**EMTEKA**: Jurnal Pendidikan Matematika
Volume 7, No. 1, 2026. 01-14
DOI: https://doi.org/10.24127/emteka.v6i1.10789

e-ISSN 2746-5594
p-ISSN 2746-5608

# ETHNOMATHEMATICS IN CONTEXTUAL LEARNING: IMPACT ON SECONDARY STUDENTS' MATHEMATICAL REASONING AND PROBLEM SOLVING

Dian Febriana [1*,] Nur Hasvira Tul Aulia [2,] Nirfayanti[3]

[1*.2.3] Universitas Muslim Maros, Sulawesi Selatan, Indonesia
* *Corresponding author. Sambueja, 90561, Maros, Indonesia.*

*E-mail:* *febriandian581@gmail.com* [1*]
*nurasfiray53@gmail.com* [2]
*nirfa@umma.ac.id* [3]

Received December 01, 2026; Received in revised form February 05, 2026; Accepted March 01, 2026

**ABSTRACT**
This study aims to analyze the contribution of ethnomathematics in contextual mathematics learning to the development of junior secondary students' mathematical reasoning and problem-solving skills using a Systematic Literature Review (SLR) approach following the PRISMA 2020 framework. A total of 15 selected articles were analyzed qualitatively based on relevance, recency, and full-text availability criteria. The results indicate that ethnomathematics is implemented through the exploration of local culture, integration of mathematical concepts into real-life contexts, and the development of contextual learning media. This approach supports the development of mathematical reasoning and enhances problem-solving skills through reflective processes. Furthermore, it creates more meaningful learning experiences, increases students' motivation, and strengthens conceptual understanding. These findings provide an empirical basis for developing innovative, contextual, and culturally relevant mathematics learning.
**Keywords**: contextual mathematics learning; ethnomathematics; mathematical problem solving ;mathematical reasoning; systematic literature review.

***ABSTRAK***
*Penelitian ini bertujuan menganalisis kontribusi etnomatematika dalam pembelajaran matematika kontekstual terhadap kemampuan penalaran dan pemecahan masalah siswa SMP melalui pendekatan Systematic Literature Review (SLR) dengan tahapan PRISMA 2020. Sebanyak 15 artikel terpilih dianalisis secara kualitatif berdasarkan kriteria relevansi, kebaruan, dan ketersediaan teks lengkap. Hasil kajian menunjukkan bahwa etnomatematika diterapkan melalui eksplorasi budaya lokal, integrasi konsep matematika dalam pengalaman nyata, serta pengembangan media kontekstual. Pendekatan ini terbukti mendukung penalaran matematis dan meningkatkan kemampuan pemecahan masalah secara reflektif. Selain itu, pembelajaran menjadi lebih bermakna, meningkatkan motivasi, serta memperkuat pemahaman konsep siswa. Temuan ini menjadi dasar pengembangan pembelajaran matematika yang inovatif, kontekstual, dan berbasis budaya lokal.*
***Kata kunci**: etnomatematika; pembelajaran matematika kontekstual; systematic literature review; pemecahan masalah matematis.; penalaran matematis.*



## Introduction

The development of mathematics education in the 21st century era requires the strengthening of high-level thinking skills, especially mathematical reasoning and problem solving. International standards such as *National Council of Teachers of Mathematics* (NCTM, 2020) affirming that these two abilities are at the core of

e-ISSN 2746-5594
p-ISSN 2746-5608

meaningful and adaptive mathematics learning to global challenges. However, the results of the PISA international study show that the mathematical literacy ability of Indonesian students, especially in the aspects of high-level reasoning and contextual problem solving, is still in the low category (OECD, 2019). This condition signals that the mathematics learning process in schools has not been fully able to build the high-level thinking skills needed to face real problems.

One of the factors that also affect the low cognitive mathematical ability of students is the learning approach that is still procedural, focuses on memorizing formulas, and does not associate mathematics with students' daily experiences (Risdiyanti & Prahmana, 2018). In fact, mathematics actually lives in the culture and social practices of the community. Ethnomathematics, as introduced by (Ambrosio, 1985), placing culture as a context for the formation of mathematical concepts so that the learning process becomes more meaningful, contextual, and relevant to students' lives. Through the exploration of local cultural elements such as traditional buildings, fabric motifs, traditional rituals,beyond traditional games, mathematical dimensions are also profoundly visible in ancestral work tools. A notable example is the exploration of agricultural implements in Kubu Raya, such as the tamarin, which demonstrates how functional objects serve as physical embodiments of geometry and spatial logic (Viranikita, 2025). By integrating these tangible cultural artifacts, educators can transform abstract theorems into relatable, hands-on experiences that sharpen students' analytical reasoning, regional games, and traditional measurement systems, students can build a stronger mathematical understanding while developing reasoning and problem solving skills. Ethnomathematics research has identified various mathematical concepts embedded in traditional cultural practices. For instance, the exploration of traditional games such as sepak takraw in the Bugis-Makassar community reveals the presence of geometric concepts and measurement principles that can be utilized as meaningful contexts in mathematics learning (Nur & Yuliany, 2025). These findings are further supported by studies published in EMTEKA, which report that culturally grounded mathematics learning not only strengthens students' conceptual understanding but also enhances mathematical reasoning and problem-solving abilities through meaningful contextual (Abdul et al., 2025). The creative problem-solving learning model is a variation of problem-solving learning that utilizes systematic techniques to organize creative ideas to solve a problem (Oktaviana et al., 2017).

