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Ethnomathematics of Damar Kurung: A Lo cal Cultural Contextualization Alternative in Mathematics Learning at Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan Gresik

Anggita Pasha[1], Nadi Suprapto[2], Ari Metalin Ika Puspita[3]
[123]Universitas Negeri Surabaya
E-mail: 25010855099@mhs.unesa.ac.id[1], nadisuprapto@unesa.ac.id[2], aripuspita@unesa.ac.id[3]

Abstract

Mathematics learning in elementary schools is often perceived as abstract and disconnected from students' daily experiences. To address this issue, this study integrates the local cultural heritage of Gresik through Damar Kurung art as an ethnomathematics medium to enhance students' understanding of plane geometry concepts. This research employed a qualitative approach with a case study design conducted at Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan Gresik. The participants consisted of one mathematics teacher, ten fourth-grade students, the school principal, and a Damar Kurung craftsperson. Data were collected through classroom observations, in-depth interviews, and documentation of cultural artefacts. Data analysis involved data reduction, data display, and conclusion drawing. The findings indicate that integrating Damar Kurung into geometry learning enhances student engagement, spatial reasoning skills, and comprehension of plane shapes. Students became more capable of identifying geometric forms through the patterns and ornaments found in Damar Kurung. Teachers also demonstrated increased creativity in linking geometric concepts with local cultural contexts. Damar Kurung based ethnomathematics provides an effective alternative for making mathematics learning more contextual, meaningful, and relevant to students' lives. This model not only strengthens cognitive understanding but also fosters cultural appreciation, creativity, and a sense of belonging to local heritage.
Keywords: Ethnomathematics; Damar Kurung; Plane Geometry; Local Culture; Contextual Learning.

Abstrak

Pembelajaran matematika di sekolah *dasar sering dianggap abstrak dan tidak terhubung dengan pengalaman nyata siswa. Untuk menjembatani kesenjangan tersebut, penelitian ini menghadirkan konteks budaya lokal Gresik melalui seni Damar Kurung sebagai media etnomatematika untuk memperkuat pemahaman konsep bangun datar.Penelitian ini menggunakan pendekatan kualitatif dengan desain studi kasus, dilaksanakan di Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan Gresik. Partisipan meliputi seorang guru matematika, sepuluh siswa kelas IV, seorang kepala sekolah, dan satu perajin Damar*

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Kurung. Data dikumpulkan melalui observasi proses pembelajaran, wawancara mendalam, dan dokumentasi artefak budaya. Analisis data dilakukan melalui tahapan reduksi data, penyajian data, dan penarikan kesimpulan.Penelitian menunjukkan bahwa integrasi Damar Kurung dalam pembelajaran geometri mampu meningkatkan keterlibatan siswa, kemampuan berpikir spasial, dan pemahaman konsep bangun datar. Siswa lebih mudah mengidentifikasi bentuk geometri melalui pola dan ornamen Damar Kurung. Guru juga menunjukkan peningkatan kreativitas dalam menghubungkan konsep geometri dengan konteks budaya lokal. Etnomatematika berbasis Damar Kurung menjadi alternatif pembelajaran yang efektif untuk membuat matematika lebih kontekstual, bermakna, dan relevan bagi kehidupan siswa. Model ini tidak hanya memperkuat pemahaman kognitif, tetapi juga menumbuhkan apresiasi budaya, kreativitas, serta rasa memiliki terhadap warisan local.
Kata kunci: *Etnomatematika, Damar Kurung; Bangun Data;, Budaya Lokal; Pembelajaran Kontekstual.*

INTRODUCTION

Mathematics is a fundamental subject in elementary education that plays a crucial role in developing students' logical reasoning, analytical thinking, creativity, and problem-solving abilities (Zainil et al., 2024). Through mathematics learning, students are expected to construct conceptual understanding that enables them to interpret real-world phenomena and solve contextual problems meaningfully (Toropova et al., 2021). However, mathematics instruction at the primary level often remains abstract and procedural, causing students to perceive mathematics as difficult, rigid, and disconnected from everyday life. This condition becomes more problematic when learning materials fail to reflect students' cultural and social environments, resulting in low engagement and superficial understanding of mathematical concepts.

This global issue is also evident in the local context of Madrasah Ibtidaiyah Miftahul Ulum, Kesamben Wetan, Gresik. Based on preliminary observations, students experience difficulties in understanding plane geometry, particularly two-dimensional shapes. Mathematics learning is still dominated by textbook-based explanations and formula memorization, with limited use of concrete or contextual learning resources. As a result, students tend to memorize definitions of shapes without comprehending their properties and applications in real-life situations. Consequently, mathematics is perceived as an abstract and intimidating subject, which negatively affects students' motivation and participation in classroom activities.

