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Teachers' and Students' Understanding of Rambu Solo' Cultural Values as the Foundation for Ethnomathematics Development in Mathematics Learning in North Toraja

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Abstract

This study investigates teachers' and students' understanding of Rambu Solo' cultural values as a foundation for developing ethnomathematics-based mathematics learning in North Toraja, Indonesia. The Rambu Solo' ceremony, a traditional Torajan funeral ritual rich in mathematical elements such as geometry, measurement, and proportional reasoning, provides a meaningful context for culturally responsive pedagogy. A quantitative descriptive design was employed, involving three mathematics teachers and forty eighth-grade students from SMP Negeri 1 Balusu, North Toraja. Data were collected using a Local Cultural Understanding Questionnaire, which was validated through expert judgment and statistical testing. The validity test using the Pearson Product–Moment correlation indicated that all items were valid ($r > 0.30$), while the reliability test using Cronbach's Alpha ($\alpha = 0.87$) showed high internal consistency, confirming the instrument's reliability.The descriptive statistical analysis revealed that both teachers and students demonstrated a low level of understanding of Rambu Solo' cultural values and their application in mathematics learning, with mean scores of 2.55 and 1.95, respectively. These findings indicate that cultural elements have not yet been systematically incorporated into classroom practices. The lack of training in local wisdom-based pedagogy, limited contextual learning materials, and absence of a structured learning model contribute to this condition. The study highlights the urgent need for culturally responsive mathematics instruction that integrates ethnomathematical perspectives rooted in local traditions. Such integration not only enhances students' conceptual understanding but also fosters cultural awareness, engagement, and pride in their heritage. The results provide an empirical foundation for developing a Toraja-based ethnomathematics learning model to make mathematics education more contextual, meaningful, and culturally sustaining.

Keywords: Rambu Solo'; Cultural Values; Mathematics Learning; Teachers' and Students' Understanding;

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INTRODUCTION

Mathematics education plays a critical role in developing logical reasoning, problem-solving skills, and analytical thinking among students. However, in culturally diverse societies like Indonesia, traditional approaches to teaching mathematics often lack contextual relevance, potentially leading to disengagement and a sense of alienation among students, particularly those from indigenous or minority backgrounds. The Toraja ethnic group in South Sulawesi, Indonesia, with its rich cultural traditions such as the Rambu Solo' ceremony, represents a vital opportunity for contextualizing mathematical learning through ethnomathematics. The Rambu Solo' is a complex cultural ritual centered around death ceremonies, involving various social, spatial, and numerical practices that can be translated into mathematical concepts. Integrating such cultural values into the mathematics curriculum is not only a way to promote educational equity but also a strategy to make learning more meaningful and personally relevant to students (Payadnya et al., 2024; Fouze & Amit, 2023).

Ethnomathematics provides a framework for recognizing and valuing the mathematical ideas embedded in cultural practices. Through this lens, mathematics is not a set of abstract and universal truths but a dynamic discipline shaped by cultural experiences and practices. By leveraging students'

cultural backgrounds, educators can create a more inclusive and engaging learning environment. In the case of the Torajan culture, the rituals, patterns, measurements, and communal activities associated with Rambu Solo' offer tangible opportunities to explore mathematical concepts such as geometry, algebra, estimation, and statistics. Furthermore, embedding such cultural content into mathematics instruction supports character development, as students learn values such as community cooperation, respect for tradition, and social responsibility. Thus, understanding and integrating the cultural values of Rambu Solo' into mathematics education aligns with the goals of culturally responsive pedagogy, enhancing both cognitive and affective domains of student development (Suryonegoro et al., 2024; Pawartani et al., 2024).

Despite the promising potential of ethnomathematics, integrating Rambu Solo' values into mathematics education in Toraja faces several pressing challenges. First is the issue of cultural relevance and accuracy. Rambu Solo' is not merely a cultural artifact but a living tradition with deep spiritual and communal significance. Teachers must be cautious in translating these complex rituals into teachable mathematical concepts without diluting or misrepresenting their cultural meaning (Dominikus et al., 2024). This becomes particularly difficult when students' exposure to traditional practices is minimal due to urbanization or shifting cultural values, which can create a gap in comprehension and appreciation between generations (Wulandari et al., 2024). Moreover, within the Torajan community itself, diverse interpretations of Rambu Solo' may emerge, adding complexity to consensus-building for curriculum development.

