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Reconceptualizing Ethnomathematics-Based Assessment: Teachers' Beliefs and Implications for Mathematics Education

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ABSTRACT

Objective – This study aims to examine in depth how teachers' beliefs influence the conceptualization and practice of ethnomathematics-based assessment in mathematics education.

Methodology – This study employs a descriptive qualitative approach, involving 10 junior high school mathematics teachers in Deli Serdang. Data collection was conducted through semi-structured interviews, and data analysis used the Miles and Huberman model, which includes data reduction, data presentation, and conclusion drawing.

Findings – The results indicate that ethnomathematics-based assessment is understood not merely as a technical innovation in evaluation but as a pedagogical and epistemological process that connects mathematics, culture, and students' learning experiences. Teachers view mathematics as a universal science that can be interpreted within local cultural contexts; consequently, assessments aligned with students' socio-cultural realities are deemed more meaningful. This study also found that ethnomathematics-based assessment is a process of cultural mathematization that involves identifying cultural practices, transforming mathematical concepts, and translating them into contextual assessment activities. Furthermore, teachers' beliefs play a crucial role in the implementation of assessment, although a gap persists between teachers' positive beliefs and classroom assessment practices due to limited systemic support.

Contribution – This study elucidates the process of cultural mathematization in assessment design and identifies the gap between beliefs and practices as a basis for developing more contextually relevant training and educational policies

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INTRODUCTION

In the 21st century, mathematics education demands a transformation in teaching and assessment approaches that focus not only on cognitive abilities but also on students' social and cultural contexts (Ramadhani, Soeharto, and Arifiyanti, 2025). Assessment is no longer merely about measuring cognitive outcomes but must reflect conceptual understanding, social context, and connections to students' real-world experiences (Marsigit, Irfan, and Sukoco, 2026). This paradigm shift positions learning as a process of constructing contextual and meaningful knowledge. Ethnomathematics has emerged as a teaching method that connects formal mathematical concepts with cultural practices embedded in everyday community life (Justine, Rohati, and Nusantara, 2026). Mania and Alam (2021) state that "by contextualizing mathematics, students will preserve their culture"; therefore, ethnomathematics should be incorporated into the mathematics curriculum.

The integration of ethnomathematics into learning can enhance the quality of students' learning experiences, strengthen the relevance of mathematics, and help students understand the connection between mathematics and daily life (Devian *et al.*, 2024; Choirunnisa, 2026). Therefore, the integration of ethnomathematics is not only important in the learning process but also in the assessment systems used by teachers (Marsigit, Irfan, and Sukoco, 2026). However, the application of ethnomathematics in teaching and assessment practices still faces various challenges, particularly regarding teachers' limited understanding of the concept and its implementation in the classroom (Maulina & Maulida, 2023). Although integrating ethnomathematics into learning and assessment offers great potential to enhance the meaning of learning, its implementation depends heavily on how teachers interpret, understand, and adopt this approach in their pedagogical practices. Mosimege, M., & Egara (2022) and Kholid (2022) state that to support and enrich student learning, ethnomathematics must be integrated into mathematics instruction and teaching materials, and teachers must be trained to enhance their cultural knowledge.

The success of implementing ethnomathematics depends heavily on teachers' ability and confidence in designing culturally contextualized instruction and assessment (Supriatin, Purnomo, and Aziz, 2025). In the field of mathematics education, teachers' beliefs are studied from two perspectives: beliefs about the essence of mathematics and beliefs about teaching methods and the mathematics learning process (Kul, 2018). Teachers' attitudes, beliefs, and teaching practices influence student achievement across subjects, including mathematics (Afrillia & Purnomo, 2025). Teachers' beliefs are a key factor in how ethnomathematics is interpreted and applied in mathematics instruction and assessment. (Astuti, Wijaya, and Hanum, 2024b) . Research by Rizky and Nugraha (2026) indicates that teachers hold positive perceptions of formative assessment, as evidenced by their understanding of assessment functions, an open attitude toward innovation, and the use of various strategies, such as quizzes, observations, assignments, and projects. Assessment is used to evaluate student achievement, design learning, and improve the teaching strategies teachers employ. (Teachers' views and beliefs regarding mathematics teaching and understanding emerge as key elements in mathematics education studies (Tong *et al.*, 2026). Research findings indicate that teachers have a positive response to ethnomathematics; they recognize its importance in learning (Khalil, 2023; Astuti, Wijaya, and Hanum, 2024b)