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Geometry learning should be closely connected to real objects and familiar experiences so that students can construct meaning through observation and exploration (Tri Septiani et al., 2023). In the cultural context of Gresik, one local wisdom that has strong potential to support contextual mathematics learning is Damar Kurung, a traditional lantern made of bamboo and paper that is commonly displayed during Eid al-Fitr celebrations (Octaviyanti & Wahyuni, 2024). Structurally, Damar Kurung is typically designed in the form of cubes or prisms and decorated with visual narratives depicting social and religious life (Lail & Budiarto, 2022). From a mathematical perspective, it contains rich elements of two-dimensional geometry such as squares, rectangles, triangles, symmetry, and proportional patterns. Despite its relevance to geometry learning, Damar Kurung has rarely been utilized as a learning resource in mathematics instruction at Madrasah Ibtidaiyah, including at MI Miftahul Ulum.

This study is theoretically grounded in the concept of ethnomathematics, which emphasizes the relationship between mathematics and cultural practices. Ethnomathematics views mathematics not merely as an abstract and universal system, but as knowledge that emerges from human activities, traditions, and local wisdom (Sari et al., 2024). This theoretical framework is employed because it provides a strong foundation for integrating cultural artifacts into mathematics learning, allowing students to perceive mathematics as meaningful, contextual, and culturally embedded. In the context of Islamic primary education, ethnomathematics is particularly relevant as it supports holistic learning that integrates cognitive development with cultural and moral values (Ramadhan & Hidayah, 2022).

Previous studies have demonstrated that ethnomathematics-based learning positively influences students' understanding and attitudes toward mathematics. Suherman and Vidákovich (2022) found that integrating local cultural patterns into geometry instruction significantly enhanced students' conceptual understanding and spatial reasoning. Similarly, Oki Kurniawan and Rossi Iskandar (2022) reported that the use of batik motifs as ethnomathematical learning media fostered students' creativity and appreciation of local culture. Nevertheless, most ethnomathematics research in Indonesia has focused on batik, traditional games, weaving patterns, or vernacular architecture. Research that specifically examines Damar Kurung as an ethnomathematical object, particularly in the context of Madrasah Ibtidaiyah, remains very limited.

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The limited exploration of Damar Kurung in mathematics education indicates a clear research gap between the availability of local cultural resources and their implementation in classroom practice. While Damar Kurung is widely recognized as a cultural symbol of Gresik, its mathematical potential especially in relation to two-dimensional geometry has not been systematically studied (Jenati, 2019). Therefore, the novelty of this research lies in its focus on identifying and analyzing the mathematical elements embedded in Damar Kurung and positioning it as an ethnomathematical learning resource for plane geometry in Madrasah Ibtidaiyah.

Based on these considerations, this research aims to explore the mathematical elements contained within Damar Kurung, examine their relevance to the plane geometry curriculum at Madrasah Ibtidaiyah, and propose a culturally contextualized mathematics learning framework grounded in ethnomathematics. Accordingly, the research question guiding this study is: What mathematical elements of two-dimensional shapes are embedded in Damar Kurung, and how can these elements be integrated into mathematics learning for students of Madrasah Ibtidaiyah? Through this inquiry, the study is expected to contribute both theoretically to the development of ethnomathematics research and practically to the implementation of culturally responsive mathematics instruction that enhances students' conceptual understanding and cultural awareness.

RESEARCH METHOD

This study employs a qualitative case study design because it aims to examine in depth the integration of Damar Kurung art into geometry instruction within a specific and bounded educational context, namely a fourth-grade classroom at Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan, Gresik. A case study approach is considered appropriate as it allows the researcher to capture rich, contextualized, and holistic descriptions of instructional practices as they occur naturally in the classroom. Unlike experimental or survey-based research, this design emphasizes understanding processes, meanings, and interactions rather than measuring causal relationships, which aligns with the exploratory nature of this study.

This research is not categorized as ethnography because its primary objective is not to investigate the broader cultural life or social practices of the Gresik community, nor to construct an anthropological interpretation of Damar Kurung as a cultural tradition. Ethnographic studies typically require prolonged immersion, participant observation over extended periods, and comprehensive documentation of cultural behavior. In contrast, this

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study focuses specifically on a single instructional case within a limited time frame, emphasizing how a cultural artifact is pedagogically integrated into mathematics learning. Therefore, the case study design is more suitable for achieving the analytical scope and practical objectives of the research.