The second challenge lies in the pedagogical transformation required to incorporate cultural values into the curriculum. Ethnomathematical instruction demands a shift from conventional teaching methods often reliant on rote learning and standardized assessments toward more participatory and inquiry-based learning models. However, many teachers lack the professional development and resources necessary to implement these methods effectively (Rosa & Orey, 2023; Izard & Moss, 2024). There is a clear gap in teacher training programs regarding the integration of cultural elements into mathematics, which may lead to uncertainty, reduced confidence, and reluctance to deviate from traditional pedagogical norms. As a result, the intended meaningful connection between mathematics and culture may remain superficial, failing to engage students on a deeper level.

A third significant barrier is the variability in teacher preparedness and attitudes toward ethnomathematics. While some educators may recognize the value of cultural integration, others may view it as an additional burden or a diversion from achieving core curriculum goals (Safriyanti & Yahfizham, 2023; Khalil, 2023). This divergence often stems from a lack of exposure to successful models of culturally responsive teaching and minimal institutional support for innovation in the classroom. Furthermore, rigid curriculum standards and assessment systems leave limited flexibility for educators to incorporate culturally grounded content. Consequently, without systemic support and clear frameworks, the integration of Rambu Solo' into mathematics education risks becoming inconsistent and ineffective, limiting its potential to enhance learning and cultural identity.

Empirical research has demonstrated that the integration of ethnomathematics into classroom instruction significantly enhances students' engagement, comprehension, and academic achievement. For example, studies by Payadnya et al. (2024) and Fouze & Amit (2023) reveal that when local cultural elements are embedded in mathematical tasks, students not only show greater interest but also demonstrate improved problem-solving abilities and conceptual understanding. Specifically, using cultural contexts such as the Rambu Solo' ceremony enables students to make personal and contextual connections to abstract mathematical concepts, thereby deepening their learning. This method of instruction helps students see mathematics as a relevant and dynamic part of their lived experiences rather than as a disconnected academic subject. Furthermore, empirical findings suggest that ethnomathematical approaches foster a sense of belonging and identity affirmation, which are essential for the development of positive educational attitudes, especially among students from marginalized communities (Hu et al., 2023).

In addition to improving cognitive outcomes, ethnomathematics-based learning environments also support affective and character development. Research by Pawartani et al. (2024) indicates that engaging students in culturally grounded mathematical tasks encourages the internalization of values

such as collaboration, responsibility, and respect core themes present in the Rambu Solo' ceremony. These values are reflected in group activities, decision-making processes, and communal problem-solving embedded in cultural traditions. Through such learning experiences, students are not only acquiring mathematical knowledge but also cultivating ethical perspectives and interpersonal skills. This dual development of cognitive and moral dimensions is vital in preparing students for both academic success and responsible citizenship. Therefore, empirical evidence strongly supports the integration of Rambu Solo' into mathematics education as a means to address the current challenges while fostering holistic student development.

Several studies have explored the role of cultural understanding among teachers and students as a foundational element for the successful integration of ethnomathematics into the curriculum. For instance, Nst & Batubara (2024) conducted a study on Batak culture in North Sumatra, revealing that teachers' deep comprehension of local cultural values significantly influenced their ability to design relevant and effective mathematics lessons. This suggests that teacher knowledge and sensitivity to cultural practices play a pivotal role in transforming ethnomathematical potential into practical learning outcomes. Similarly, the research by Lestari & Mulyawati (2024) on the use of traditional musical instruments to teach geometry emphasizes how teachers who understand the cultural significance of these tools can better engage students and contextualize abstract concepts.

Student understanding of cultural practices also plays a key role in facilitating meaningful mathematical learning. In a study conducted by Meyundasari et al. (2024), students who had prior knowledge and familial exposure to local cultural practices showed higher engagement and conceptual retention when participating in ethnomathematics-based lessons. This finding aligns with the results of Supiyati et al. (2023), who found that students' cultural familiarity enhanced their identity formation and academic confidence. The study emphasized that recognizing students as cultural beings allows for more personalized and impactful teaching strategies, especially in culturally rich regions like Toraja. When students see their own traditions reflected in the curriculum, their motivation and sense of relevance increase, leading to improved learning outcomes.