Understanding the relationship between teachers' beliefs and assessment practices is crucial for ensuring the successful and sustainable integration of ethnomathematics into mathematics education (Astuti, Wijaya, and Hanum, 2024a). Teachers with positive attitudes toward assessment tend to use it as a guide to improve teaching quality. In contrast, teachers with negative perceptions are more likely to view assessment as a burden that disrupts meaningful learning (Tóth & Csapó, 2022). Given this gap, a more comprehensive study is needed to understand the relationship between teachers' beliefs and ethnomathematics-based assessment practices in mathematics education. This study aims to address this gap by examining in depth how teachers' beliefs shape the conceptualization and practice of ethnomathematics-based assessment, and the implications for mathematics education.

METHODOLOGY

Research Design

This study employs a descriptive qualitative approach. The qualitative approach is used to broadly explore teachers' beliefs and experiences regarding the implementation of ethnomathematics-based assessment in mathematics instruction. Arikunto states that descriptive qualitative research is designed to collect data on existing conditions or effects (Sari & Arini, 2024).

Participants

The research subjects were 10 junior high school mathematics teachers in Deli Serdang Regency, North Sumatra. The participating teachers from each school are presented in Table 1 below.

Table 1. Number of Participating Teachers from Each School

No	School	Number of Teachers
1	PAB 9 Klambir Junior High School	1
2	PAB 19 Manunggal Junior High School	1
3	MTs PAB 2 Sampali	1
4	MTS PAB 3 Helvetia	2
5	Melyaz Islamic Junior High School	1
6	Hamparan Perak Public Junior High School 1	2
7	PAB Junior High School 19 Helvetia	1
8	PAB 1 Klumpang Junior High School	1
	Total	10

The research subjects were selected through purposive sampling based on their teaching experience and involvement in contextual learning. The teaching experience referred to in this study includes teachers who have taught mathematics for 5–15 years at the junior high school level, have experience in designing and implementing classroom assessments, and are actively involved in teaching practices that integrate students' real-life contexts and local culture into mathematics instruction. These criteria are considered important because teachers with such experience are assumed to possess adequate pedagogical understanding and practical insights regarding the implementation of ethnomathematics-based assessment in classroom learning.

Data Collection

Data collection in this study was conducted through interviews to explore culture-related aspects of mathematics, teachers' pedagogical beliefs, and their understanding and implementation of ethnomathematics-based assessment in classroom learning. Semi-structured interviews were conducted with junior high school mathematics teachers to analyze their beliefs, understanding, and experiences in integrating local cultural contexts into the assessment process.

Instruments

The instruments used in this study include: interviews, observations, and documentation. Interviews were used to examine beliefs, understanding, and the implementation of an assessment that integrates local cultural contexts into the learning evaluation process. Interviews were conducted with all junior high school teachers who were the subjects of this study. Observations were used to examine teachers' actual classroom practices and determine whether they were grounded in local culture. Additionally, observations were used to examine the assessment methods implemented. Documentation was used to analyze the instructional materials and assessment methods employed**.**

Data Analysis

The data analysis method used in this study is qualitative. Qualitative data analysis was used to analyze and examine in depth how teachers' beliefs influence the conceptualization and practice of ethnomathematics-based assessment, as well as its implications for mathematics education. The qualitative approach used in this study followed the concept proposed by Miles and Huberman, consisting of three stages: data reduction, data presentation, and conclusion drawing.

In this study, data analysis followed the Miles and Huberman model, which proceeds in a cyclical, interactive manner. The process begins with data reduction—the selection, focusing, simplification, and coding of data from open-ended questionnaires and interviews—grouping teachers' responses into categories such as "Mathematical and cultural characteristics," "Teachers' beliefs," "Assessment practices," and "Challenges" in implementing ethnomathematics. This is followed by data presentation, which involves organizing the reduced data into descriptive narratives, matrices, thematic tables, or charts to facilitate understanding of patterns and relationships among categories. This process concludes with the drawing and verification of conclusions, which involves formulating preliminary findings based on emerging patterns and then re-examining their validity through triangulation of sources and techniques, cross-checking data, and verifying the consistency of findings to arrive at valid and reliable conclusions.