The study was conducted at Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan, Gresik Regency, an Islamic elementary school known for its strong attachment to local religious and cultural traditions. The research site was purposively selected for two main reasons. First, the local community has a close historical and cultural connection to Damar Kurung as a traditional art form unique to Gresik. Second, the madrasah has demonstrated openness toward context-based and culturally responsive learning approaches. The research was carried out over a one-month period, from October 2025, encompassing stages of pre-field preparation, field data collection, data analysis, and validation of findings. This duration was considered sufficient to capture the instructional process while remaining consistent with the scope of a qualitative case study.

The participants of the study were selected using purposive sampling, based on their direct involvement and relevance to the instructional case under investigation. The main participants included one fourth-grade mathematics teacher who implemented geometry instruction using Damar Kurung, ten fourth-grade students representing diverse academic achievement levels, the school principal who supported innovation grounded in local culture, and one local cultural practitioner or Damar Kurung artisan who provided contextual insights into the philosophical and geometric aspects of the artwork. These participants were chosen because they possessed firsthand experience with the learning process and cultural artifact under study. Other potential participants were not involved because they were not directly engaged in the implementation of Damar Kurung-based mathematics instruction, which is central to the focus of this research.

Data collected in this study consisted of both primary and secondary data. Primary data were obtained through classroom observations, in-depth semi-structured interviews, and visual documentation of learning activities. Secondary data included lesson plans, syllabi, student worksheets, assessment records, and relevant literature related to Damar Kurung and ethnomathematics. To ensure systematic data collection, research instruments were developed with clear indicators. Observation indicators included the teacher's strategy in integrating Damar Kurung into geometry instruction, students' engagement and responses, and the manifestation of geometric concepts during learning activities. Interview indicators

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focused on participants' understanding of geometry concepts, perceptions of cultural integration, instructional challenges, and perceived learning benefits. Documentation indicators included the alignment of lesson plans with ethnomathematics principles, visual representations of geometric elements, and student learning artifacts.

Data collection was conducted through three main techniques: observation, interview, and documentation. Classroom observation was carried out in a moderately participatory manner, allowing the researcher to observe instructional activities directly while minimizing interference. Semi-structured interviews were conducted to provide flexibility in exploring participants' experiences and perspectives regarding the use of Damar Kurung in mathematics learning. Documentation served to strengthen empirical evidence through written and visual records that supported observational and interview data. All data were collected in a naturalistic setting to ensure authenticity and ecological validity.

The data analysis process was guided by the interactive model proposed by Miles and Huberman (1994), which consists of data reduction, data display, and conclusion drawing and verification. Data reduction involved selecting, coding, and focusing data relevant to the integration of Damar Kurung, instructional strategies, and students' understanding of plane geometry. Data display was carried out through descriptive narratives and thematic categorization to illustrate relationships between cultural artifacts and mathematical concepts. Conclusions were drawn iteratively and verified through continuous comparison across data sources, ensuring that interpretations were firmly grounded in empirical evidence.

To ensure the trustworthiness of the findings, the study applied four criteria of qualitative rigor: credibility, transferability, dependability, and confirmability (Creswell, 2016). Credibility was achieved through triangulation of data sources, methods, and time. Transferability was enhanced by providing thick descriptions of the research context and procedures. Dependability was ensured through systematic documentation of research processes, while confirmability was maintained by grounding interpretations in the data and minimizing researcher bias through reflexive practices.

Through this methodological framework, the study seeks to provide a comprehensive and credible understanding of how Damar Kurung can be utilized as an ethnomathematical context for teaching plane geometry in Islamic elementary schools. The qualitative case study approach enables the exploration of instructional practices, cultural meanings, and students' learning experiences in an integrated manner, thereby contributing to the development of culturally responsive and contextually meaningful mathematics education.

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RESULT AND DISCUSSION

Overview of Research Context

The study was conducted at Madrasah Ibtidaiyah Miftahul Ulum, Kesamben Wetan, Gresik, a school deeply rooted in Islamic and local Javanese culture. The Damar Kurung traditional painted lanterns depicting everyday life and moral stories have long been part of the Gresik cultural landscape. The school community, surrounded by artisans and families who still preserve this craft, provided a meaningful environment to explore how cultural elements can be integrated into mathematics learning. Data were collected through classroom observations, semi-structured interviews with teachers, students, and a local Damar Kurung artisan, and document analysis.

The focus of the findings is to illustrate how ethnomathematics, particularly through Damar Kurung, became a tool for teaching plane geometry, and how this approach influenced students' learning engagement and conceptual understanding.

