussing the implementation, trends, and impact of the ethnomathematics approach in mathematics learning in Indonesia.

3.1 Data Source

The data sources used were articles from accredited national journals published between 2020 and 2024. A total of 19 journals were analyzed, consisting of field research results, library studies, systematic literature reviews (SLRs), and bibliometric analysis.

3.2 Data collection technique

Data was collected by: (1) Systematically review the contents of the article, including: title, author's name, year, objectives, methods, research results, strengths and weaknesses of the research; (2) Identifying relevant articles with the keywords: ethnomathematics, mathematics learning, local culture, and culture-based learning media. The search was conducted on Google Scholar and Indonesian university journal portals for articles from 2020–2024.

3.3 Data Analysis Techniques

Data was analyzed using content analysis techniques. The steps involved include: (1) Identification: Identifying articles that fit the theme; (2) Categorization: Grouping articles based on key themes, such as trends, impacts, and best practices of ethnomathematics (3) Synthesis: Compiling the analysis results to draw general conclusions about the effectiveness and implementation of ethnomathematics in mathematics learning.

3.4 Article Selection Criteria

The inclusion criteria for articles in this review were as follows: (1) the article must be published in an accredited journal; (2) it must address the topic of ethnomathematics within the context of mathematics education; and (3) it must present data related to learning outcomes, student motivation, or the instructional model employed.

4. Finding and Discussion

This study aims to examine trends, impacts, and best practices for implementing ethnomathematics in mathematics learning based on an analysis of 19 articles from accredited national journals. The articles included are presented in table 1.

Table 1. the articles included the study

No	Author	Title	Journal Name	Accreditation
1.	Zulkirah Harisah, Irma Aryani, Rahmi Rahmi, Riki Musriandi, Hasanah Hasanah	Analisis Kemampuan Literasi Numerasi Siswa SMA Pada Pembelajaran Matematika	Journal Dedikasi Pendidikan	Sinta 4
2.	Aji Permana Putra,Dias Prasetyo	Peran Etnomatematika Dalam Konsep Dasar Pembelajaran Matematika	Intersections: Journal Pendidikan Matematika dan Matematika	Sinta 5
3.	Anzora Anzora, Irvandi irvandi, Riki Musriandi, Irma Aryani, Rahmi Rahmi, Rini Susiani	Analisis Tingkat Kemampuan Dan Komunikasi Matematis Siswa	Juornal Dedikasi Pendidikan	Sinta 4
4.	Ubiratan D'Ambrosio	Ethnomathematics and its Place in the History and Pedagogy of Mathematics	Journal For the Learning of Mathematics	Scopus Quartile 3 (Q3)

5.	Eri Yudanti, Yulia Endra Jati Retno Satiti, Margaretha Ivana Angeline.	Eksplorasi Etnomatematika Terkait Aktivitas Fundamental pada Rumoh Aceh	Journal PRISMA, Prosiding Seminar Nasional Matematika	Sinta 4
6.	Eri Saputra, Rinaldi Mirsa, Puji Dama Yanti, Wulandari Wulandari, Asmaul Husna,	Eksplorasi Etnomatematika Pada Arsitektur Rumoh Aceh	Aksioma: Journal Program Studi Pendidikan Matematika	Sinta 2
7.	Siti Fatimah, Rania Zulfi Fajriyah, Frika Fatimah Zahra, Sigit Prasetyo Prasetyo	Integrasi Etnomatematika dalam Pembelajaran Matematika di Sekolah Dasar Berbasis Kesenian Tari Budaya Lampung	Al-madrasah: journal ilmiah Pendidikan Madrasah Ibtidaiyah	Sinta 4
8.	Muhamad Syahdan Sa'id Syahdan	Etnomatematika Pada Budaya Lokal Batik Kawung	Journal Inovasi Pendidikan Matematika	Sinta 5
9.	Santi Arum Puspita Lestari, Dwi Sulistya Kusumaningrum, Fitria Nurapriani	Integrasi Etnomatematika dalam Pembelajaran Bangun Datar Segi Empat Berbasis Kearifan Lokal untuk Meningkatkan Pemahaman Matematika	Journal Inovasi Penelitian dan Pengabdian Masyarakat	Sinta 4
10.	Nur Azmi, Siti Nurhaliza, Darajatul Ula, Dwi Syifa, Suhaimi, Rossa Aprillia	Eksplorasi Etnomatematika Dan Geometri Pada "Rumoh Aceh"	Ar-riyadhiyyat: Journal Pendidikan Matematika	Sinta 5
11.	Shalsabilla Octania Liesandra	A Cultural Semiotics Study: ethnomathematical Exploration In Geometry Materials Through Cultural Site In Aceh	Journal cakrawala pendas	Sinta 3
12.	Ilham Muhammad	Penelitian Etnomatematika Dalam Pembelajaran Matematika (1995- 2023)	Edukasia: journal Pendidikan dan pembelajaran	Sinta 2
13.	Ajmain, Herna, Sitti Inaya Masrura	Implementasi Pendekatan Etnomatematika Dalam Pembelajaran Matematika	SIGMA: Journal Pendidikan	Sinta 4