FINDINGS

Assessment is not merely a final evaluation tool but an integral part of a learning strategy aimed at achieving expected learning outcomes (Ali *et al.*, 2026). The success of assessment implementation is greatly influenced by teachers' understanding and beliefs, which shape decision-making and classroom assessment practices (Latif, A., & Wasim, 2022; Koubek & Rodriguez, 2023). An analysis of teachers' beliefs regarding assessment can be seen from the researcher's interviews with the research subjects. The interview results are presented in the statements below, along with the aspects discussed. Code P: Researcher; G: Teacher.

The Nature of Mathematics and Culture

P: In your opinion, what is mathematics?
G1: In my view, mathematics is the science that studies patterns, structures, and relationships between concepts logically and systematically. Mathematics is not merely a collection of formulas, but a way of thinking that helps us understand the world. When I teach plane figures, for example, I do not merely teach the formula for the area of a rectangle, but also encourage students to think about why the formula applies and where they encounter it in real life.
G2: In my opinion, mathematics is the science that studies numbers, patterns, structures, and relationships used to solve various problems in daily life as well as in other fields of science. Mathematics also trains logical, critical, and systematic thinking skills.
G3: Mathematics is a fundamental science that we must master; every lesson and every aspect of life we experience inevitably involves mathematics.

P: Is mathematics universal, or can it be linked to local culture?
G1: I believe mathematics is fundamentally universal; for example, the concepts of angles, area, and volume apply everywhere. However, how mathematics is discovered, used, and interpreted is heavily influenced by local culture. The trapezoidal roofs of traditional Batak Toba houses, the woven Malay mats that form geometric patterns, or the cone-shaped tumpeng—all of these are evidence that our local culture has been "mathematical" long before formal mathematics was taught in schools.
G2: Oh, the scope of mathematics is not just local, is it? It can be linked to local culture—especially when we look at the number of traditional houses we have, how many types there are, what their structures are like—what exactly are we talking about here? Who designed them? Nowadays, it is architects, right? Well, they have to understand the calculations down to the details; the connection to culture is crystal clear.
G3: Mathematics is universal, but it can certainly be linked to local culture to make it easier for students to understand. For example, when children buy snacks, they are definitely using math, aren't they?

P: To what extent is cultural context important in mathematics education?
G1: It is very important, especially at the elementary and middle school levels. Elementary and middle school students learn from concrete examples that are close to their daily lives. If I teach three-dimensional shapes using examples like a milk carton as a cube or a can as a cylinder, students grasp the concepts more easily than if I simply draw them on the blackboard. Local cultural context strengthens the connection between school mathematics and students' lives, making learning more meaningful and less foreign.
G2: It is very important because when math is just about numbers, many students already feel afraid just by looking at those numbers. However, when we incorporate local culture, students immediately understand because it connects to their daily lives.
G3: Cultural context is important because it helps students understand mathematical concepts through experiences close to their lives. As in the earlier example, they have to count money and tell time; all those numbers involve math.

Based on the interview results, teachers view mathematics as a universal science encompassing patterns, structures, relationships, and tools for logical and systematic thinking in solving everyday problems. However, there is a strong awareness that mathematics can and should be connected to local culture, making learning more contextual and meaningful. Teachers believe that culture is not merely an accessory but a concrete source for understanding abstract mathematical concepts, so cultural context plays a vital role in bridging students' understanding of mathematical concepts.

Pedagogical Beliefs

The results of an interview with one of the teachers, selected as a sample to explore Pedagogical Beliefs, are shown below.

P: How do you usually teach mathematical concepts?
G4: I use the concrete-semi-concrete-abstract (CSA) approach. For two-dimensional shapes, I start with real objects—such as ceramics in the classroom, a table surface, or batik fabric—then ask students to draw their representations, and only after that do we move on to mathematical formulas and symbols. For three-dimensional shapes, I often ask students to bring objects from home, such as gift boxes, used cans, or plastic balls. This way, students do not just mechanically memorize formulas but build understanding from real-world experiences.