Integration of Damar Kurung in Mathematics Learning

The integration process was centered on the topic of plane geometry (two-dimensional shapes) in the fourth-grade mathematics curriculum. The teacher used Damar Kurung artworks to help students recognize shapes, patterns, and spatial relationships. Observations revealed that the Damar Kurung served not only as a visual teaching aid but also as a bridge between cultural identity and mathematical abstraction.

Table 4.1.
Implementation of Ethnomathematics through Damar Kurung in Geometry Lessons

Learning Phase	Activity Description	Observed Ethnomathematical Elements	Remarks
Introduction	Teacher introduced Damar Kurung as Gresik's traditional art and asked students to observe its patterns.	Recognition of symmetry, repetition, and proportional composition.	Students showed excitement and cultural familiarity.

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Exploration	Students identified geometric shapes (triangles, rectangles, circles) in the Damar Kurung patterns.	Application of shape recognition and spatial visualization.	Students related shapes to cultural motifs, e.g., mosque domes and lantern frames.
Concept Formation	Teacher guided students to draw simplified versions of Damar Kurung emphasizing geometric forms.	Measurement, scaling, and use of grids for proportion.	Students began to link mathematical reasoning with creative expression.
Reflection	Discussion on how geometry exists in local crafts.	Abstract-concrete linkage of mathematical concepts.	Students expressed pride in connecting culture with learning.

The integration process demonstrated that mathematics can be taught contextually by using cultural artifacts that are meaningful to students. The Damar Kurung not only provided visual representations of geometric figures but also encouraged students to engage emotionally and cognitively. The teacher noted that "students were more focused when the lesson used something familiar from their culture," suggesting that cultural contextualization enhanced attention and participation.

Students' Cognitive and Affective Responses

Interviews and observations indicated significant improvement in both cognitive understanding and affective engagement. Students displayed better recognition of geometric concepts and showed increased enthusiasm in class discussions.

Table 4.2.
Students' Learning Responses toward Ethnomathematics Integration

Aspect	Indicators Observed	Findings
Cognitive	Ability to identify and categorize geometric shapes from Damar Kurung motifs.	Most students correctly identified 3 or more shapes (triangle, square, circle, parallelogram) within artwork examples.

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Conceptual Understanding	Connection between artistic motifs and mathematical properties (symmetry, congruence).	Students could describe symmetrical balance and proportionality using their own words.
Affective	Motivation, curiosity, and pride in cultural identity.	Students actively participated and expressed joy in learning.
Collaboration	Peer interaction during drawing and measurement tasks.	Students engaged in cooperative problem-solving and shared cultural insights.

During observation, several students were heard saying, *"Oh, this pattern looks like rectangles!"* or *"Our lanterns have circles like the moon!"* indicating intuitive connections between artistic and mathematical thinking. Interviews with students revealed that learning through Damar Kurung helped them "understand shapes better because they can see them in real life."

Teachers also reported a visible shift in classroom dynamics: "Students who were usually quiet became more expressive when discussing their own cultural symbols." This suggests that integrating ethnomathematics not only enhances understanding but also nurtures confidence and identity in learning.

Teacher's Pedagogical Strategies

The mathematics teacher employed several strategies to ensure that cultural integration remained educationally meaningful rather than purely decorative. Lesson plans were designed using a constructivist approach, where students explored concepts through observation, discussion, and creation.

Key pedagogical strategies included: 1) Contextual Introduction-The teacher began lessons by discussing Gresik's culture and showing actual Damar Kurung artworks. 2) Exploratory Observation-Students analyzed shapes and patterns collaboratively. 3) Guided Abstraction-The teacher guided students to formalize observed patterns into mathematical concepts. 4) Reflective Dialogue-Students discussed what they learned about both culture and mathematics.

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Table 4.3.
Summary of Teacher's Pedagogical Approach

Strategy	Implementation Example	Pedagogical Function
Contextual Introduction	Introducing cultural artifacts before mathematical explanation.	Builds relevance and engagement.
Exploration	Encouraging students to find geometric shapes within Damar Kurung.	Promotes discovery-based learning.
Guided Abstraction	Transforming real-life motifs into geometric models.	Strengthens conceptual understanding.
Reflection	Discussing cultural and mathematical meaning.	Integrates affective and cognitive learning outcomes.

Through this sequence, the teacher positioned mathematics not as a detached abstract subject but as a meaningful part of students' daily and cultural experiences. Documentation analysis showed that this approach aligned with the national curriculum's emphasis on contextual and character-based education.