Additionally, teacher-student collaboration in exploring cultural knowledge has been identified as a critical success factor in several ethnomathematics studies. For example, research by Fonataba et al. (2023) and Abay & Parola (2024) underscores the value of participatory learning models where both teachers and students contribute cultural insights to shape the learning process. This reciprocal exchange fosters mutual respect and deeper engagement, as both parties become co-creators of knowledge. In the context of Toraja, involving students in identifying mathematical patterns within the Rambu Solo' ceremony can cultivate a sense of ownership and pride in their cultural heritage while reinforcing their mathematical understanding. Therefore, existing literature supports the importance of examining teachers' and students' cultural understanding as a central component of successful ethnomathematics implementation.

The integration of ethnomathematics within different cultural contexts has been examined in numerous studies, each offering unique insights into the interplay between culture and mathematics education. This study differs from previous research in various ways, particularly in its contextual focus, methodologies employed, and educational implications, providing significant new insights into the effectiveness of this approach.

One of the major distinctions of this study lies in its examination of a specific cultural context, namely the Rambu Solo' traditions of Toraja, Indonesia. Previous research has predominantly explored ethnomathematics in a broad spectrum of cultural backgrounds, such as Akan culture in West Africa (Owusu-Darko et al., 2023) and folk games in the Bicol region of the Philippines (Abay & Parola, 2024). While these studies emphasize localized cultural practices, this research delves deeper into a unique and intricate cultural ritual, examining how the complexities of Rambu Solo' can inform mathematical concepts, which distinguishes it from broader ethnomathematical studies. Moreover, unlike earlier works that often generalized findings across multiple communities or cultures, this study provides a focused analysis of a singular cultural event. This specificity allows for a more nuanced exploration of how particular cultural practices within a community directly inform local teaching practices and mathematical

understanding, offering a richer narrative about the relationship between culture and mathematics than previous broad-spectrum studies can provide (Nst & Batubara, 2024).

Another critical area where this study diverges is in its methodological approach. Many ethnomathematics studies have employed qualitative analyses focused on broad observations or surveys of teaching practices across various educational settings. For instance, studies like those conducted by Abdullah et al. emphasize structural methodologies without a deep dive into the specificities of localized cultural practices (Abdullah et al., 2024). In contrast, this study utilizes ethnographic methods, including participatory action research, which engage community members in the educational process, fostering co-creation of knowledge rather than merely observing it. This participatory approach allows for iterative feedback from the community, ensuring that the educational materials developed are contextually relevant and culturally sensitive (Pirma & Caswita, 2023). Additionally, the study incorporates a direct pedagogical approach, with the development of mathematics instructional materials specifically designed around the Rambu Solo' practices. This methodological innovation not only enhances the relevance of the educational content but also provides a practical framework that educators can apply in the classroom (Kyeremeh et al., 2025).

The implications of this research are profound and nuanced, offering new insights into how ethnomathematics can bridge cultural gaps in education. Previous studies have shown that culturally relevant pedagogy can improve student engagement and understanding (Sulistyowati & Mawardi, 2023; Novelza et al., 2023). However, this research emphasizes that integrating localized cultural practices leads to not just improved engagement but also deeper mathematical reasoning and critical thinking, as students learn to see mathematics as a lived experience rather than abstract concepts disconnected from their realities (Pirma & Caswita, 2023). Moreover, the findings indicate that embedding local wisdom within mathematical contexts can promote a stronger cultural identity among students, helping them reconcile their educational experiences with their cultural backgrounds (Cervantes-Barraza & Araújo, 2023). This connection is pivotal in regions where cultural dissonance may occur, contributing to a more profound sense of self and community belonging, which previous studies did not adequately address (Owusu-Darko et al., 2023).

This study offers several new insights into ethnomathematics and its application in education. Primarily, it highlights the necessity of tailoring educational approaches to fit specific local cultural contexts, as different cultures possess unique mathematical understandings and applications that should inform teaching practices (Nst & Batubara, 2024). Furthermore, it sheds light on the potential for ethnomathematical frameworks to enhance not only mathematical understanding but also cultural appreciation among students, filling a critical gap in the literature regarding the holistic benefits of integrating culture in math education research (Abay & Parola, 2024; Cervantes-Barraza & Araújo, 2023).

Examining teachers' and students' understanding of Rambu Solo' cultural values in the context of ethnomathematics in Toraja presents both theoretical and empirical urgencies. These urgencies underscore the need for a deeper engagement with culturally relevant mathematics education, ultimately benefiting educational outcomes and community cohesion.

