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Evaluating ChatGPT Response Quality in Ethnomathematics Learning

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Abstract: *This study analyzes the quality of ChatGPT responses in generating ethnomathematical explanations in mathematics learning. A descriptive qualitative approach with a case study design was employed. The research participants consisted of one mathematics teacher and 30 eleventh-grade students at SMAI Nurul Huda. Data were collected through classroom observation, semi-structured interviews, and documentation of prompt-response transcripts. Two ethnomathematics-based plane geometry problems, related to a traditional engklek arena and a traditional-house pattern, were explored using ChatGPT through a text-based interface. The documented responses were evaluated based on three indicators: scientific accuracy, logical coherence, and cultural contextual relevance. The findings show that ChatGPT produced stronger responses in terms of scientific accuracy and logical coherence, particularly for lower-complexity problems. In Problem 2, 97% of the responses were categorized as accurate and 100% were highly coherent. In contrast, responses to the more complex Problem 1 were mostly categorized as fairly accurate and coherent, with 7% of the responses identified as inaccurate and incoherent. The weakest performance appeared in cultural contextual relevance, as 93% of responses to Problem 1 were less relevant and 100% of responses to Problem 2 were irrelevant. Observations and interviews further revealed that ChatGPT can increase student engagement and support procedural understanding, but it may also encourage dependence on instant answers if not accompanied by teacher guidance. Therefore, ChatGPT should be positioned as a supplementary learning tool whose use requires mathematical verification, prompt scaffolding, and explicit cultural reflection.*

Keyword: *ChatGPT, ethnomathematics, cultural contextual relevance, mathematics education, response quality*

INTRODUCTION

Mathematics is one of the fundamental subjects that plays a strategic role in developing logical and analytical thinking skills, as well as problem-solving abilities needed to face the challenges of globalization and technological advancement. However, in practice, mathematics learning is still often perceived as abstract, rigid, and difficult for students to understand. This condition contributes to low learning interest, limited student engagement, and suboptimal understanding of mathematical concepts (Kania et al., 2025; Mahmudah et al., 2026; Miftahul Jannah et al., 2023; Mira et al., 2024). Furthermore, mathematics learning that is less contextual causes students to experience difficulties in relating mathematical concepts to real-life situations, resulting in low knowledge transfer abilities. Meanwhile, mathematics learning should be contextual and relevant to students' daily lives (Putra et al., 2024). This indicates the need for more contextual and meaningful learning approaches so that students can understand concepts more deeply (Chandra Wardana et al., 2024; Mallika, 2024).

Mathematics does not develop separately from human life; rather, it grows and develops within the cultural context of society. This has given rise to the concept of ethnomathematics, which is an approach that examines the relationship between mathematics and local culture.

Ethnomathematics demonstrates that cultural activities such as measuring, counting, pattern-making, and traditional games contain mathematical values that can be utilized in the learning process (Hidayat Ismail et al., 2023; Prahmana et al., 2021). Recent studies have shown that the implementation of ethnomathematics can improve students' mathematical literacy, critical thinking, and problem-solving skills because the learning process becomes more contextual and meaningful (Kabuye Batiibwe, 2024; Nisa et al., 2025; Nursanti et al., 2024).

The implementation of ethnomathematics in learning still faces various challenges, particularly in systematically integrating cultural contexts into classroom instruction. This is in line with previous studies showing that the implementation of ethnomathematics continues to encounter several obstacles, such as limited teacher understanding, the lack of culture-based learning resources, and difficulties in curriculum integration (Simbolon, 2024), which are also related to challenges in teacher training and curriculum integration in mathematics learning (Kusi & Bonyah, 2025). Many students are still unaware of the existence of mathematical elements within the cultural practices they encounter in their daily lives (Putra & Lestari, 2024), while school learning has not yet optimally integrated local cultural contexts into instructional materials (Madu et al., 2025). Therefore, innovation is needed to support the more effective integration of ethnomathematics, one of which is through the utilization of digital technology.