Emerging Cultural and Educational Values

Beyond cognitive outcomes, this study revealed several cultural and moral values embedded within the integration of Damar Kurung. These values include cooperation, discipline, aesthetic appreciation, and spiritual reflection, all of which resonate with the character education goals of Islamic schooling.

Table 4.4.
Cultural Values Emerging from Ethnomathematics Integration

Value	Cultural Origin in Damar Kurung	Manifestation in Classroom Learning
Cooperation	Scenes of community working together in lantern-making.	Group-based projects enhanced teamwork.
Discipline	Symmetrical balance and precision required in designs.	Accuracy in measuring and drawing shapes.
Creativity	Artistic composition of patterns and colors.	Students created geometric-based artwork.

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Spiritual Reflection	Religious motifs and mosque illustrations in lanterns.	Students linked shapes to spiritual spaces (domes, windows).

These findings highlight that integrating ethnomathematics promotes holistic learning that connects intellectual, emotional, and spiritual dimensions. The teacher commented, "When we teach geometry through Damar Kurung, we are not only teaching shapeswe are teaching students to see harmony, balance, and faith in their own culture."

Students also expressed pride in their heritage. One student said, *"I like it because this art belongs to Gresik. I can learn math and remember my tradition."* Such statements reflect how ethnomathematics fosters cultural continuity and strengthens identity among young learners.

Discussion

Cultural Integration through Ethnomathematics in Damar Kurung Context

The integration of Damar Kurung as a medium for ethnomathematical learning in Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan Gresik offers a transformative approach to mathematics education that bridges culture, creativity, and conceptual understanding. The findings of this study reveal that students' engagement significantly increased when mathematical concepts particularly plane geometry were contextualized within familiar cultural artifacts such as Damar Kurung. This aligns with Barton's (2008) notion that mathematics is not culture-free but rather a human activity deeply embedded in local knowledge systems.

Teachers observed that when students identified geometric patterns in the decorative frames, symmetry in the lamp structure, and proportional dimensions within Damar Kurung illustrations, their comprehension of plane figures improved meaningfully. These observations resonate with the findings of Rosa and Orey (2011), who argue that ethnomathematics can contextualize abstract mathematical concepts, making them more tangible and culturally resonant. The local context serves as a bridge between students' prior knowledge and formal mathematical representations, fulfilling Vygotsky's concept of the zone of proximal development, where cultural mediation aids cognitive growth.

Moreover, students demonstrated enhanced cultural appreciation and pride as they linked mathematics learning to their regional identity. This outcome reflects the dual impact of ethnomathematics not only reinforcing mathematical competence but also fostering cultural continuity. In the case of Damar Kurung, a traditional Gresik art form symbolizing

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storytelling and illumination, the intersection between culture and mathematics becomes a narrative of identity preservation through education.

Enhancing Conceptual Understanding of Plane Geometry through Cultural Contexts

The integration of Damar Kurung into the learning of plane geometry allowed students to explore concepts such as symmetry, congruence, angles, and area through real-life visualization. During classroom activities, students analyzed geometric elements in the frame and motifs of Damar Kurung, sketching and calculating areas of the repetitive patterns. This experiential process helped them construct mathematical meaning from familiar visuals rather than abstract symbols.

This finding supports the research of (Mania & Alam, 2021) who states that cultural objects act as concrete manifestations of mathematical structures that are often overlooked in conventional curricula. In addition, explorations by (Danoebroto et al., 2024)demonstrate that embedding mathematics in cultural practices enhances retention and problem-solving ability because students engage emotionally and cognitively with contextual materials.

Students' problem-solving processes were also found to be more collaborative and reflective. They discussed shapes, measurements, and artistic balance while constructing their own "mini Damar Kurung" models. Such activities mirror (Supriyadi et al., 2024)Realistic Mathematics Education theory, which posits that learning mathematics should emerge from meaningful contexts that are experientially real for students.

In this study, the cultural environment of Gresik provided an authentic learning setting where abstract geometry became visible and meaningful. Students who previously struggled to visualize spatial relationships could easily understand parallel lines, area calculation, and geometric proportions through the tangible representation of Damar Kurung's design. This connection between cultural aesthetics and mathematical reasoning reinforces the role of context in shaping cognitive engagement and knowledge construction.