Theoretically, the study supports the framework of culturally sustaining pedagogy, which emphasizes that education should not only acknowledge students' cultural identities but also preserve and evolve them within academic contexts (Payadnya et al., 2024). In doing so, the research contributes to the discourse on educational justice, particularly in minority communities where mainstream curricula may overlook or marginalize local knowledge systems. By affirming cultural identities through mathematical learning, this study promotes a more equitable educational environment where diverse ways of knowing are validated. This aligns with broader goals in education that seek to address historical and systemic inequities in curriculum content and delivery (Astuti & Rozikin, 2025).

Empirically, this study is urgent because it addresses the gap in teacher preparedness and student engagement regarding local cultural integration in mathematics education. The findings can inform future professional development programs by identifying specific areas where teachers need support in designing and delivering culturally relevant instruction. Additionally, by evaluating students' responses to Rambu Solo'-based math instruction, the study can provide evidence of how cultural contextualization

enhances learning outcomes. Such data are crucial for education policymakers aiming to redesign curriculum standards to be more inclusive, responsive, and effective for diverse student populations.

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METHOD

This study employed a quantitative descriptive design aimed at obtaining empirical data on teachers' and students' understanding of Rambu Solo' cultural values and their potential integration into ethnomathematics-based mathematics learning. This approach was chosen because it enables a systematic and factual description of the actual conditions of research subjects based on quantitative data collected through structured questionnaires and classroom observations.

Research Site and Participants

The study was conducted at SMP Negeri 1 Balusu, a public junior high school located in North Toraja Regency, South Sulawesi, Indonesia. This school was chosen due to its strong cultural environment, where the Rambu Solo' funeral tradition remains an integral part of community life, providing a relevant cultural context for this research. The participants consisted of three mathematics teachers and forty eighth-grade students selected through purposive sampling. The teachers were chosen based on their involvement in classroom practices that have potential connections to local culture, while the students were selected to represent learners who are directly exposed to the Torajan cultural environment. The purposive sampling technique ensured that all respondents were familiar with or related to the cultural context under study.

Research Instruments

The main instrument used in this study was a Local Cultural Understanding Questionnaire, designed to measure teachers' and students' levels of comprehension regarding the cultural values of Rambu Solo' and their relationship to mathematical concepts. The questionnaire employed a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). To ensure the validity and reliability of the instrument, both expert validation and statistical analysis were performed prior to data collection. The validity test, using the *Pearson Product–Moment Correlation*, revealed that all questionnaire items obtained correlation coefficients (r) greater than the critical value ($r = 0.30$), indicating that all items were valid. The reliability test, conducted using Cronbach's Alpha, produced a coefficient value of 0.87, which falls within the high reliability category. These results confirmed that the questionnaire possessed strong internal consistency and was suitable for assessing cultural understanding in the educational context.

In addition to the questionnaire, observation sheets and supporting interviews were utilized to collect qualitative data on how teachers interpret and apply cultural values in mathematics learning. Classroom observations were carried out to identify instances of cultural integration, while informal interviews with teachers provided contextual insights into challenges and opportunities in implementing culture-based learning.

Research Procedure

The research procedure consisted of three major stages: preparation, data collection, and data analysis. In the preparation stage, a preliminary study was conducted to identify mathematical elements embedded within Rambu Solo' cultural practices, such as geometric patterns in *tongkonan* (traditional houses), grouping systems for livestock, and calculations of ritual costs and schedules. During the data collection stage, validated questionnaires were administered to teachers and students of SMP Negeri 1 Balusu, followed by classroom observations and informal interviews to triangulate the data.

Data Analysis Techniques

Quantitative data were analyzed using descriptive statistical techniques, including the calculation of means, standard deviations, and categorical classifications of understanding levels (low, medium, and high). Categorization was based on the distribution of empirical scores obtained from the respondents. The results were presented in tables and graphs to illustrate the overall distribution of teachers' and students' understanding levels of Rambu Solo' cultural values.

The quantitative findings were further interpreted qualitatively to explore underlying factors contributing to the observed results—such as the limited availability of culture-based training for teachers, the scarcity of contextual learning materials, and the absence of a structured instructional model that integrates local cultural values into mathematics education.

Through this methodological framework, the study provides an empirical foundation for the development of an ethnomathematics-based instructional model rooted in Rambu Solo' cultural values, aiming to create more meaningful, contextual, and character-oriented mathematics learning experiences for students in North Toraja.

RESULTS AND DISCUSSION

Teacher's level of understanding

The level of teachers' understanding of the cultural values of *Rambu Solo'* and their application in mathematics learning is categorized as low. This finding indicates that most teachers have not yet developed adequate comprehension of how to integrate local cultural elements into mathematics instruction. The results of the descriptive statistical analysis, as presented in Figure 1 and Table 1, show that the average score falls below the moderate category. These results highlight the need to develop a learning model that systematically integrates *Rambu Solo'* cultural values to enrich the contextualization of mathematics learning in schools.