P: Have you ever used local cultural contexts? Can you tell us about that?
G4: Yes, and that was one of my most memorable teaching experiences. When teaching two-dimensional shapes, I brought in a photo of a gorga (Batak carving) and asked students to identify the shapes within it—triangles, rhombuses, and trapezoids. The students were very enthusiastic because they felt their culture was "recognized" in a math lesson. For three-dimensional shapes, I once linked the material to the roof of a traditional Batak community hall, which is shaped like a triangular prism. Students were asked to estimate the roof's surface area based on its dimensions. The students' responses were far more active than in standard problems.

P: In your opinion, does the contextual approach help students' understanding?
G4: Yes, I am very confident of that. Based on my experience, students who learn through real-world contexts retain their understanding for longer. They are not only able to answer worksheet questions but can also explain these concepts in their own words. The contextual approach also helps students who are usually passive become more confident in asking questions and participating in discussions, because they feel they "understand" the topic.

Teachers believe that effective mathematics learning must start from contexts close to students' lives, whether through daily experiences or local culture. The approaches used tend to be contextual and progressive (from concrete to abstract), and involve real-life examples, discussions, and practice. The use of cultural contexts, such as market activities or local cultural objects, has been shown to enhance students' understanding, engagement, and motivation to learn. Thus, teachers believe that meaningful learning occurs when students can connect mathematics to the realities they know.

Assessment Beliefs (Teachers' Views on Assessment)

The results of an interview with one of the teachers, which was used as a sample to explore Assessment

Beliefs, are shown below:

P: In your opinion, what is the main purpose of assessment?
G5: "We see how much we have learned, for example, over the course of a month – there are weekly, monthly, and mid-semester assessments, followed by the final semester assessment. So, during that learning period, we see how much we have achieved. If there were no assessments, we would not know whether we have succeeded or not."

P: Is assessment only for measuring learning outcomes?
G5: "No, not exactly. Sometimes during an assessment, a student might be sick or unfocused. Or maybe they are just having a bad day? Not necessarily. There are also smart students whose scores drop during assessments. When a struggling student gets a high score – whether by cheating or some other means – that is unreliable. However, assessments at least serve as a measuring tool, even if they do not guarantee 100 percent accuracy. What we know for sure is what happens in the classroom. In the classroom, we can identify which students are truly capable. That is why we have daily grades. We can use those daily grades to make up for a student's assessment score. That is how it works."

P: What is your opinion on context-based cultural questions?
G5: "Culturally context-based questions are excellent because they can boost students' motivation to learn, make the questions more meaningful, and help students understand mathematical concepts through situations that are close to their daily lives.

Conclusions from the interview results indicate that teachers' beliefs regarding assessment view it not only as a tool for quantitatively measuring learning outcomes but also as a means to continuously monitor students' learning progress through various forms of assessment, such as daily, weekly, and semester assessments. Teachers believe that assessment has limitations in representing students' overall abilities, as it is influenced by situational factors such as physical condition, concentration, and the potential for cheating, so assessment results do not always reflect students' actual abilities. Therefore, the assessment process during classroom learning is considered more authentic in understanding students' abilities. Additionally, teachers also believe that good assessment must integrate cultural context, so that it not only measures cognitive abilities such as numeracy but also instills and preserves local cultural values in mathematics learning.

The Assessment Design Process

To examine the teachers' Assessment Design Process, the following is based on an interview with Teacher G10, a respondent who had previously designed assessments:

P: How do you design math questions?
G10: "For now, we base them on the curriculum. The curriculum is already in place. We have also been given guidelines. We follow those guidelines. We do not just create them randomly."

P: Have you ever linked questions to local culture?
G10: For now, the questions you mentioned earlier involve drawing a traditional house. Yes, there are. For example, after you draw a traditional house, at which point? For example, at the roof's corner. Alternatively, at which coordinate point?"

P: How do you transform cultural contexts into math problems?
G10: I transform cultural contexts into math problems by taking everyday activities within those cultures and linking them to mathematical concepts such as arithmetic operations, measurement, and geometry.