Recent research further confirms the effectiveness of integrating local cultures in mathematics learning. (Nur et al., 2020) It shows that ethnomathematics-based contextual learning is able to improve students' mathematical problem-solving skills at various levels of thinking development. This scholarly perspective is reinforced by further evidence showing that when mathematics is anchored in local wisdom, it bridges the gap between abstract theory and concrete reality. Such an approach does not merely present cultural artifacts as static objects, but as dynamic tools that help students navigate complex problem-solving scenarios across various cognitive stages (Tamarin et al., 2025). Similar findings were presented (August & Huwaa, 2021) which states that the application of Contextual Teaching and Learning (CTL) based on ethnomathematics is effective in increasing learning interest, concept

e-ISSN 2746-5594
p-ISSN 2746-5608

understanding, and student involvement in the learning process. In addition, the latest meta-analysis by (Mandala et al., 2024) provides strong evidence that ethnomathematics has a significant effect on improving students' mathematical creative thinking skills. These results are reinforced by the study (Widianingrum et al., 2025) which found that the Problem-Based Learning Assisted by ethnomathematics-based e-learning modules effectively improve mathematical problem-solving skills. This study revealed that students with visual, auditory, and kinesthetic learning styles demonstrate distinct approaches to solving problems (Ningrum et al., 2025). In line with the findings (Rokhmah et al., 2024) It also reported that ethnomathematics-based e-learning teaching materials contributed significantly to improving students' problem-solving skills at the vocational level. Furthermore, the structural design of learning materials plays a decisive role; recent evidence suggests that the use of specialized instructional scaffolds, such as Faded Example worksheets, can systematically guide students through complex mathematical procedures, thereby significantly bolstering their independent problem-solving capabilities (Solihin et al., 2025). In this learning model, students discover and construct their own knowledge, thereby discovering new concepts they had never previously known (Vahlia & Agustina, 2016).

Conceptually, the synthesis of these findings places ethnomathematics as a learning context that presents real cultural experiences for students, while CTL acts as a pedagogical approach that connects mathematical concepts with everyday life situations. Within this framework, mathematical reasoning and problem solving are the main *learning outcomes* that develop through the process of meaningful learning. The components of CTL are brought to life through cultural contexts, namely constructivism that encourages students to build an understanding of cultural experiences, *inquiry* that facilitates the exploration of mathematical patterns and concepts in local practice, *learning communities* that foster collaboration based on socio-cultural knowledge, and reflection that helps students evaluate the mathematical meaning of these experiences. Thus, the integration of ethnomathematics and CTL forms a learning model that is not only contextual, but also oriented towards the development of higher-level thinking skills in a sustainable manner.

The Contextual Teaching and Learning (CTL) approach is in line with the spirit of ethnomathematics because it places real experience as the basis for knowledge construction. A number of studies have shown that the integration of ethnomathematics in contextual learning is effective in encouraging active student engagement, strengthening conceptual understanding, and improving higher-level thinking skills, including mathematical reasoning and problem-solving (Diniyati et al., 2022; Pathuddin & Raehana, 2019) However, literature reviews that specifically and comprehensively analyze the contribution of ethnomathematics in the framework of Contextual Teaching and Learning (CTL) to the two cognitive abilities simultaneously are still limited. Therefore, this study is important to fill these gaps and provide a more targeted scientific synthesis.

Based on these conditions, it can be identified that students' mathematical reasoning and problem-solving skills are still low, mathematics learning has not fully raised the local cultural context, and there have not been many literature studies that have examined in depth the role of ethnomathematics in contextual

e-ISSN 2746-5594
p-ISSN 2746-5608

learning on the development of students' cognitive abilities. This raises the need to further examine how ethnomathematics can contribute to improving mathematical reasoning and problem solving through contextual learning approaches. Referring to this phenomenon, the formulation of the problem in this study includes: (1) how to apply ethnomathematics in contextual mathematics learning; (2) how does ethnomathematics contribute to the development of students' mathematical reasoning skills; (3) how does ethnomathematics contribute to students' mathematical problem-solving skills; and (4) how the synthesis of previous research findings illustrates the relationship between ethnomathematics, CTL, reasoning, and mathematical problem-solving.