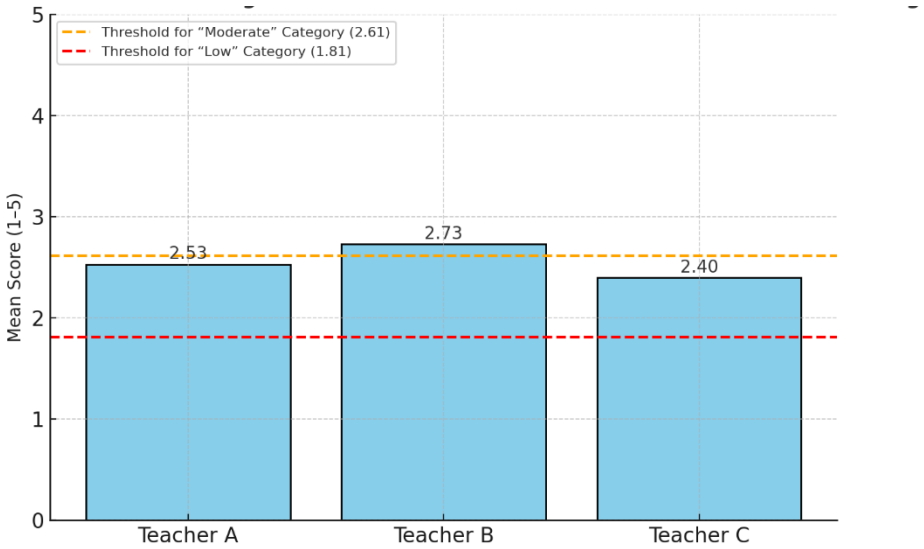

Figure 1. Graph of teacher understanding levels

The chart above illustrates teachers' level of understanding of Rambu Solo' cultural values and their application in mathematics teaching. Based on the questionnaire data analysis, the average scores obtained by the teachers ranged from 2.40 to 2.73 on a 1–5 scale. Specifically, Teacher A scored 2.53, Teacher B scored 2.73, and Teacher C scored 2.40. When compared with the threshold categories, a value of 2.61 marks the boundary for the *moderate* category, while 1.81 represents the threshold for the *low* category. According to these indicators, most teachers fall below the moderate level, indicating that their understanding is categorized as low.

These results show that teachers' comprehension of Rambu Solo' cultural values has not yet been internalized effectively in the context of mathematics instruction. The low scores reflect teachers' limited ability to connect mathematical concepts with local cultural practices and symbolism. For instance, teachers have not yet been able to integrate geometric patterns, calculations, or social structures found in the Rambu Solo' ceremony as meaningful contexts for students' learning.

The factors influencing this condition include the lack of training based on local wisdom, limited availability of contextual learning resources, and insufficient time for lesson planning. Moreover, there is still no learning model integrated with local culture such as Rambu Solo', making it difficult for teachers

to find practical references for implementation in classroom activities. Integrating local culture into the curriculum remains a challenge, especially for teachers accustomed to conventional approaches and with limited experience in culture-based learning.

Table 1. Descriptive Statistics

Statistic	Value
Number of Respondents	3
Number of Items	15
Minimum Score	36
Maximum Score	41
Mean	2.55
Standard Deviation (SD)	0.17

The overall mean score of 2.55 indicates that teachers' understanding of the *Rambu Solo'* cultural values and their application in mathematics learning is categorized as **low**. The small standard deviation (SD = 0.17) reflects minimal variation among respondents, suggesting a consistent pattern of limited understanding across teachers. This finding implies that teachers generally lack sufficient knowledge and awareness regarding Torajan cultural values and how these can be integrated meaningfully into mathematics learning. The low mean score also indicates that local cultural contexts, such as *Rambu Solo'*, have not yet been systematically incorporated into teaching practices. Therefore, there is an urgent need for culturally responsive pedagogy and professional development programs to strengthen teachers' capacity in connecting indigenous cultural heritage with mathematics education.