Technological advancement, particularly in the field of Artificial Intelligence (AI), has brought transformation to the educational sector through the utilization of ChatGPT as a learning support tool that can enhance learning effectiveness and support adaptive learning processes (Kaur & Kapoor, 2025; Yang et al., 2024). ChatGPT is an AI-based language model developed by OpenAI that is capable of generating interactive and adaptive text-based responses. In the context of education, ChatGPT can be utilized as a learning aid to explain concepts, assist in problem-solving, and provide rapid and personalized feedback (Egara & Mosimege, 2024; Nita et al., 2023). Recent studies have also shown that the use of ChatGPT in mathematics learning can improve students' critical thinking skills, self-confidence, and learning effectiveness (Nurjannah et al., 2024; Rizaldi et al., 2024).

Although various studies have examined ethnomathematics and the use of ChatGPT in learning, most of them still discuss these two aspects separately. Studies on ethnomathematics mainly focus on the integration of culture into the learning process, while research related to ChatGPT primarily emphasizes the use of technology in learning in general. To date, studies that specifically evaluate the quality of ChatGPT-generated responses in ethnomathematics learning remain limited. In fact, the integration of local culture and AI-based technology has the potential to create learning experiences that are more contextual, interactive, and relevant to the needs of 21st-century education (Almarashdi et al., 2024). The novelty of this study lies in its specific focus on evaluating ChatGPT responses not only from mathematical aspects, but also from cultural contextual aspects. Unlike previous studies that tend to examine ChatGPT as a general learning aid or ethnomathematics as a culture-based pedagogical approach, this study combines both perspectives by assessing whether ChatGPT can produce responses that are scientifically accurate, logically coherent, and culturally meaningful in ethnomathematics-based mathematics learning.

This study aims to analyze the quality of OpenAI ChatGPT responses in generating ethnomathematical materials or explanations through a contextual approach, viewed from the aspects of scientific accuracy, logical coherence, and cultural contextual relevance in mathematics learning. This study is expected to contribute to the development of innovative and

contextual mathematics learning that is adaptive to technological advancement while remaining sensitive to local cultural values.

METHODS

This study employed a descriptive qualitative approach with a case study design to conduct an in-depth analysis of the quality of ChatGPT responses in generating ethnomathematical explanations through a contextual approach in mathematics learning. This design was selected because the study did not aim to measure experimental effectiveness, but to describe and interpret the characteristics, strengths, and limitations of ChatGPT responses when used in ethnomathematics-based problem solving. A descriptive qualitative approach is relevant for exploring classroom interactions, user perceptions, and challenges faced by teachers and students when adopting artificial intelligence in mathematics learning (Egara & Mosimege, 2024).

The study was conducted at SMAI Nurul Huda. The research participants consisted of one mathematics teacher and 30 eleventh-grade students. Participants were selected using purposive sampling because they had prior experience using ChatGPT in mathematics learning activities. Data were collected through observation, semi-structured interviews, and documentation. Observation was conducted to examine interactions among students, the teacher, and ChatGPT during the process of solving ethnomathematics-based problems. Interviews were used to explore participants' perceptions, experiences, and challenges. Documentation was used to collect problem sheets, learning materials, prompt-response transcripts, screenshots of ChatGPT outputs, and students' written solutions.

The ChatGPT response exploration was carried out by providing two ethnomathematics-based plane geometry problems. Problem 1 involved the traditional engklek game and required students to calculate the area of a composite shape consisting of eight squares and one semicircle. Problem 2 involved a rhombus pattern found in a traditional-house context and required students to calculate the area of a rhombus using its diagonals. Each student interacted with ChatGPT using a structured prompt that asked for a step-by-step solution and an explanation of the relationship between the mathematical concept and the cultural context. The responses generated by ChatGPT were documented and analyzed as response transcripts. To ensure transparency, examples of prompts and excerpts of ChatGPT responses are presented in the results section.