P: How do you determine the difficulty level of these problems?
G10: The difficulty level of the problems does need to vary. Children are all different. If we create problems that are too difficult for smart kids, that is hard. For less capable children, it is completely impossible. It is very difficult. Moreover, even for bright students, it remains difficult for those with lower ability. So the difficulty level – especially when involving mathematical formulas – means explaining the formula takes a long time, then understanding the concept takes even longer. A single problem might require two pages to explain. Especially if there are many problems – explaining each one separately would be very difficult. That is the reality. Bright students might still be

able to handle it. We review the material, right? For students who struggle, we have to be strategic – teachers have to be creative. We select difficult problems within a certain percentage. We will take the parts we consider somewhat easier, at a certain percentage. So, at least students below that level can handle them. They might not reach the minimum passing score. That is what we are considering. For the brighter students, they can get perfect scores, but we have to think about the many students who only reach the minimum passing score."

Teachers view assessment not only as a tool for measuring learning outcomes but also as a means to understand students' learning processes, identify difficulties, and improve teaching strategies. Assessment serves formative and reflective functions, not merely summative ones. Furthermore, teachers view culture-based assessment positively, as it is considered capable of making questions more meaningful, increasing motivation, and helping students understand concepts more deeply. However, there is an awareness that assessment must still maintain the clarity of mathematical concepts so that they are not obscured by context.

In the context of ethnomathematics, teachers are involved in the process of cultural mathematization, which includes: identifying relevant cultural phenomena, extracting mathematical concepts within them, simplifying the context to suit students' levels, and designing questions in the form of contextual narratives. The determination of question difficulty is based on students' abilities, the complexity of concepts, and cognitive levels (from LOTS to HOTS). However, teachers face several challenges, such as limited references, difficulty connecting culture with mathematical concepts, and time constraints; therefore, support in the form of training, collaboration, and adequate learning resources is necessary. Therefore, if we consider the relationship between assessment, teachers' beliefs, and ethnomathematics, this can be illustrated as shown in the figure below.

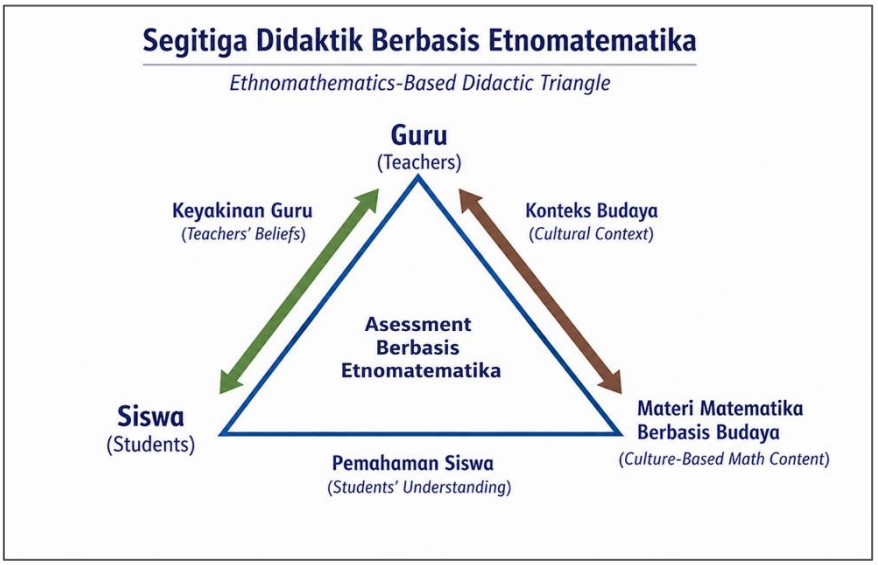

Figure 1. Ethnomathematics-Based Didactic Triangle

The ethnomathematics-based didactic triangle illustrates the relationship between teachers, students, and culturally rooted mathematical content, with assessment at the core of learning. The relationship between teachers and students is significantly influenced by teachers' beliefs, in which teachers view mathematics not only as an abstract science but also as knowledge that connects to cultural contexts and daily life. These beliefs encourage the use of contextual approaches and the integration of local culture, making learning more meaningful (Adler, 2002). The relationship between teachers and the subject matter is mediated by cultural context, in which teachers engage in cultural mathematization by connecting local cultural practices to formal mathematical concepts.