Teacher's Pedagogical Role in Contextualized Ethnomathematics Learning

Teachers played a crucial role in mediating students' understanding by connecting cultural narratives with mathematical ideas. The pedagogical shift from a traditional lecture approach to a discovery-based, context-driven method empowered teachers to act as facilitators of knowledge rather than mere transmitters. The data reveal that teachers guided students in interpreting Damar Kurung as a mathematical text asking exploratory questions

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like "How many symmetrical patterns can you find?" or "Which parts represent rectangles or triangles?"

This method resonates with (Zainovi et al., 2025) framework of ethnomathematics as a pedagogical approach that emphasizes cultural relevance, creativity, and dialogic interaction. Through storytelling and guided exploration, teachers fostered an environment where mathematical meaning was co-constructed. Moreover, the process nurtured students' metacognitive awareness, as they reflected on how cultural products could encode mathematical logic.

The teachers' reflective practices also demonstrated professional growth. Initially, some expressed uncertainty about connecting mathematics with art and culture, yet through practice, they developed strategies that merged visual-spatial reasoning with cultural interpretation. This echoes the study of (Wiryanto et al., 2024), who found that teachers who incorporate local culture into mathematics teaching experience increased pedagogical confidence and innovation.

Students' Engagement and Attitude Transformation

The integration of Damar Kurung in mathematical instruction significantly influenced students' motivation and affective engagement. Observations indicated that students who were previously passive in learning sessions became active participants when lessons involved cultural elements. Their enthusiasm grew as they discovered that mathematics exists within their daily traditions. This transformation exemplifies (Sunzuma et al., 2021) educational philosophy that authentic learning emerges from the interplay between experience and reflection.

Students' curiosity was particularly heightened during activities involving the creation of geometric patterns based on Damar Kurung designs. They engaged in cooperative discussions, sharing creative ideas and analyzing the mathematical balance of their designs. Such learning conditions promote intrinsic motivation a critical factor for sustaining long-term mathematical interest.

The findings correspond with those of (Sunzuma & Maharaj, 2020) who found that culturally responsive mathematics teaching enhances student engagement, empathy, and social connection within the classroom. Furthermore, the integration of cultural identity into learning contributes to inclusive education, as each student feels represented and valued within the learning material.

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Comparative and Theoretical Alignment with Previous Research

The present findings are in line with multiple ethnomathematical studies emphasizing the cultural embeddedness of mathematics. (Wulandari et al., 2024) highlighted that students who learn through ethnomathematical frameworks exhibit deeper conceptual understanding and improved retention compared to those in conventional classrooms. Similarly, (Kyeremeh et al., 2023) observed that learners in African contexts developed advanced spatial reasoning when exposed to traditional crafts and patterns during mathematics instruction.

However, this study expands on prior research by specifically situating ethnomathematics within the artistic context of Damar Kurung a form of storytelling through light boxes unique to Gresik. While most previous works examined traditional games, weaving, or batik patterns, this study contributes a new perspective where narrative art becomes a mathematical text. This represents a significant theoretical expansion of ethnomathematics as it intersects with art, design, and local storytelling traditions.

The findings thus highlight a research gap in existing literature, where limited attention has been paid to integrating narrative-based cultural artifacts into mathematics education. This study provides empirical evidence that such integration can yield both cognitive and affective benefits for elementary learners in madrasah settings, enriching the cultural dimension of STEM education.

Implications and Future Prospects

The integration of ethnomathematics through Damar Kurung offers meaningful pedagogical implications for curriculum development and teacher training. First, it underscores the need for contextualized materials that reflect the cultural realities of Indonesian students. Embedding local wisdom within mathematics education can strengthen national identity while advancing critical and creative thinking.

Second, the results suggest that teacher education programs should incorporate ethnomathematics modules, equipping future educators with the competence to identify and transform local cultural practices into mathematical learning resources. This aligns with UNESCO's vision for culturally sustainable education that respects diversity while promoting global competencies.

Finally, the Damar Kurung-based learning model demonstrates potential scalability beyond Gresik. Other regions can adapt similar models using their own cultural artifacts, creating a nationwide movement toward culturally responsive mathematics teaching.

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CONCLUSION

This study demonstrates that integrating Damar Kurung as an ethnomathematical medium in learning plane geometry at Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan, Gresik has significant pedagogical, theoretical, and practical implications. Pedagogically, the findings indicate that culturally contextualized mathematics learning enables students to construct deeper conceptual understanding by connecting abstract geometric concepts with familiar cultural artifacts. This approach enhances students' engagement, motivation, and active participation, while simultaneously fostering a sense of cultural identity and appreciation for local heritage. For teachers, the integration of Damar Kurung encourages greater pedagogical creativity and reflective practice, as educators move beyond formula-based instruction toward more meaningful and student-centered learning experiences. Theoretically, the study reinforces ethnomathematics as a relevant framework for primary mathematics education, particularly in Islamic school contexts, by demonstrating how cultural knowledge can function as a legitimate and effective source of mathematical meaning.