The quality of ChatGPT responses was evaluated based on three indicators adapted from Verawati et al. (2025): scientific accuracy, logical coherence, and cultural contextual relevance. Scientific accuracy refers to the correctness of concepts, formulas, procedures, and calculation results. Responses were categorized as accurate when all mathematical concepts and calculations were correct, fairly accurate when the main concept was correct but minor procedural or computational weaknesses remained, less accurate when several important mathematical elements were incomplete, and inaccurate when the concept or calculation was substantially wrong. Logical coherence refers to the consistency and sequence of solution steps. Responses were categorized as highly coherent when the explanation was complete, systematic, and consistent from the identification of known information to the final answer; coherent when the steps were generally logical but not fully detailed; less coherent when the sequence was incomplete; and incoherent when the steps were inconsistent or misleading. Cultural contextual relevance refers to the extent to which responses connected mathematical concepts to the cultural elements embedded in the problem. Responses were categorized as highly relevant

when they explicitly explained both mathematical and cultural meanings, relevant when they made a clear but limited cultural connection, less relevant when they only mentioned the cultural object without meaningful interpretation, and irrelevant when they focused solely on mathematical procedures without addressing the cultural context.

Data analysis was conducted using the interactive model proposed by Miles and Huberman, which consists of data reduction, data display, and conclusion drawing. In the data reduction stage, the researcher selected and categorized ChatGPT response transcripts, observation notes, interview excerpts, and documentation according to the research focus. The data were then presented in descriptive narratives, tables, and selected interview excerpts. Conclusions were drawn by identifying patterns across the three response-quality indicators and comparing them with classroom observations and interview findings. Data credibility was ensured through source and technique triangulation by comparing the results of observations, interviews, documentation, and ChatGPT response transcripts.

RESULT AND DISCUSSION

This section presents the findings of the study based on the analysis of ChatGPT response transcripts, classroom observations, and interviews with students and teachers. The evaluation focuses on three indicators, namely scientific accuracy, logical coherence, and cultural contextual relevance, to examine the quality of ChatGPT responses in supporting ethnomathematics learning. In addition, the findings describe how students interacted with ChatGPT during the learning process and present the perceptions of both students and teachers regarding its use.

Student Interaction with ChatGPT

In the learning process, students interacted directly with ChatGPT in solving ethnomathematics-based problems. This interaction aimed to identify the role of ChatGPT in helping students understand mathematical concepts and relate them to local cultural contexts. At the initial stage, students were given ethnomathematics problems and were asked to find alternative solutions using ChatGPT. Observation results showed that students actively tried various questions, particularly those related to solution procedures and the appropriate use of formulas. However, students' questions still tended to focus on obtaining procedural answers rather than exploring cultural meanings. Examples of prompts and excerpts of ChatGPT responses are presented in Table 1.

Table 1. Examples of ChatGPT Prompts and Response Transcripts

PROBLEM	PROMPT	EXCERPT OF CHATGPT RESPONSE
Problem 1	If one engklek arena consists of eight square units and one semicircle, how can the total area of the arena be calculated step by step? Please explain the reason for each calculation step.	The engklek arena is a composite shape consisting of eight squares and one semicircle. First, calculate the area of one square and multiply it by eight. Next, calculate the area of the semicircle by taking half of the area of a full circle. Finally, add the area of the squares and the semicircle to obtain the total area of the arena.
Problem 1 (Follow-up)	Why is the formula for the area of a semicircle multiplied by 1/2?	A semicircle represents half of a complete circle. Therefore, its area is obtained by taking one-half of the circle area formula, $A = \pi r^2$, resulting in $A = 1/2\pi r^2$.
Problem 2	A rhombus pattern in a traditional-house context has two diagonals. How can its	The area of a rhombus is calculated using $A = 1/2 \times d1 \times d2$. Multiply the two diagonals and divide the result by two to obtain the area. The response mainly

	area be calculated, and how is the calculation related to the traditional-house pattern?	explains the geometric procedure and gives only a limited reference to the traditional-house context.
Problem 2 (Follow-up)	Explain why the rhombus pattern in the traditional house can be used as an ethnomathematics example.	The rhombus pattern can be viewed as a geometric shape found in cultural objects. However, the explanation remains general and does not elaborate on the cultural meaning, function, or value of the traditional-house pattern.

To avoid this tendency of dependency, students were directed to reread and understand the solution steps provided by ChatGPT. Students were asked to identify the mathematical concepts used and the relationships between each step of the solution process. Afterward, several students were selected to write their work on the whiteboard as a form of understanding verification. Students' activities while presenting their work on the whiteboard can be seen in Figure 2.