14.	Cut Eva Nasryah, Arief Aulia Rahman	Pengaruh pendekatan etno matematika terhadap kemampuan pemecahan masalah matematis dan motivasi siswa SD di Aceh Barat	MAJU: Journal Ilmiah Pendidikan Matematika	Sinta 5
15.	Yuli Bangun Nursanti, Bagus Aqil Saputra, Gibran Khalil Gibran	Systematic Literature Review: Efektivitas Penerapan Pendekatan Etnomatematika Dalam Pembelajaran Matematika	Journal education and development	Sinta 4
16.	Gita Kencanawaty, Chatarina Febriyanti, Ari Irawan	Kontribusi Etnomatematika dalam Pembelajaran Matematika Tingkat Sekolah Dasar	Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang	Sinta 3
17.	Finariyati Finariyati, Arief Aulia Rahman, Yuli Amalia	Pengembangan Modul Matematika Berbasis Etnomatematika untuk Meningkatkan Kemampuan Pemecahan Masalah Siswa	MAJU: Journal Ilmiah Pendidikan Matematika	Sinta 5
18.	Hannia Luthfi, Fibri Rakhmawati	Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Etnomatematika pada Materi Bangun Ruang Sisi Lengkung Kelas IX	Journal Cendekia: Jurnal Pendidikan Matematika	Sinta 4
19.	Fara Febria, Rismawati	Pengembangan Video Pembelajaran Matematika SMA/MA Berbasis Etnomatematika	Journal Math Edu	Sinta 5

The findings indicate that the ethnomathematics approach has experienced increasing attention in both learning practices and scientific publications in recent years. A bibliometric study noted a surge in publications in 2022, with a primary focus on the integration of local culture in mathematics learning, indigenous education, and geometry and cultural identity [12]. This fact reflects a growing awareness of the importance of contextual and locally-based learning.

From the implementation side, the ethnomathematics approach has been proven to have a positive impact on mathematics learning. Showed that the integration of local culture in mathematics learning can significantly improve student learning outcomes, from 70.58% to 82.35% after implementing the approach [13]. Similar findings were also obtained through a quantitative approach, which proved that the ethnomathematics approach improves students' problem-solving abilities and motivation compared to conventional methods, with contributions of 17.7% and 47.4% respectively [14].

Furthermore, this approach not only impacts academic outcomes, but also increases student motivation and engagement in the learning process. Research shows that student engagement increases significantly when they learn mathematics through cultural contexts such as traditional houses or community social activities [16][9]. Students become more active and feel that mathematics lessons have a real connection to their lives.

In addition, the ethnomathematics approach also strengthens the understanding of mathematical concepts. By linking materials such as plane figures, symmetry, and geometry with local culture such as Kawung Batik [7] or Acehese Rumoh architecture [5] students more easily understand and apply mathematical concepts in everyday life. This supports the view that culture can be a bridge between mathematical abstractions and students' concrete realities.

Best practices in implementing ethnomathematics include the development of various culture-based learning media, such as modules [16], student worksheets [17], and learning videos [18]. These media have proven to be feasible and practical, and have received positive responses from both students and teachers. This kind of innovation not only increases the effectiveness of learning but also opens up opportunities for preserving local culture through education.