In line with the formulation of the problem, this study aims to: (1) describe the concept and application of ethnomathematics in contextual mathematics learning; (2) analyze the contribution of ethnomathematics to the development of students' mathematical reasoning skills; (3) examine the role of ethnomathematics in improving students' mathematical problem-solving skills; and (4) to prepare a comprehensive literature synthesis on the relationship between ethnomathematics, contextual approaches, and strengthening students' mathematical cognitive abilities. In contrast to previous studies that tended to discuss ethnomathematics or contextual learning separately and focused on specific empirical results, this study seeks to present a more complete synthesis by integrating the two perspectives in one conceptual framework. Through this approach, the contribution of ethnomathematics to mathematical reasoning and problem solving is not only partially understood, but analyzed simultaneously and systematically. Therefore, this research is expected to provide a theoretical contribution in the form of a more comprehensive mapping of conceptual relationships, as well as a practical contribution as a foundation for the development of culturally based mathematics learning that is contextual, relevant, and in line with the demands of today's education.

## Research Methods

This study uses the Systematic Literature Review (SLR) approach to analyze the contribution of ethnomathematics in contextual mathematics learning to the development of students' cognitive abilities. This approach was chosen because it allows the synthesis of previous research results to be carried out systematically, transparently, and can be replicated. The study process follows the PRISMA 2020 guidelines which include four main stages, namely identification, screening, eligibility, and included. The literature search was carried out using Publish or Perish software which extracts article metadata from several scientific databases, namely Google Scholar. The keywords used include a combination of the terms ethnomathematics, contextual learning, Contextual Teaching and Learning, mathematical reasoning, and problem solving. The literature is limited to the last 5 years (2020–2025) to ensure the up-to-date research findings.

e-ISSN 2746-5594
p-ISSN 2746-5608

Table 1. Data inclusion criteria

| No | Criteria | Inclusions |
|---|---|---|
| 1. | Year of Publication | Articles published 5 years ago |
| 2. | Language | Indonesian or English |
| 3. | Focus | The article discusses ethnomathematics in the context of mathematics learning with a focus on developing students' cognitive abilities (e.g., mathematical reasoning and problem solving). |
| 4. | Text Availability | Full Text/ *Open Access* |
| 5. | Journal Index | Journals accredited by SINTA, Scopus, WoS, or peer-reviewed. |

Table 1 presents the inclusion criteria applied in selecting the articles for this study. The criteria were established to ensure the relevance and quality of the reviewed literature. Specifically, the selected articles were limited to publications from the last five years (2020–2025) to capture recent research developments. In addition, only articles written in Indonesian or English and focusing on ethnomathematics within the context of mathematics learning related to students' cognitive development particularly mathematical reasoning and problem solving were included. Furthermore, only full-text and peer-reviewed journals indexed in SINTA, Scopus, or WoS were considered to maintain academic rigor and credibility.

Table 2. Data exclusion criteria

| No | Criteria | Exclusion |
|---|---|---|
| 1. | Year of Publication | Articles published outside the span of the last 5 years. |
| 2. | Language | Articles other than Indonesian or English. |
| 3. | Focus | The article does not discuss ethnomathematics in the context of mathematics learning nor does it relate to the development of students' cognitive abilities (mathematical reasoning and problem-solving). |
| 4. | Text Availability | Articles are not available in *full text* or cannot be accessed openly. |
| 5. | Journal Index | Articles are not published in accredited scientific journals or do not go through *a peer review* process. |

Table 2 presents the exclusion criteria used to eliminate articles that did not meet the established standards of this review. These criteria were designed to ensure that only relevant and high-quality studies were included in the analysis. Articles published outside the specified five-year range (2020–2025), written in languages other than Indonesian or English, or not focusing on ethnomathematics within the context of mathematics learning related to students' cognitive development were excluded. Additionally, studies that were not available in full text, were not openly accessible, or were not published in accredited and peer-

e-ISSN 2746-5594
p-ISSN 2746-5608

reviewed journals were removed from consideration. These exclusion criteria helped maintain the rigor and credibility of the systematic review process.

This study utilizes the framework of Preferred Reporting items For Systematic Review and Meta-Analysis (PRISMA). The complete process related to article selection is presented in the following image shows in Figure 1.