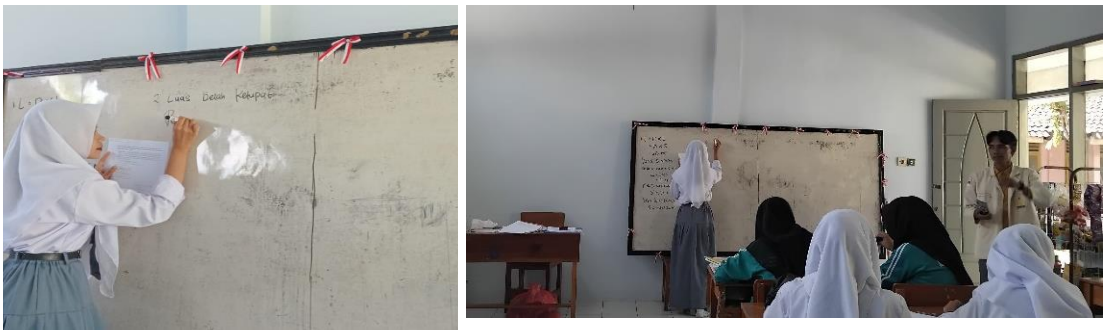

Figure 2. Students Writing Their Solutions on the Board

After the students finished writing their work, an interaction occurred between the researcher and the students, which demonstrated varying levels of understanding. One student was able to explain the solution steps procedurally, although the student still relied on the answers generated by ChatGPT, as illustrated in the following dialogue:

Researcher : Please explain how you obtained the area of the engklek field.
S1 : There are 8 squares and a semicircle. First, I calculated the area of the squares, then I added the area of the semicircle.
Researcher : Why did you use that method?
S1 : Because it is a composite shape, so each part must be calculated separately.
Researcher : Did you understand the steps provided by ChatGPT?
S1 : Yes, but I was initially confused about the semicircle part, so I reviewed the steps again.

The dialogue indicates that the student had begun to understand the structure of the solution process, but still required assistance to achieve a deeper conceptual understanding. This finding suggests that ChatGPT functioned as an initial guide; however, it had not yet fully developed the student's conceptual understanding.

In contrast to these findings, some students still demonstrated dependence on the answers provided by ChatGPT without deeply understanding the solution process. This can be observed in the following dialogue:

Researcher : Can you explain why you used that formula?
S2 : I just followed the answer from ChatGPT.
Researcher : Did you understand the steps?
S2 : Not completely, I only followed the method that was provided.

This dialogue reinforces the finding that the use of ChatGPT has the potential to create dependency if it is not accompanied by proper guidance. Students tended to focus on the final answer without fully understanding the reasoning behind the use of mathematical concepts.

In the second problem, which was relatively simpler, students demonstrated better understanding because the solution steps were shorter and more straightforward. This was reflected in the students' ability to explain the formulas used.

Researcher : How did you calculate the area of the rhombus?
S3 : By using the formula one-half multiplied by diagonal one and diagonal two.
Researcher : Where did you learn that formula?
S3 : From ChatGPT, and it had also been taught previously.
Researcher : Did you relate it to the traditional house context?
S3 : Not really, I was more focused on the calculation itself.

Although the student was able to understand and explain the solution process well, the dialogue indicates that the relationship between mathematical concepts and cultural contexts was still not deeply understood. Students tended to perceive the problem as an ordinary mathematical problem without relating it to the ethnomathematical elements contained within it.

Overall, the results of these interactions indicate that the use of ChatGPT was able to increase student participation and assist students in understanding procedural solution steps. However, without guidance from the researcher or teacher, students tended to merely follow the answers provided without engaging in deeper reflective processes. Activities such as writing solutions on the whiteboard and explaining the results to the teacher or researcher helped students strengthen their understanding, although the ability to relate mathematical concepts to cultural contexts still needs to be improved. Based on these findings, the integration of ChatGPT in ethnomathematics learning requires pedagogical strategies that not only focus on problem-solving, but also emphasize the development of students' conceptual and contextual understanding. The interaction results further indicate that the use of ChatGPT influenced not only the problem-solving process but also students' level of understanding. To obtain a more systematic overview, the subsequent analysis focused on three indicators, namely scientific accuracy, logical coherence, and the Cultural Contextual Relevance.