Meanwhile, the relationship between students and the subject matter is reflected in their understanding, which improves when learning incorporates cultural contexts relevant to their lives. Ethnomathematics assessment, situated at the center of the triangle, serves not only as an evaluation tool but also as a means to understand the learning process and enhance teaching. However, research indicates a gap between teachers' positive beliefs about ethnomathematics and suboptimal assessment practices due to limitations in

competencies and resources. Therefore, this triangle emphasizes that integrating teachers' beliefs, cultural context, and assessment is crucial for creating contextually meaningful mathematics learning**.**

DISCUSSION

Teachers in this study affirmed that cultural artifacts and social practices contain mathematical structures that can be mobilized as concrete representations to teach abstract concepts; thus, the findings indicate an epistemological orientation leaning toward a constructivist-contextual approach in mathematics education. This perspective aligns with the idea of ethnomathematics, which holds that mathematics is not merely universal knowledge detached from culture, but rather knowledge constructed and given meaning in local contexts. By interpreting teachers' beliefs through an epistemological lens, the findings suggest that teachers view mathematics as a symbolic system that can be reconnected to students' experiential—a theoretical foundation supporting the integration of ethnomathematics into the curriculum and assessment practices.

Analysis of interviews and documentation reveals that teachers engage in a process that can be termed "cultural mathematization": identifying cultural phenomena, extracting mathematical concepts, simplifying the context to match students' levels, and translating these into narrative assessment items. This process must be situated within a didactic framework; the ethnomathematics-based didactic triangle illustrated depicts the mediation between teachers, students, and culturally rooted content, with assessment as the central hub connecting learning objectives, processes, and outcomes. Theoretically, this reinforces the argument that assessment design is not merely technical (validity, reliability) but also *cultural-semiotic*: assessment mediates the construction of mathematical meaning within a socio-cultural context.

The finding that teachers view cultural contextualization as a way to enhance student understanding and engagement supports previous studies emphasizing the benefits of ethnomathematics for learning relevance and for increased student participation when learning is grounded in real-world experiences (Mania, S. & Alam, 2021; Devian *et al.*, 2024). The study by Sunzuma, G., & Maharaj (2022) indicates that a lack of understanding of cultural elements and diversity among students hinders educators from effectively utilizing ethnomathematics. However, this study also confirms literature reports indicating an implementation gap despite positive attitudes (Mosimege, M., & Egara, 2022; Maulina & Maulida, 2023). Positive beliefs do not automatically translate into mature assessment practices due to barriers related to competence, resources, and systemic support. A key distinction emerging here is the detailed process of cultural mathematization described by teachers (concrete steps for designing culture-based problems), which contributes specific empirical evidence to a literature that has often been normative or conceptual.

Although teachers' beliefs are an important asset, the data indicate that this asset is vulnerable to pragmatic barriers: limited academic references, curriculum pressures, time constraints, and the need to balance question difficulty levels for students of varying abilities. Critically, this indicates that pedagogical transformation requires more than just a shift in attitude; it demands *a knowledge infrastructure* (teaching resources, a bank of contextual questions), professional capacity (targeted training), and mechanisms for interprofessional collaboration to formulate valid and fair assessment criteria (e.g., rubrics that integrate cultural and cognitive aspects). Without such interventions, there is a risk that culturally based questions will serve merely as "decoration" of context, without making a valid contribution to the measurement of mathematical competence.

Placing ethnomathematics assessment at the center of the learning process requires addressing two theoretical and practical issues: (1) conceptual validity—ensuring that the selected cultural context indeed contains the intended mathematical concepts and does not create instructional ambiguity; (2) fairness and accountability—ensuring that variations in students' cultural backgrounds do not result in biases that disadvantage specific groups. Therefore, the design of rubrics and assessment procedures must combine indicators of cognitive ability (mathematical accuracy) with indicators of contextual interpretation (the ability to relate mathematics to cultural situations), accompanied by assessment moderation procedures to maintain inter-rater consistency.