Distribution of Student Understanding Level Categories

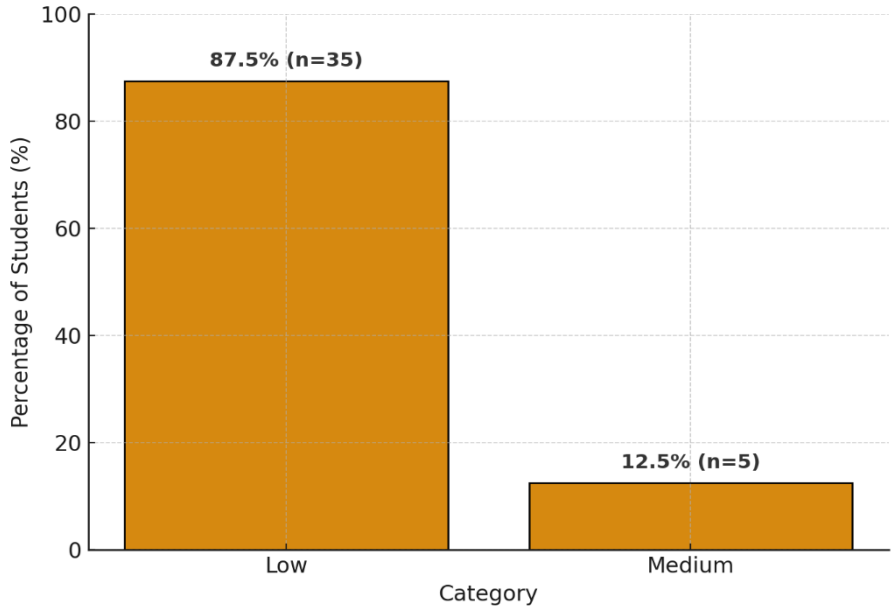

Figure 1. Distribution of Student Understanding Level Categories

The bar chart illustrates the distribution of students' understanding levels of *Rambu Solo'* cultural values. The majority of students (87.5%, n = 35) are categorized as having a low level of understanding, while only a small portion (12.5%, n = 5) fall into the medium category. No students reached the high category, indicating a lack of deep comprehension. This pattern shows that students generally have limited awareness of *Rambu Solo'* values and their relevance to learning contexts. The dominance of the low category highlights the need for integrating local cultural knowledge into education to foster deeper cultural appreciation and contextual learning.

Table 2. Quantitative Descriptive Analysis Results

Statistic	Value
Overall Mean (M)	1.95
Standard Deviation (SD)	0.33
Minimum Score	1.40
Maximum Score	2.90

The quantitative descriptive analysis indicates that students' understanding of *Rambu Solo'* cultural values in mathematics learning is categorized as low. The overall mean score of 1.95 suggests that most students have not yet developed a deep comprehension of the relationship between local Torajan culture and mathematical concepts. The relatively small standard deviation (0.33) implies that students' understanding levels are quite consistent across the sample. The majority of students (87.5%) fall within the low category, while only a few (12.5%) are in the medium category, and none reach the high level of understanding.

The results of the study reveal that both teachers and students demonstrate a low level of understanding regarding the cultural values of *Rambu Solo'* and their application in mathematics learning. This finding indicates that the integration between local culture and mathematics education has not yet been effectively internalized within the learning process. The low mean scores reflect a limited ability among teachers and students to connect mathematical concepts with the cultural practices embedded in *Rambu Solo'*. Understanding this phenomenon requires consideration of pedagogical, cultural, and institutional dimensions that influence teaching and learning practices.

Integrating local cultural values into mathematics learning through the ethnomathematics approach offers a promising way to bridge the gap between abstract mathematical content and the lived experiences of students. Ethnomathematics recognizes that every culture possesses unique ways of understanding and applying mathematical ideas. The *Rambu Solo'* ceremony, a traditional funeral rite of the Torajan people, contains numerous mathematical elements such as cost calculations, spatial arrangements of *tongkonan* (traditional houses), grouping of participants, and measurement of time and distance. By incorporating these elements into lessons, teachers can help students realize that mathematics is not an isolated or purely theoretical discipline but one deeply rooted in social and cultural realities. As noted by Dominikus et al. (2023), ethnomathematical approaches allow students to make connections between their cultural backgrounds and mathematical concepts such as ratio, proportion, and measurement. For example, calculating the number of buffalo used in *Rambu Solo'* can serve as a contextual learning experience for understanding proportional reasoning. Muchlis and Mais (2023) further emphasize that learning grounded in local culture enhances emotional engagement, making mathematics more meaningful and personally relevant to students while fostering cultural pride.