In the context of Acehese culture, research results by [4][9] show that elements in Rumoh Aceh can be used as effective contextual media to teach mathematical concepts such as spatial figures, geometry, symmetry, reflection, and transformation. For example, the odd number of steps in Rumoh Aceh can be used to introduce the concept of odd-even numbers, while the division of space in the house illustrates the concept of proportion and relations that can be linked to social mathematics material. [10] also emphasizes that the shape of the roof, the structure of the stilt house, and the orientation of the building have semiotic values that are closely related to the principles of geometry.

In addition to aspects of form and architecture, Acehese culture is also rich in numerical elements that can be used to develop culturally based numeracy literacy. One example is the use of number names in the Acehese language such as satee (1), dua (2), tulo (3), and so on, which can be used in basic mathematics learning in elementary schools. This is supported by [4], who found that introducing numbers through local languages helps students more quickly understand the sequence and pattern of numbers because it is related to their daily lives. Traditional measurements in carpentry activities, the division of inherited land, and agricultural activities of the Acehese people also reflect informal mathematical practices that can be incorporated into formal learning in the classroom.

From a psychological and socio-cultural perspective, an Acehese-based ethnomathematics approach has been shown to increase student motivation and engagement. [6] demonstrated that mathematics learning based on regional cultures such as dance and art can build students' emotional connections to the material, making them more active and enthusiastic in participating in learning. This also applies in the Acehese context, where students feel proud when their local culture is used as a learning resource.

However, the analysis also points to several challenges. Most studies were conducted within a limited (local) scope and used a qualitative approach without further statistical analysis. Several studies, such as [6], also highlight limited resources, minimal teacher training, and a lack of curriculum support as obstacles to the widespread implementation of ethnomathematics. Rumoh Aceh and its regional language are particularly potential sources for developing

ethnomathematics. This approach not only helps students understand mathematical concepts contextually, but also fosters a love of their own culture and preserves local wisdom through formal education.

5. Conclusion and Recommendation

Ethnomathematics is a valuable approach for teaching mathematics because it makes learning contextual, meaningful, and culturally relevant. By connecting mathematical concepts to students' daily lives and cultural backgrounds, this approach not only improves their learning outcomes and problem-solving skills but also increases their motivation and engagement.

Despite its benefits, implementing ethnomathematics faces challenges. While research in Indonesia is growing, it's often limited in scope. To fully integrate this approach into the curriculum, we need broader research, better teacher training, and stronger support from education policy. By addressing these challenges, we can ensure the sustainable use of ethnomathematics in classrooms.

Reference

- [1] Harisa Z, Aryani I, Rahmi R, Musriadi R, Hasanah H. Analisis Kemampuan Literasi Numeresi Pada Siswa SMA Pada Pembelajaran Matematika. *Jurnal Dedikasi Pendidikan*. 2025;9(2):1059-1068. Available from: <http://jurnal.abulyatama.ac.id/index.php/dedikasi/article/view/6860>
- [2] Putra, A. P., & Prasetyo, D. (2020). Peran etnomatematika dalam konsep dasar pembelajaran matematika. *Intersections: Jurnal Pendidikan matematika dan matematika*. 2022;7(2): 2685-7952. Available from: <https://jurnal.ucy.ac.id/index.php/intersections/article/view/1312>
- [3] Anzora A, Irvandi I, Musriadi R, Aryani I, Rahmi R, Susiani R. Analisis Tingkat Kemampuan Komunikasi Matematis Siswa. *Jurnal Dedikasi Pendidikan*. 2023;7(2):727-732. <http://jurnal.abulyatama.ac.id/index.php/dedikasi/article/view/4043>
- [4] D'Ambrosio, U. Ethnomathematics and its Place in the History and Pedagogy of Mathematics. *For the Learning of Mathematics*, 1985; 5(1), 44-48. <https://www.jstor.org/stable/40247876>
- [5] Yudanti E, Satiti YEJ, Angeline MI. Eksplorasi Etnomatematika Terkait Aktivitas Fundamental pada Rumoh Aceh. *PRISMA, Prosiding Seminar Nasional Matematika*. 2022;5:234-243. Available from: <https://journal.unnes.ac.id/sju/prisma/article/view/54162>
- [6] Saputra E, Mirsa R, Yanti PD, Wulandari, Husna A. Eksplorasi etnomatematika pada arsitektur Rumoh Aceh. *Aksioma: Jurnal Program Studi Pendidikan Matematika*. 2022;11(1):703-717. <https://doi.org/10.24127/ajpm.v11i1.4751>
- [7] Fatimah S, Fajriyah RZ, Zahra FF, Prasetyo S. Integrasi etnomatematika dalam pembelajaran matematika di sekolah dasar berbasis kesenian tari budaya Lampung. *Al-Madrasah: Jurnal Ilmiah Pendidikan Madrasah Ibtidaiyah*. 2024;8(4):1631-1640. <https://doi.org/10.35931/am.v8i4.3721>
- [8] Syahdan MS, Arfinanti N, Azka R. Etnomatematika pada budaya lokal Batik Kawung. *Jurnal Inovasi Pendidikan Matematika*. 2021;3(2):83-91. <https://doi.org/10.37729/jipm.v3i2.1580>
- [9] Lestari SAP, Kusumaningrum DS, Nurapriani F. Integrasi etnomatematika dalam pembelajaran bangun datar segi empat berbasis kearifan lokal untuk meningkatkan pemahaman matematika.