Based on the findings, three systemic interventions are urgently needed: (a) professional development programs focused on techniques for the mathematization of culture and the design of assessment instruments;

(b) the creation of a repository of learning resources and validated examples of ethnomathematics test items (including assessment rubrics); (c) curriculum policies that provide time and flexibility for teachers to develop and moderate contextual assessments. These three steps address the identified barriers (competencies, resources, policies) and increase the likelihood that positive beliefs will be internalized into consistent and high-quality assessment practices.

Methodologically, this descriptive qualitative study provides depth to the understanding of teachers' beliefs, but the generalizability of the findings is limited to a sample of 10 teachers in a single district; thus, comparative cross-regional studies and quantification of key aspects (e.g., belief scales vs. actual practices) are needed to assess the breadth of its impact. Furthermore, future research could explore intervention studies (teacher training + question repositories) that test the transformation of beliefs into practice in assessment design. A mixed-methods approach combining classroom observation, item analysis, and student feedback would enrich the evidence regarding the effectiveness of ethnomathematics-based assessment.

However, there remains a gap between beliefs and practice, particularly in the development of ethnomathematics-based assessment, which remains suboptimal. This gap is influenced by factors such as resource constraints, competencies, and systemic support. Therefore, these findings emphasize that the development of ethnomathematics-based assessment requires not only conceptual changes but also systemic interventions, such as training, the provision of learning resources, interdisciplinary collaboration, and educational policies that support assessment innovation.

The uniqueness of this study lies in its effort to reconceptualize ethnomathematics-based assessment through the lens of teachers' beliefs by integrating epistemological, pedagogical, and assessment dimensions into a comprehensive analytical framework. This study not only highlights the importance of cultural context in assessment but also uncovers the process of cultural mathematization carried out by teachers as well as the gap between beliefs and practices in its implementation. Furthermore, this research produces a conceptual model that explains the relationship between teachers' beliefs and the process of designing ethnomathematics-based assessment, thereby providing theoretical and practical contributions to the development of contextual, meaningful, and culturally responsive mathematics assessment.

CONCLUSION

This study demonstrates that ethnomathematics-based assessment cannot be understood merely as a technical innovation in the development of evaluation instruments, but as a pedagogical and epistemological process that reconstructs the relationship between mathematics, culture, and students' learning experiences. Teachers in this study view mathematics as a universal science, yet one that can be interpreted through the lens of local cultural contexts. This perspective shapes the pedagogical belief that mathematics learning and assessment become more meaningful when connected to the socio-cultural realities close to students' lives.

Conceptually, this study emphasizes that ethnomathematics-based assessment is not merely the addition of cultural context to math problems, but rather a process of "cultural mathematization" that involves identifying cultural practices, extracting mathematical concepts, transforming context into pedagogical representations, and translating these into meaningful assessment activities. Thus, assessment functions not only as a tool for measuring learning outcomes but also as a medium for constructing meaning that connects formal mathematical knowledge with students' cultural experiences.

Research findings also indicate that teachers' beliefs play a central role in determining how ethnomathematics is understood and implemented in assessment practices. Teachers who view mathematics as contextual knowledge tend to develop assessment approaches that are more reflective, formative, and student-understanding-oriented. However, there is a gap between teachers' positive beliefs and the implementation of ethnomathematics-based assessment in the classroom. This gap indicates that transforming assessment practices cannot rely solely on a shift in teachers' paradigms but also requires systemic support through professional capacity development, contextual learning resources, spaces for pedagogical collaboration, and educational policies that foster assessment innovation.

The primary theoretical contribution of this study lies in reconceptualizing ethnomathematics-based

assessment by integrating epistemological, pedagogical, and cultural dimensions into a single conceptual framework. This study expands understanding of culturally responsive mathematics assessment as a mediating process between teachers, students, and cultural contexts in the construction of mathematical meaning. Within this framework, assessment is no longer viewed as a neutral evaluative activity separate from culture, but as a social practice that shapes how students understand mathematics in their lives.

Thus, this study implies that the development of contextual and culturally equitable mathematics education requires a shift in assessment perspective. Ethnomathematics-based assessment should be designed to foster a reflective space that not only measures students' mathematical competencies but also values their cultural identities, local experiences, and thought processes in constructing meaningful mathematical understanding.

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