To support deeper conceptual understanding, the application of the solo (Structure of the Observed Learning Outcome) taxonomy provides a structured framework for guiding students' cognitive development. The Solo taxonomy helps teachers design activities that move learners from surface-level understanding to complex analytical thinking. In the context of *Rambu Solo'*, students may begin by identifying mathematical elements present in the ceremony (unistructural level), linking several related concepts such as measurement, cost estimation, and resource allocation (multistructural level), and then analyzing interrelationships and underlying mathematical principles (relational and extended abstract levels). Ghunaimat and Alawneh (2024) highlight that the Solo taxonomy promotes the development of higher-order thinking skills by encouraging progressive engagement with concepts. Through activities such as analyzing ceremonial budgets, modeling the geometric structure of *tongkonan*, or simulating logistical planning for the ceremony, students develop not only procedural fluency but also reflective and contextual mathematical understanding.

Integrating *Rambu Solo'* into mathematics lessons also promotes cultural awareness. By engaging with the meanings, rituals, and symbolic aspects of the ceremony, students gain a greater appreciation for their cultural heritage while recognizing the universality of mathematical thought. Pongdatu and Huwae (2024) assert that culturally responsive pedagogy enhances both motivation and achievement by affirming students' cultural identities within the learning process. When mathematics lessons incorporate familiar cultural practices such as livestock bartering or sharing communal resources students not only

learn concepts like value, ratio, and fairness but also develop empathy, respect, and cultural pride. This alignment between cultural identity and academic content nurtures a sense of belonging and relevance, making learning more holistic and transformative.

The low level of teacher understanding observed in the study can be attributed to several interrelated factors, including individual teacher competence, institutional support, cultural awareness, and systemic challenges. Teacher knowledge and confidence are critical for effective integration of indigenous culture into the curriculum. Educators must possess both deep content knowledge in mathematics and sufficient cultural literacy to design meaningful lessons. Studies by Sakaria et al. (2023) and Persaud et al. (2025) demonstrate that professional development programs focused on culturally responsive teaching significantly enhance teachers' pedagogical and cultural competencies. In addition, teachers' attitudes and self-efficacy play a pivotal role. Pradhan (2023) found that teachers with positive beliefs about the value of local culture are more willing to incorporate indigenous materials into their instruction. Conversely, teachers lacking confidence or awareness tend to rely on conventional, decontextualized teaching methods that fail to connect mathematics with students' lived experiences.

Institutional support and curriculum policy also shape teachers' capacity to integrate local culture into mathematics education. Schools that promote innovation and provide professional resources create environments conducive to culturally relevant pedagogy. As Luecke and Sanders (2023) note, effective school leadership that encourages experimentation and acknowledges the significance of local knowledge can foster teacher agency and student engagement. However, when schools lack structural support, even teachers with good intentions struggle to sustain culturally responsive practices.

Teachers' cultural awareness is another essential aspect. According to Lyublinskaya et al. (2024), cultural competence enables educators to understand the backgrounds of their students and build bridges between indigenous knowledge systems and academic mathematics. In Toraja, teachers who understand the social hierarchy, symbolism, and geometry embedded in *Rambu Solo'* can more easily draw parallels with mathematical ideas such as symmetry, measurement, and proportional reasoning. This awareness not only enriches instruction but also validates the cultural context as a legitimate foundation for mathematical learning.

Nevertheless, challenges remain. As Sun and Ann (2023) point out, many teachers face constraints related to time, curriculum rigidity, and lack of culturally relevant materials. Educational systems that emphasize standardized testing and performance metrics often discourage creative, culture-based teaching approaches. This tension between policy expectations and cultural inclusion limits teachers' ability to design lessons that connect mathematics to local wisdom.

Culturally Responsive Pedagogy (CRP) has been proven to improve students' engagement, conceptual understanding, and academic performance in mathematics learning. When students see their cultural identities reflected in classroom instruction, they develop greater motivation and participation. Payadnya et al. (2024) show that connecting mathematical concepts to cultural contexts significantly increases student interest and persistence. Moreover, CRP fosters an inclusive classroom environment where students feel valued and respected, which in turn encourages active learning and problem-solving (Levine & Tamburrino, 2024). Douglas et al. (2024) emphasize that culturally responsive teaching helps students from marginalized communities view themselves as capable mathematicians, strengthening their mathematical identity and confidence.