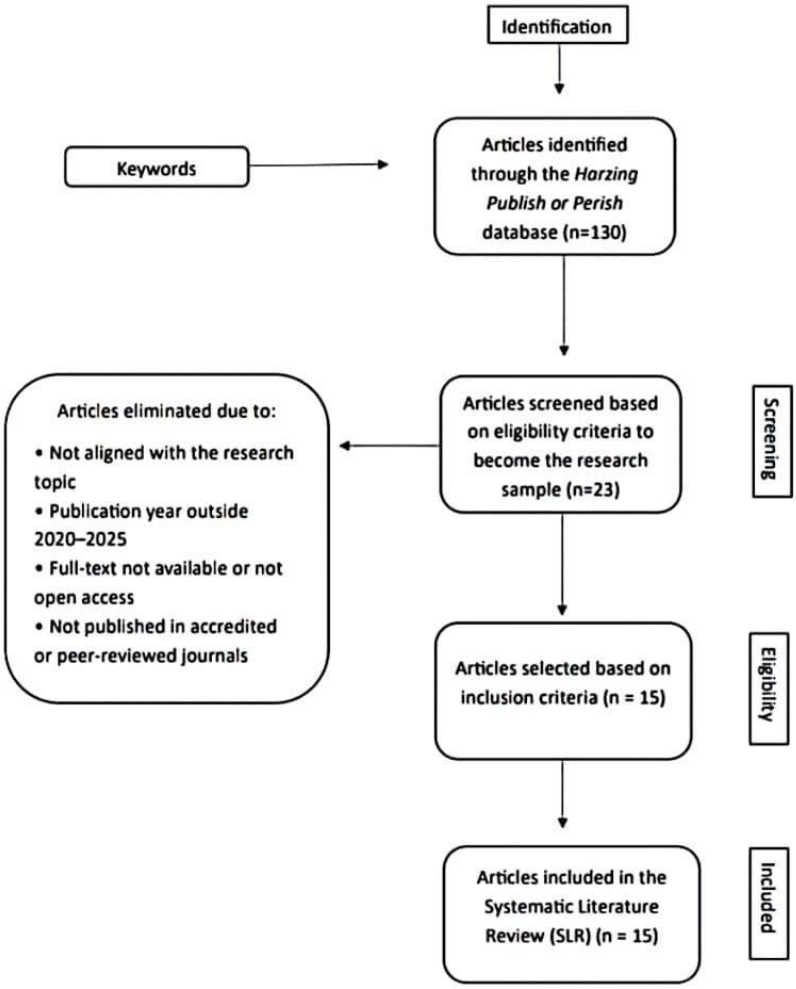


Figure 1. PRISMA 2020 Method

## Results and Discussion

Based on the results of searching for articles using *Harzing Publish or Perish* software with the keywords "ethnomathematics, CTL, mathematical reasoning, and mathematical problem solving", 130 articles were obtained in the early stages. The articles are then selected in stages with reference to the inclusion and exclusion criteria that have been set. Some articles do not proceed to the analysis stage because they do not specifically address the development of mathematical cognitive abilities, are not in the context of contextual learning, are conceptual without empirical data, are identified as duplicates, or are not available in full-text

e-ISSN 2746-5594
p-ISSN 2746-5608

form. The screening process is done consistently so that only truly relevant articles are further analyzed. Through this stage, 15 articles were obtained that met all the study criteria. Findings from the selected articles were then analyzed and synthesized to illustrate the contribution of ethnomathematics in contextual mathematics learning to students' cognitive development, as presented in Table 3.

Table 3. Review results

| No | Researcher (Year) | Research Title | Research Methods | Review Results | Relevance to Research Variables |
|---|---|---|---|---|---|
| 1. | Yuli Bangun Nursanti, et al. (2024) | *Systematic Literature Review: The Effectiveness of the Application of Ethnomathematical Approaches in Mathematics Learning* | *Systematic Literature Review* (SLR) | The Ethnomathematics approach is effective in developing: Problem Solving, Critical Thinking (Reasoning indicator), and Mathematical Communication (Reasoning indicator). | Supporting mathematical reasoning and problem-solving variables through ethnomathematical contexts. |
| 2. | Ilham Muhammad (2023) | *Ethnomathematics Research in Mathematics Learning (1995-2023)* | Descriptive Bibliometric Analysis | Problem Solving is identified as one of the new and important themes in Ethnomathematical research. | Strengthening the relevance of problem solving as the main outcome. |
| 3. | Khaerani, et al. (2024) | *The Role of Ethnomathematics in Improving the Quality of Mathematics Learning: A Review of the Literature* | Literature Review | Ethnomathematics is significant in improving conceptual understanding and mathematical communication skills (Reasoning indicators). | Contribute to indicators of mathematical reasoning. |
| 4. | Abdul Rauf Bimantara (2024) | *The Role of Ethnomathematics in Mathematics Learning* | Literature Research | Ethnomathematics has been shown to improve students' mathematical abilities, including | Supports the strengthening of mathematical reasoning. |