Scientific Accuracy

Based on the analysis of ChatGPT's responses on the scientific accuracy indicator, the data recapitulation is presented in Table 2.

Table 2. Summary of The Scientific Accuracy of ChatGPT's Responses

CATEGORY	PROBLEM 1	PROBLEM 2	% PROBLEM 1	% PROBLEM 2
Accurate	0	29	0%	97%
Fairly Accurate	28	1	93%	3%
Less Accurate	0	0	0%	0%
Inaccurate	2	0	7%	0%
TOTAL	30	30	100%	100%

Based on Table 2, in the first problem based on the traditional engklek game, the majority of responses were categorized as fairly accurate. ChatGPT was generally able to identify the correct mathematical concepts, namely the area of squares and the area of a semicircle. However, some responses still showed weaknesses in defining relevant measurements, maintaining calculation precision, and consistently combining the square and semicircular components. Two responses were categorized as inaccurate because they treated the semicircle as a full circle or combined different shape components without a clear procedure. In contrast,

in the second and simpler problem, almost all responses were categorized as accurate because the rhombus area formula was stated correctly and the calculation steps were direct. These findings indicate that ChatGPT performs more optimally in solving direct and less complex problems. This finding is supported by Dao & Le (2023), who revealed that ChatGPT demonstrates good performance on basic-level mathematics problems, but its performance declines significantly on problems requiring higher-order and complex reasoning.

Logical Coherence

Based on the analysis of ChatGPT's responses on the logical coherence indicator, the data recapitulation is presented in Table 3.

Table 3. Summary of The Logical Coherence of ChatGPT's Responses

CATEGORY	PROBLEM 1	PROBLEM 2	% PROBLEM 1	% PROBLEM 2
Highly Coherent	0	30	0%	100%
Coherent	28	0	93%	0%
Less Coherent	0	0	0%	0%
Incoherent	2	0	7%	0%
TOTAL	30	30	100%	100%

Based on Table 3, ChatGPT demonstrated relatively good performance in terms of logical coherence. Most responses to the first problem were categorized as coherent because the explanation generally followed a logical order, from identifying the composite shape to calculating each part and adding the results. However, the responses were not categorized as highly coherent because several transcripts did not sufficiently clarify the relationship between the known information, the selected formula, and the final calculation. All responses to the second problem were classified as highly coherent because the problem required a shorter and more linear solution, namely identifying the diagonals, applying the rhombus area formula, and producing the final answer. This finding is supported by Pardos & Bhandari (2023), who showed that ChatGPT can provide responsive learning assistance, although guidance is still required to ensure students' understanding.

Cultural Contextual Relevance

Based on the analysis of ChatGPT's responses on the cultural contextual relevance indicator, the data recapitulation is presented in Table 4.

Table 4. Summary of The Cultural Contextual Relevance of ChatGPT's Responses

CATEGORY	PROBLEM 1	PROBLEM 2	% PROBLEM 1	% PROBLEM 2
Highly Relevant	0	0	0%	0%
Relevant	0	0	0%	0%
Less Relevant	28	0	93%	0%
Irrelevant	2	30	7%	100%
TOTAL	30	30	100%	100%

Based on Table 4, the results on the cultural contextual relevance aspect showed relatively low performance. In Problem 1, the engklek context should ideally be explained not merely as a composite plane figure, but also as a traditional game that contains spatial arrangements, counting activities, body movement, and informal geometric reasoning. In Problem 2, the traditional-house context should ideally be connected to the use of rhombus patterns as cultural representations in architectural or decorative forms. However, ChatGPT tended to provide mathematical answers without adequately explaining the cultural meanings embedded in the problems. In the first problem, the majority of responses were categorized as less relevant because ChatGPT mentioned the engklek arena but did not elaborate on its

ethnomathematical meaning. In the second problem, all responses were categorized as irrelevant because they focused only on the rhombus formula and calculation procedure. These findings indicate that ChatGPT has not yet been able to optimally integrate ethnomathematics into the learning process. This limitation is related to ChatGPT's difficulty in understanding complex and abstract learning contexts, as revealed by Baskara & Mukarto (2023). In fact, ethnomathematics emphasizes the relationship between mathematical concepts and culture in various real-life practices (Wardah et al., 2023).