Beyond engagement, CRP enhances students' conceptual understanding by situating abstract ideas in familiar, meaningful contexts. Wardani et al. (2023) argue that learning grounded in cultural practices allows students to construct mathematical meaning through experiences that resonate with their everyday lives. Empirical evidence supports that students taught using culturally responsive strategies outperform those taught with conventional methods, particularly in comprehension and problem-solving (Payadnya et al., 2024). Furthermore, Safirah et al. (2024) found that culturally contextual worksheets promoting higher-order thinking skills deepen conceptual understanding and encourage critical reflection.

In terms of academic achievement, culturally responsive instruction contributes positively to students' performance. Günay and Takunyacı (2023) observed that incorporating cultural elements in geometry lessons improved students' ability to solve problems related to transformations and spatial reasoning. The cultural context not only facilitated understanding but also provided motivation and a

sense of relevance. By integrating culture into the learning process, educators can close achievement gaps and promote equitable outcomes for diverse student populations (Levine & Tamburrino, 2024).

The role of technology further strengthens the integration of local culture into mathematics education. Digital platforms such as GeoGebra can be used to visualize geometric structures inspired by *Rambu Solo'*, such as the spatial arrangement of offerings or the architectural layout of *tongkonan*. Ichtiari et al. (2024) found that when technology is combined with local cultural examples, students show higher engagement and improved connections between visual and abstract representations. Technology-supported learning environments thus provide an innovative medium for linking cultural heritage with mathematical concepts, fostering creativity and deeper comprehension.

Findings of this study, supported by related literature, indicate that the low understanding of teachers and students regarding *Rambu Solo'* cultural values in mathematics stems from limited cultural knowledge, inadequate institutional support, and the absence of an integrated learning model that bridges culture and mathematics. However, the integration of ethnomathematics, the SOLO taxonomy, and Culturally Responsive Pedagogy provides a promising pathway toward improvement. Such integration not only enhances students' conceptual mastery but also nurtures cultural awareness, motivation, and engagement. When supported by sustained teacher training, flexible curriculum design, and the use of educational technology, the inclusion of *Rambu Solo'* values in mathematics learning can transform education into a culturally grounded yet globally relevant experience, aligning local wisdom with the demands of 21st-century learning.

CONCLUSION

This study revealed that both teachers and students at SMP Negeri 1 Balusu in North Toraja demonstrated a low level of understanding of Rambu Solo' cultural values and their application in mathematics learning. The mean scores of 2.55 for teachers and 1.95 for students indicate that the integration of local cultural values into classroom practices has not yet been systematically implemented. The limited understanding reflects a broader pedagogical and institutional gap in connecting mathematics with indigenous knowledge and local traditions. The findings confirm that the Rambu Solo' ceremony, as a rich cultural practice, contains various mathematical concepts such as geometry, measurement, estimation, and proportional reasoning that can serve as meaningful learning contexts. However, the absence of training, lack of contextual resources, and minimal institutional support have constrained teachers' ability to design culturally responsive instruction. The study concludes that strengthening teachers' and students' cultural understanding is essential for developing ethnomathematics-based learning models grounded in local wisdom. Integrating cultural values like Rambu Solo' into mathematics learning not only enhances conceptual comprehension but also fosters cultural awareness, engagement, and identity among learners. Ultimately, this approach promotes education that is culturally sustaining, contextually relevant, and aligned with the values of the Torajan community.

RECOMMENDATIONS

1. For Teachers:Teachers should receive professional development and training focused on integrating local cultural values into mathematics instruction. Workshops and mentoring programs can equip teachers with both pedagogical and cultural competencies necessary for designing ethnomathematics-based lessons.
2. For Curriculum Developers: Educational authorities should incorporate local wisdom, such as Rambu Solo', into the mathematics curriculum as a contextual learning resource. This can be achieved by developing curriculum guidelines and teaching materials that explicitly connect mathematical concepts with cultural practices.
3. For Schools and Institutions: Schools need to provide institutional support through policy and resource allocation that encourages innovative, culture-based learning models. Collaboration with cultural experts and community leaders should be strengthened to ensure cultural authenticity in instructional design.
4. For Further Research: Future studies should explore the development and testing of an ethnomathematics learning model based on Rambu Solo' cultural elements. Experimental and

design-based research could measure its effectiveness in improving students' mathematical understanding and cultural appreciation.

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AUTHOR CONTRIBUTIONS

All authors contributed equally to the conception, design, data collection, analysis, and writing of this article. Amos Patiung led the field research, data analysis, and drafting of the manuscript.I Made Ardana, Sariyasa, and Gede Suweken provided theoretical guidance, supervision, and critical revisions of the manuscript.

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