e-ISSN 2746-5594
p-ISSN 2746-5608

| | | | | | |
|---|---|---|---|---|---|
| | | | | mathematical communication skills (Reasoning indicators). | |
| 5. | Kamid, et al. (2023). | *Analysis of Process Skills in Junior High School Students Through Knowledge Recall with the Help of Ethnomathematics* | Qualitative Descriptive | Process *skills* are substantive for problem solving. Ethnomathematics helps construct meaningful (contextual) knowledge. | Explain the ethnomathematics-based contextual problem-solving mechanism. |
| 6. | Rewatus, et al. (2020) | *Development of ethnomathematics-based student worksheets on triangular and quadrilateral materials* | *Research & Development* (R&D) | Produce valid, practical, and effective media for contextual learning. | Supporting contextual learning as a research approach. |
| 7. | Aji Permana Putra & Dias Prasetyo (2022) | *The role of ethnomathematics in the basic concepts of mathematics learning* | Literature Review | Ethnomathematics is able to awaken students' understanding (underpinning reasoning) and present concepts contextually through culture. | Strengthen the relationship between ethnomathematics → reasoning. |
| 8. | Yeni Dwi Kurino, et al. (2022) | *Geometry concept with ethnomathematical exploration of Panjalin traditional house* | Qualitative | Describe the concept of geometry (trapezoids, squares, blocks) contextually as a learning resource. | Demonstrate ethnomathematics as a learning context. |
| 9. | Dwi Ratnaningsih, et al. (2025) | *Improving High School Students' Critical Thinking and Learning Outcomes through the Contextual Teaching and Learning (CTL) Model* | Quantitative (*Quasi Experiment*) | The Contextual Teaching and Learning (CTL) model is effective in improving Critical Thinking skills (the main indicator of Mathematical Reasoning). | Support mathematical reasoning variables via CTL. |

e-ISSN 2746-5594
p-ISSN 2746-5608

| | | | | | |
|---|---|---|---|---|---|
| 10. | Priyadi, Hermawan Gatot, & Yumiati (2021) | *The Effect of Contextual Teaching and Learning (CTL) Model With Outdoor Approach Towards the Students' Ability of Mathematical Representation* | Quantitative (*Quasi Experiment*) | CTL significantly affects students' Mathematical Representation abilities (part of Mathematical Reasoning). which conceptually becomes the framework for the implementation of ethnomathematics. | Strengthening reasoning indicators in contextual learning. |
| 11. | Dinda Fasya Purnomo Putri, et al. (2022) | *Students' Mathematical Reasoning Ability in Solving Mathematical Problems Reviewed from Learning Style* | Qualitative Descriptive | Reasoning is an essential thought process in Problem Solving. Good reasoning is demonstrated by the ability to carry out all the steps of Polya Problem-Solving. | Affirm the relationship of problem-solving reasoning. |
| 12. | Scott, et al. (2024). | *Contextual-Based Bulletin as Media for Learning Renewable Energy* | Experiments | Contextual-based learning media is effective in improving students' Critical Thinking skills (Reasoning indicators). | Supporting reasoning through contextual learning. |
| 13. | A Taste of Beauty (2020) | *Application of Contextual Teaching and Learning Approach on Statistics Material Against Student Results* | Experiments | The implementation of CTL helps students understand concepts and skillfully solve problems (*skilled solve issues* ). as a pedagogical basis for ethnomathematical integration. | Strengthen CTL-based mathematical problem solving. |
| 14. | Rifka Fauziah Azis & Tia Purniati (2023) | *Systematic Literature Review: Mathematical Communication* | SLR | Mathematical Communication (Reasoning indicator) is important to be | Relevant to mathematical reasoning indicators. |

e-ISSN 2746-5594
p-ISSN 2746-5608

| | | | | | |
|---|---|---|---|---|---|
| | | *Skills Reviewed from Students' Self Efficacy* | | developed and influenced by the psychological factors of the student. | |
| 15. | Arief Aulia Rahman, et al. (2023) | *The Effect of Contextual Teaching Learning (CTL) Model on Students' Achievement in Elementary School* | Quantitative | The CTL model is effective in improving student learning outcomes (achievements). which is conceptually in line with the integration of ethnomathematics as a source of cultural context | Supporting the effectiveness of contextual approaches in learning. |