Teacher and Student Perceptions

The observation results also showed that students appeared active and enthusiastic while using ChatGPT. Students asked questions, attempted to understand the solution steps, and followed the guidance provided by ChatGPT. However, students' activities still tended to focus primarily on finding answers. Some students had not yet demonstrated sufficient effort to relate the calculation results to cultural contexts. Based on these findings, the use of ChatGPT can increase learning engagement, but it still needs to be properly guided in order to avoid student dependency. Meanwhile, the interview results with the teacher further supported these findings. The teacher stated that ChatGPT could assist in developing questions, including HOTS and LOTS questions, but its use among students should be limited because students tend to rely on instant answers. The teacher also explained that ChatGPT has not yet been able to deeply relate mathematics to cultural contexts and still requires teacher guidance. This finding is consistent with the study conducted by Hankeln (2024), which stated that ChatGPT is capable of presenting structured and logical responses in solving mathematical problems, but still has limitations in understanding conceptual aspects in depth. This condition indicates that although ChatGPT is effective in providing systematic solution steps, its ability to relate more complex contexts, including culture-based learning, remains suboptimal. The interview dialogue with the teacher is presented as follows.

Researcher : What is your opinion regarding the use of ChatGPT in mathematics learning?
Teacher : ChatGPT is actually helpful, especially for creating questions. Teachers can be assisted in developing both HOTS and LOTS questions.
Researcher : Is ChatGPT appropriate to be used directly by students?
Teacher : It can be used, but it needs to be limited. If students are given too much freedom in using ChatGPT, they tend to directly take the answers without understanding the process.
Researcher : What do you think about the accuracy of ChatGPT's answers?
Teacher : Conceptually, some of the answers are already correct. However, sometimes the solution steps differ from the methods commonly taught in class, which can confuse students.
Researcher : How about ChatGPT's ability to relate mathematics to local culture?
Teacher : In my opinion, it is still lacking. ChatGPT usually provides direct calculations, but it does not explain the relationship between the problem and the cultural context in depth.
Researcher : So, what is the role of the teacher in the use of ChatGPT?
Teacher : Teachers still need to guide students and review the answers. ChatGPT may serve as a supporting tool, but it should not become the only learning source.

The interview results with students revealed different responses. The first student felt helped because ChatGPT provided quick and systematic answers. Meanwhile, the second student stated that although ChatGPT was helpful, it did not always help in deeply understanding the concepts because the explanations were sometimes too brief. The second

student also demonstrated a tendency to become passive and dependent on instant answers. The interview dialogue with the students is presented as follows.

Researcher : Does ChatGPT help you in learning mathematics?
S1 : Yes, it does. The answers are provided quickly, and the solution steps are clearly presented.
Researcher : Are the explanations from ChatGPT easy to understand?
S1 : In my opinion, they are quite easy to understand because the explanations are arranged systematically from the formula to the final answer.
Researcher : Does ChatGPT help you understand plane geometry materials?
S1 : Yes, especially in calculating areas and understanding the solution steps.
Researcher : Does ChatGPT relate the answers to local culture?
S1 : Not really. It usually focuses more on the calculations, but it still helps with the mathematical aspects.
Researcher : Does the use of ChatGPT make you more interested in learning?
S1 : Yes, because it is faster and less boring.

The second student dialogue is presented as follows:

Researcher : Does ChatGPT help you solve mathematics problems?
S2 : It helps, but sometimes I do not fully understand the concepts.
Researcher : Why do you not fully understand them?
S2 : Because the explanations are sometimes too brief and go directly to the answer.
Researcher : Do you trust ChatGPT's answers?
S2 : Not always. If the method is different from what the teacher taught, I become doubtful.
Researcher : Does ChatGPT explain the relationship between mathematics and local culture?
S2 : Not much. I pay more attention to the calculations rather than the cultural meaning.
Researcher : Does the use of ChatGPT make you more active in learning?
S2 : Sometimes it actually makes me look directly at the answers, so I think less independently.