Jurnal Inovasi Penelitian dan Pengabdian Masyarakat. 2024;4(2):161–171.
<https://doi.org/10.53621/jippmas.v4i2.369>

[10] Azmi N, Nurhaliza S, Ula D, Syifa D, Suhaimi, Aprillia R. EKSPLORASI ETNOMATEMATIKA DAN GEOMETRI PADA “RUMOH ACEH”. Ar-Riyadhiyyat: Jurnal Pendidikan Matematika. 2021;2(1):38–47. <https://journal.iainlhokseumawe.ac.id/index.php/arriyadhiyyat/article/view/1401>

[11] Liesandra SO. A CULTURAL SEMIOTICS STUDY: ETHNOMATHEMATICAL EXPLORATION IN GEOMETRY MATERIALS THROUGH CULTURAL SITE IN ACEH. Jurnal Cakrawala Pendas. 2022;8(3):688–697. <https://www.ejournal.unma.ac.id/index.php/cp/article/view/2537>

[12] Muhammad I. Penelitian etnomatematika dalam pembelajaran matematika (1995–2023). EDUKASIA: Jurnal Pendidikan dan Pembelajaran. 2023;4(1):427–438. <https://jurnaledukasia.org/index.php/edukasia/article/view/276>

[13] Ajmain H, Herna, Masrura SI. Implementasi pendekatan etnomatematika dalam pembelajaran matematika. SIGMA (Suara Intelektual Gaya Matematika). 2020;12(1):45–54. <https://doi.org/10.53755/sigma.v12i1.139>

[14] Nasryah CE, Rahman AA. Pengaruh pendekatan etnomatematika terhadap kemampuan pemecahan masalah matematis dan motivasi siswa SD di Aceh Barat. MAJU: Jurnal Ilmiah Pendidikan Matematika. 2020;7(2):126–140. <https://www.neliti.com/publications/503738/>

[15] Nursanti YB, Saputra BA, Gibran GK. Efektivitas penerapan pendekatan etnomatematika dalam pembelajaran matematika. Jurnal Education and Development. 2024;12(3):107–113. <https://journal.ipts.ac.id/index.php/ED/article/view/6367>

[16] Kencanawaty G, Febriyanti C, Irawan A. Kontribusi etnomatematika dalam pembelajaran matematika tingkat sekolah dasar. Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang. 2020;4(2):255–262. <https://www.academia.edu/download/92415319/950.pdf>.

[17] Finariyati F, Rahman AA, Amalia Y. Pengembangan modul matematika berbasis etnomatematika untuk meningkatkan kemampuan pemecahan masalah siswa. MAJU: Jurnal Ilmiah Pendidikan Matematika. 2020;7(1):89–97. <https://www.neliti.com/publications/502688/>

[18] Luthfi H, Rakhmawati F. Pengembangan lembar kerja peserta didik (LKPD) berbasis etnomatematika pada materi bangun ruang sisi lengkung kelas IX. Jurnal Cendekia: Jurnal Pendidikan Matematika. 2022;7(1):98–109. <https://doi.org/10.31004/cendekia.v7i1.1877>

[19] Febria F, Rismawati. Pengembangan video pembelajaran matematika SMA/MA berbasis etnomatematik. Jurnal MathEdu. 2024;7(1):102–110. <https://journal.ipts.ac.id/index.php/MathEdu/article/view/5799>