### *Application of Ethnomathematics in Contextual Mathematics Learning*

The results of the literature review show that the application of ethnomathematics in contextual mathematics learning through the *Contextual Teaching and Learning* (CTL) is able to create a meaningful learning process that is close to students' lives. (Kurino et al., 2022) emphasized that the exploration of geometric concepts through the Panjalin traditional house makes learning more concrete and relevant to students' cultural experiences. These findings are in line with(Rewatus et al., 2020) who develop ethnomathematics-based worksheets and prove that the tool is valid, practical, and effective in supporting contextual learning. However, the focus of the two studies is still placing the cultural context, especially as a medium for the concretization of concepts. This approach provides a space for students to actively build knowledge through the context of local culture, in accordance with CTL principles that emphasize the linkage between academic and real-life knowledge (Ratnaningsih & Triwahyuni, 2025) Thus, the application of ethnomathematics in CTL not only serves as a means of cultural introduction, but also strengthens students' thinking skills through authentic and contextual learning experiences. Theoretically, mathematical reasoning is not singular, but multidimensional which includes the ability to understand concept relationships, make generalizations, formulate logical arguments, and draw conclusions reflectively. Therefore, the integration of ethnomathematics within the framework of CTL should not only be understood as a strategy of presenting a cultural context, but also as a means that activates the various dimensions of students' mathematical reasoning through a meaningful, contextual, and rooted learning experience in the reality of their lives.

### *Ethnomathematics's Contribution to the Development of Students' Mathematical Reasoning Skills*

e-ISSN 2746-5594
p-ISSN 2746-5608

Literature review shows that the contribution of ethnomathematics to mathematical reasoning lies not only in the provision of cultural context, but in its ability to activate students' higher-level thinking processes. (Nursanti et al., 2024) It shows that this approach correlates with the development of critical thinking, mathematical communication, and problem-solving skills as the main components of reasoning. Meanwhile, (Khaerani et al., 2024) Placing cultural-based conceptual understanding as a mechanism that shifts learning from mere procedural to relational meaning. This perspective is deepened by (Bimantara, 2024) which confirms that the interconnection between cultural patterns and mathematical structures encourages the formation of logical reasoning more naturally. When viewed in the context of contextual learning, the role is reinforced through the characteristics of CTL that place the student as an active subject who builds, represents, and communicates his or her mathematical ideas (Priyadi et al., 2021) Thus, the relationship between ethnomathematics and CTL is not additive, but integrative in that the cultural context serves as a trigger for the construction of meaning, while the CTL principle directs the process towards the formation of critical, reflective, and communicative mathematical reasoning.

### *Contribution of Ethnomathematics to the Development of Students' Mathematical Problem-Solving Skills*

Problem-solving skills can be understood as a form of high-level cognition that demands the involvement of logical reasoning, situational analysis, and reflective consideration in determining solution strategies. Overview (Muhammad, 2023) shows that problem-solving is increasingly prominent as a focus in the study of cutting-edge ethnomathematics, especially as culture-based approaches are expected to provide more meaningful exploration space for students when formulating solutions. In line with that, (Kamid, et. al. 2023) suggests that the use of ethnomathematical contexts tends to be related to the development of process skills, which conceptually become an important foundation for problem-solving activities. In the context of contextual learning, CTL not only directs students to procedural understanding, but also encourages the connection between the structure of mathematical problems and real-world experiences (Scott, 2020). A similar trend is seen in the findings (Ratnaningsih & Triwahyuni, 2025) which implies the strengthening of critical thinking through the application of CTL, a component that plays a role in the problem-solving process. Overall, these findings indicate that ethnomathematics's contribution to mathematical problem-solving abilities is likely to take place through the process of contextualizing meaning, activating reasoning, and cultural experience-based reflection, although the magnitude of the influence is still influenced by learning design and student characteristics.

### *Synthesis of Previous Research Findings: The Relationship between Ethnomathematics, Contextual Learning (CTL), Mathematical Reasoning and Problem Solving*

The results of the synthesis show a close relationship between ethnomathematics, CTL approach, reasoning, and mathematical problem solving.

e-ISSN 2746-5594
p-ISSN 2746-5608

Ethnomathematics provides a relevant cultural context for constructing mathematical concepts meaningfully, while CTL provides a pedagogical framework that relates the concept to real-life situations. The combination of the two creates learning that encourages students to think critically, logically, and reflexively in the face of mathematical problems. This is in line with the findings (Scott, S. Scott, 2024) which proves that contextual-based learning media is effective in improving students' critical thinking skills. In addition, the findings (Rahman et al., 2023) indicates that the application of the *Contextual Teaching and Learning* (CTL) is related to improving learning outcomes as well as strengthening student motivation in mathematics learning. In this context, the integration of ethnomathematics into the CTL framework not only has the potential to enrich the cognitive dimension, but also encourages the development of scientific attitudes and appreciation of local culture as a source of learning. Conceptually, the existence of cultural context through ethnomathematics seems to play a role especially in the early stages of problem solving according to the Polya framework, namely in helping students understand problem situations more meaningfully and plan solution strategies that are relevant to their experiences. Therefore, the integrative relationship between ethnomathematics and CTL can be seen as a pedagogical mechanism that contributes to strengthening students' reasoning and mathematical problem-solving abilities at various levels of education, although the level of effectiveness is still influenced by the learning design and characteristics of students.