Findings imply that local cultural artifacts such as Damar Kurung can serve as powerful instructional resources that support contextual, humanistic, and value-based education. This approach aligns with contemporary educational paradigms in Indonesia that emphasize culturally responsive teaching and the integration of local wisdom within the Merdeka Belajar framework. By utilizing Damar Kurung, mathematics learning is no longer perceived solely as an abstract cognitive activity but as a holistic process that integrates intellectual development with moral, social, and cultural values. Consequently, this model has the potential to be adapted and implemented in other Madrasah Ibtidaiyah or elementary schools that possess rich local cultural resources. Based on these implications several recommendations can be proposed. First, mathematics teachers at the primary level are encouraged to explore and systematically integrate local cultural artifacts into their instructional practices to enhance conceptual understanding and student engagement. Second, school leaders and curriculum developers should provide institutional support through professional development programs that strengthen teachers' competencies in ethnomathematics and culturally responsive pedagogy. Third, future research is recommended to expand the scope of investigation by examining the impact of Damar Kurung-based ethnomathematics on students' learning outcomes using mixed or experimental research designs, as well as exploring its application to other mathematical

topics beyond plane geometry. Finally, policymakers and educational stakeholders are advised to consider ethnomathematics as a strategic approach in curriculum development to ensure that mathematics education remains relevant, contextual, and rooted in Indonesia's diverse cultural heritage.

REFENRENCES

Azizi, M. K., & Shafrizal, A. (2022). Merdeka Belajar Dalam Sudut Pandang Teori Belajar Konstruktivisme dan Pendidikan Agama Islam. *Jurnal Pendidikan Dan Konseling*, *4*(4), 796–803. https://journal.universitaspahlawan.ac.id/index.php/jpdk/article/view/5321

Cresswell, J. W. (2016). *Research Design Pendekatan Metode Kuaalitatif, Kuantitatif, dan Campuran* (Edisi Keem). Pustaka Pelajar.

Danoebroto, S. W., Suyata, & Jailani. (2024). Teachers' Efforts to Promote Students' Mathematical Thinking Using Ethnomathematics Approach. *Mathematics Teaching-Research Journal*, *16*(2), 207–216.

Iffah, R. D. L., Subanti, S., Usodo, B., & Nurhasanah, F. (2025). Systematic literature review: Ethnomathematics research in Indonesia. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *10*(1), 15–27. https://doi.org/10.23917/jramathedu.v10i1.5621

Jenati, M. (2019). Eksplorasi Konsep Matematika dalam Karya Seni Damar Kurung sebagai Budaya Lokal dari Kabupaten Gresik. *Jpgsd*, *7*(3), 2964–2974.

Kholil, M., & Usriyah, L. (2020). Pengembangan Buku Ajar Matematika Terintegrasi Nilai-Nilai Keislaman dalam Penanaman Karakter Siswa Madrasah Ibtidaiyah. *Madrasah: Jurnal Pendidikan Dan Pembelajaran Dasar*, *12*(1), 52–62. https://doi.org/10.18860/mad.v12i1.7442

Kyeremeh, P., Awuah, F. K., & Dorwu, E. (2023). Integration of Ethnomathematics in Teaching Geometry: A Systematic Review and Bibliometric Report. *Journal of Urban Mathematics Education*, *16*(2), 68–89. https://doi.org/10.21423/JUME-V16I2A519

Lail, R. M., & Budiarto, M. T. (2022). Eksplorasi Etnomatematika Budaya Kampung Kemasan Gresik. *MATHEdunesa*, *11*(3), 710–719. https://doi.org/10.26740/mathedunesa.v11n3.p710-719

Mania, S., & Alam, S. (2021). Teachers' perception toward the use of ethnomathematics approach in teaching math. *International Journal of Education in Mathematics, Science and Technology*, *9*(2), 282–298. https://doi.org/10.46328/IJEMST.1551

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook (2nd ed.).* Sage publications.