Based on the interview results, it can be understood that the use of ChatGPT has two different implications. On the one hand, ChatGPT helps students obtain explanations that are fast, systematic, and easy to follow. On the other hand, the use of ChatGPT has the potential to make students dependent on instant answers if it is not properly guided. The different responses between S1 and S2 indicate that the effectiveness of ChatGPT is determined not only by the quality of its answers, but also by how students utilize it. Students who use ChatGPT as a supporting tool can benefit from understanding the solution procedures. In contrast, students who rely on ChatGPT merely to obtain final answers are at risk of developing superficial understanding.

In general, the findings of this study indicate that ChatGPT is stronger in mathematical aspects than in cultural contextual aspects. In terms of scientific accuracy, ChatGPT was able to provide accurate answers for simple problems, but still encountered difficulties when dealing with more complex problems. In terms of logical coherence, ChatGPT was able to present explanations in a structured and systematic manner. However, regarding the Cultural Contextual Relevance, ChatGPT has not yet been able to integrate cultural elements in depth. These findings demonstrate that ChatGPT can be utilized as a supporting tool in mathematics learning, but it is not sufficient to replace the role of teachers in ethnomathematics learning. The findings

further indicate that ChatGPT functions as a learning aid in mathematics education, yet it cannot fully replace the role of teachers. This is supported by the study conducted by Mahsun et al (2024), which revealed that the use of ChatGPT in learning faces limitations related to contextual understanding and the lack of direct supervision, thereby emphasizing the continued importance of teachers in guiding students' learning processes.

The use of ChatGPT in ethnomathematics learning should therefore be positioned as a supporting medium. Teachers still play a central role in selecting problems, guiding the use of ChatGPT, evaluating the accuracy of responses, and strengthening the relationship between mathematical concepts and local culture. Without teacher guidance, students may only understand computational procedures without comprehending the cultural values embedded within the problems. Therefore, the integration of ChatGPT and ethnomathematics can become a relevant educational innovation, but it must be implemented critically, systematically, and contextually.

Overall, ChatGPT can be utilized as an effective supporting tool in mathematics learning, particularly in terms of scientific accuracy and logical coherence. However, in the context of ethnomathematics, its utilization remains suboptimal due to its limitations in relating mathematical concepts to cultural aspects. Therefore, the active role of teachers is still required in guiding the use of ChatGPT so that learning is not merely oriented toward obtaining answers, but also toward developing conceptual understanding and connections to cultural contexts.

CONCLUSION AND SUGGESTION

Based on the findings, the quality of ChatGPT responses in solving ethnomathematics problems varied across the three indicators. ChatGPT showed stronger performance in scientific accuracy and logical coherence, especially for direct and low-complexity problems. However, its performance declined when the problem required multi-step reasoning and the integration of several geometric concepts. The weakest aspect was cultural contextual relevance, because the generated responses were still dominated by mathematical procedures and rarely explained the cultural meanings embedded in the problems.

These findings confirm that ChatGPT can serve as a supplementary tool in mathematics learning, but it should not be used as the main source of ethnomathematics learning. Teacher guidance remains essential to verify mathematical accuracy, clarify reasoning, and connect mathematical concepts with local cultural values. Thus, the use of ChatGPT in ethnomathematics learning should be designed through guided prompts, classroom verification, and cultural reflection activities.

This study has several limitations. First, the evaluation was conducted using only two ethnomathematics problems representing specific cultural contexts. Second, the study focused exclusively on ChatGPT without comparing its performance with other generative artificial intelligence tools. Third, the study involved a limited number of participants from a single educational setting, which may limit the generalizability of the findings. Therefore, the findings should be interpreted within the context of this study.

Future studies are recommended to involve more varied ethnomathematics problems, compare several generative AI tools, and examine instructional strategies that can improve AI-assisted cultural contextualization. For teachers, ChatGPT should be used in a directed manner as a learning support tool, accompanied by response verification and cultural-context discussion. For students, ChatGPT should be used not only to obtain quick answers, but also to

understand solution steps, question the reasoning behind each procedure, and develop independent mathematical thinking.

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