## Conclusions and Suggestions

Based on a synthesis of fifteen research articles, this study shows that the integration of ethnomathematics in contextual mathematics learning has the potential to support the development of students' mathematical reasoning and problem-solving skills through the use of meaningful cultural contexts and strengthening the principles *of Contextual Teaching and Learning* (CTL). The findings confirm that cultural context serves not only as a learning medium, but also as a pedagogical mechanism that helps students understand problems, plan solution strategies, and build reflective reasoning.

The results of this study indicate the need for a more systematic application of ethnomathematics in mathematics learning practices, as well as open up opportunities for further empirical research to test the effectiveness of the integration of ethnomathematics and CTL in a variety of mathematical abilities, educational levels, and broader cultural contexts. Further research is also recommended to develop innovative learning designs based on local culture to strengthen the contribution of ethnomathematics to improving the quality of mathematics education.

## Referensi

Abdul, D., Lidinillah, M., Muharram, M. R. W., & Nurronnavisa, S. (2025). *Development Of Ethnomathematics-Filled Picture Storybooks As a Medium For Learning Mathematics In Elementary Schools*. *6*(1), 83–95. https://doi.org/10.24127/emteka.v6i1.6253

Agustis, C., & Huwaa, W. M. N. C. (2021). *The Effect of Contextual Teaching and*

*Learning Model Based on Ethnomathematics on the S tudents ' Interest and Learning Outcomes of Class XII SMA Negeri 2 Salahutu in Three-Dimensional Materials*. *550*(Icmmed 2020), 492–496. https://doi.org/10.2991/assehr.k.210508.110

Ambrosio, U. D. (1985). *Ethnomathematics and its Place in the History and Pedagogy of Mathematics*. *February*, 5(1) 44–48.

Bimantara, A. R. (2024). Peran Etnomatematika Dalam Pembelajaran Matematika. *Innovative: Journal Of Social Science Research*. https://doi.org/10.31004/innovative.v4i1.7712

Diniyati, R., Komarudin, K., & Nurfitriyani, N. (2022). Integrasi Etnomatematika Dalam Pembelajaran Kontekstual Untuk Meningkatkan Kemampuan Berpikir Tingkat Tinggi Siswa. *Jurnal Pendidikan Matematika*, *16*(2), 112–123. https://doi.org/10.31004/cendekia.v8i3.3526

Gatot, H., & Effect, T. (2021). *Education Quarterly Reviews*. https://doi.org/10.31014/aior.1993.04.03.352

Khaerani, K., Arismunandar, A., & ... (2024). Peran Etnomatematika Dalam Meningkatkan Mutu Pembelajaran Matematika: Tinjauan Literatur. *Indonesian Journal of intellectual publication 5(1),20-26.* https://doi.org/10.51577/ijipublication.v5i1.579

Kurino, Y. D., Herman, T., Majalengka, U., & Indonesia, U. P. (2022). *Jurnal Cakrawala Pendas*. *8*(1). https://doi.org/10.31949/jcp.v8i1.1937

Mandala, A. S., Hidayah, I. R., & Rahmawati, D. (2024). *The Effectiveness Of Ethnomathematical Approaches On Students ' Mathematical Creative Thinking Skills In Indonesia : a Meta-Analysis Study*. *2759*. https://doi.org/10.20527/edumat.v12i2.19957

Muhammad, I. (2023). Penelitian Etnomatematika Dalam Pembelajaran Matematika (1995- 2023). *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*, *4*(1), 427–438. https://doi.org/10.62775/edukasia.v4i1.276

Ningrum, A. P. S., Andayani, S., Vahlia, I., & Dewi, W. U. (2025). Analysis Of Problem Solving In Spldv Material Using Castel Stages Reviewed From Students'Learning Styles. *EMTEKA: Jurnal Pendidikan Matematika*, 6(2), 1006-1018.https://doi.org/10.24127/emteka.v6i2.8803

*NCTM Standards ( 2020 ) – Secondary ( Initial Preparation )*. 1–6.