Octaviyanti, L., & Wahyuni, I. (2024). Konstruksi Konsep Geometri Berdasarkan Teori Apos Konteks Budaya Damar Kurung Ditinjau Dari Perbedaan Gender. *Radian Journal: Research and Review in Mathematics Education*, *2*(3), 103–113. https://doi.org/10.35706/rjrrme.v2i3.9011

Oki Kurniawan, & Rossi Iskandar. (2022). Pendidikan Multikultural Di Sekolah Dasar : Eksplorasi Batik Nusantara Berbasis Kearifan Lokal. *Jurnal Pendidikan Dasar*, *12*(02), 173–182. https://doi.org/10.21009/jpd.v12i02.26790

Rahmawati, E. F., Mariati, P., & ... (2023). Peningkatan Keterampilan Menyimak Cerita Melalui Media Damar Kurung Pada Siswa Sekolah Dasar. *Prosiding National ...*, *01*, 461–467. https://conferences.unusa.ac.id/index.php/NCU2020/article/view/1122

Ramadhan, F. A., & Hidayah, N. (2022). *Penggunaan Strategy Diskursus Multy Representation (DMR) untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika Peserta Didik*. *3*(2).

Sari, A., Putri, R. I. I., Zulkardi, & Prahmana, R. C. I. (2024). Ethnomathematics in Indonesian Woven Fabric: The Promising Context in Learning Geometry. *Mathematics Teaching-Research Journal*, *16*(5), 157–185.

Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (Sutopo (ed.); Cet. 1). Alfabeta.

Suherman, S., & Vidákovich, T. (2022). Tapis Patterns in the Context of Ethnomathematics to Assess Students' Creative Thinking in Mathematics: A Rasch Measurement. *Mathematics Teaching-Research Journal*, *14*(4), 56–79.

Sunzuma, G., & Maharaj, A. (2020). Exploring Zimbabwean Mathematics Teachers' Integration of Ethnomathematics Approaches into the Teaching and Learning of Geometry. *Australian Journal of Teacher Education*, *45*(7), 77–93. https://doi.org/10.14221/ajte.2020v45n7.5

Sunzuma, G., Zezekwa, N., Gwizangwe, I., & Zinyeka, G. (2021). A Comparison of the Effectiveness of Ethnomathematics and Traditional Lecture Approaches in Teaching Consumer Arithmetic: Learners' Achievement and Teachers' Views. *Pedagogical Research*, *6*(4), em0103. https://doi.org/10.29333/pr/11215

Supriyadi, E., Turmudi, T., Dahlan, J. A., & Juandi, D. (2024). Development of Sundanese Gamelan Ethnomathematics E-Module for Junior High School Mathematics Learning. *Malaysian Journal of Learning and Instruction*, *21*(2), 147–186. https://doi.org/10.32890/mjli2024.21.2.6

Toropova, A., Myrberg, E., & Johansson, S. (2021). Teacher job satisfaction: the importance of school working conditions and teacher characteristics. *Educational Review*, *73*(1), 71–97. https://doi.org/10.1080/00131911.2019.1705247

Tri Septiani, Y., Destiniar, & Putri Dewi Nurhasana. (2023). Pengembangan Media Permainan Spin (Roda Putar) Pada Materi Bangun Datar Siswa Kelas Iv Sekolah Dasar Negeri 6 Rambang. *Didaktik : Jurnal Ilmiah PGSD STKIP Subang*, *9*(2), 5635–5644. https://doi.org/10.36989/didaktik.v9i2.1272

Wiryanto, Habibie, R. K., & Nurlaily, V. A. (2024). Hypothetical Learning Trajectory Strategy in Ethno-Realistic Mathematics Education: An Exploration of Damar Kurung. *Jurnal Elementaria Edukasia*, *7*(3), 3062–3071. https://doi.org/10.31949/jee.v7i3.10455

Wulandari, I. G. A. P. A., Payadnya, I. P. A. A., Puspadewi, K. R., & Saelee, S. (2024). The Role of Ethnomathematics in South-East Asian Learning: A Perspective of Indonesian and Thailand Educators. *Mathematics Teaching-Research Journal*, *16*(3), 101–119.

Zainil, M., Helsa, Y., Sutarsih, C., Nisa, S., Sartono, & Suparman. (2024). A needs analysis on the utilization of learning management systems as blended learning media in elementary school. *Journal of Education and E-Learning Research*, *11*(1), 56–65. https://doi.org/10.20448/jeelr.v11i1.5310

Zainovi, P. S., Mariana, N., Istiq'faroh, N., Wiryanto, W., & Muhimmah, H. A. (2025). Integrating Ethnomathematics in Geometry Learning to Enhance Primary Students' Numeracy Skills: A Systematic Literature Review. *Journal of Innovation and Research in Primary Education*, *4*(3), 1044–1053. https://doi.org/10.56916/jirpe.v4i3.1467