Nur, A. S., Waluya, S. B., Rochmad, R., & Wardono, W. (2020). *Contextual learning with Ethnomathematics in enhancing the problem solving based on thinking levels*. *5*(3), 331–344. https://doi.org/10.23917/jramathedu.v5i3.11679

Nursanti, Y. B., Saputra, B. A., & Gibran, G. K. (2024). Systematic Literature Review: Efektivitas Penerapan Pendekatan Etnomatematika Dalam Pembelajaran Matematika. *Jurnal Education and Development*, *12*(3), 107–113. https://doi.org/10.37081/ed.v12i3.6367

OECD. (2019). *PISA 2018 Results (Volume I): What Students Know and Can Do*. OECD Publishing. https://doi.org/10.1787/5f07c754-en

Oktaviana, O., & Jazim & Vahlia, I. (2017). Pengaruh Model Pembelajaran Creative Problem Solving Berbantu Media Ular Tangga Bangun Ruang Terhadap Kreativitas Belajar Siswa Kelas VIII MTs Ma'Arif Nu 5 Sekampung. *Semnasdik FKIP*, 1(1), 293-301.

Page, M. J., Mckenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D.,

Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-wilson, E., Mcdonald, S., … Moher, D. (2021). *The PRISMA 2020 statement : an updated guideline for reporting systematic reviews*. 1–11. https://doi.org/10.1186/s13643-021-01626-4

Pangemanan, A. (2020). *Application of Contextual Teaching and Learning Approach on Statistics Material Against Student Results*. *13*(4), 1–7. https://doi.org/10.5539/ies.v13n4p1

Pathuddin, H., & Raehana, S. (2019). Integrasi etnomatematika dalam pembelajaran kontekstual untuk meningkatkan kemampuan pemecahan masalah matematis. *Journal of Educational Science and Technology*, *5*(1), 56–65. https://doi.org/10.26858/est.v5i1.10068

Rahman, A. A., Kamaruddin, I., & Azhari, D. S. (2023). *The Effect of Contextual Teaching Learning ( CTL ) Model on Students ' Achievement in Elementary School A . Introducion*. *4*(1), 146–157. https://doi.org/10.51276/edu.v4i1.282

Ratnaningsih, D., & Triwahyuni, E. (2025). *Improving High School Students ' Critical Thinking and Learning Outcomes through the Contextual Teaching and Learning ( CTL ) Model*. *8*(2), 251–258. https://doi.org/10.23887/jp2.v8i2.99439

Rewatus, A., Leton, S. I., Fernandez, A. J., & Suciati, M. (2020). Pengembangan Lembar Kerja Peserta Didik Berbasis Etnomatematika Pada Materi Segitiga dan Segiempat. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *4*(2), 645–656. https://doi.org/10.31004/cendekia.v4i2.276

Risdiyanti, I., Charitas, R., & Prahmana, I. (2018). *Etnomatematika : eksplorasi dalam permainan*. *2*(1), 1–11. https://doi.org/10.31331/medives.v2i1.562

Ristiati, T. (2023). *Analisis Keterampilan Proses pada Siswa SMP Melalui Recall Pengetahuan dengan Bantuan Etnomatematika*. *07*(November), 3304–3320. https://doi.org/10.31004/cendekia.v7i3.2905

Rokhmah, N., Yaniawati, R. P., & Supianti, I. I. (2024). *Ethnomathematics E-learning Teaching Material Development : Student-Oriented Problem-Solving Ability*. *14*(2). https://doi.org/10.23969/pjme.v14i2.17166

Susetyo, G. A. (2024). *Contextual-Based Bulletin as Media for Learning Renewable Energy*. *14*(01), 84–99. https://doi.org/10.26740/jpfa.v14n1.p84-99

Solihin, S. A., Mutaqin, A., & Rahayu, I. (2025). *Development Of Faded Example Worksheet To Enhance The Ability Of Mathematical Problem*. *6*(1), 37–51.

Vahlia, I., & Agustina, R. (2016). Perbandingan Hasil Belajar Discovery Learning Berbasis Problem Solving Dan Group Investigation Berbasis Problem Solving Pada Pembelajaran Metode Numerik. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 5(1), 82-93.https://doi.org/10.24127/ajpm.v5i1.469

Viranikita, D. (2025). *Exploration Of Ethnomatematics In Traditional*. *6*(2), 636–650. Https://doi.org/10.24127/emteka.v6i1.9652

Widianingrum, E., Wanabuliandari, S., & Premprayoon, K. (2025). *The Effectiveness Of Problem-Based Learning Assisted With The Ethnomathematics-Based Geocube e-Module On Problem- Solving Skills*. *10*(3), 135–145. https://doi.org/10.23917/jramathedu.v10i3.3228