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Ethnomathematics in Sundanese Crafts: A Systematic Literature Review

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Abstrak

Etnomatematika adalah studi tentang hubungan antara konsep matematika dengan praktik budaya suatu masyarakat. Penelitian ini mengeksplorasi etnomatematika dalam kerajinan tradisional Sunda melalui tinjauan literatur sistematis (SLR) terhadap 13 artikel yang diterbitkan antara tahun 2020-2024. Penelitian ini mengidentifikasi berbagai konsep matematika yang terkandung dalam kerajinan seperti anyaman bambu, payung geulis, dan bros kain bertumpuk. Analisis menunjukkan bahwa prinsip-prinsip matematika, termasuk geometri datar dan ruang, simetri, tessellasi, transformasi geometris, dan deret aritmetika, secara alami diterapkan dalam pembuatan kerajinan tradisional. Studi ini juga menyoroti potensi untuk mengintegrasikan temuan ini ke dalam pembelajaran matematika guna meningkatkan pemahaman siswa melalui pendekatan berbasis budaya dan kontekstual. Oleh karena itu, penelitian ini menyediakan sintesis dasar untuk pengembangan pendidikan matematika yang lebih inklusif berdasarkan kebijaksanaan lokal.
Kata Kunci: Etnomatematika; Kerajinan; Sunda

Abstract

Ethnomathematics is the study of connecting mathematical concepts with the cultural practices of a society. This study explores ethnomathematics in traditional Sundanese crafts through a systematic literature review (SLR) of 13 articles published between 2020-2024. This research identifies various mathematical concepts contained in crafts such as bamboo weaving, *payung geulis*, and stacked fabric brooches. The analysis reveals that mathematical principles, including plane and spatial geometry, symmetry, tessellation, geometric transformations, and arithmetic sequences, are naturally applied in traditional craftmaking. This study also highlights the potential for integrating these findings into mathematics learning to enhance students' understanding through a culturally based, contextual approach. Thus, this research provides a foundational synthesis for the development of more inclusive mathematics education based on local wisdom.
Keywords: Ethnomathematics; Crafts; Sundanese

I. INTRODUCTION

Ethnomathematics is a field of study that examines the relationship between mathematics and culture (Batiibwe, 2024), particularly how mathematical concepts are integrated into the cultural practices of a society. The term was first introduced by Ubiratan D'Ambrosio in 1977, who emphasized the importance of understanding mathematics not only as an abstract academic discipline, but also as a cultural product that develops in everyday life. Ethnomathematics is a bridge between mathematics and culture, as previously explained by ethnomathematics, which recognizes different ways of doing mathematics in community activities (Rawani & Fitra, 2022; Payadnya et al., 2024). Ethnomathematics encompasses various aspects, ranging from geometric patterns (Balacuit & Oledan, 2024) and number systems (Janiola, 2024) to measurement (Anriana et al., 2023) and logic concepts (Patri & Heswari, 2021) applied in specific cultural contexts.

In the context of Sundanese culture, traditional crafts such as bamboo weaving (Leksmono, Budiarto, & Ekawati, 2021), batik (Faiziyah et al., 2021; Devita, Puspitasari, & Afriansyah, 2025), and geulis umbrellas (Fauzi et al., 2023) not only reflect aesthetics and function, but also contain profound mathematical principles. For example, the motifs on bamboo weaving in Rajapolah, Tasikmalaya, demonstrate the application of geometric concepts, including symmetry, tessellation, and fractal patterns (Daniel et al., 2025). This weaving often employs repeating patterns that depict mathematical regularity, even though it is created manually without the aid of modern measuring tools. This shows that mathematical concepts can develop naturally in local traditions.

The design of the geulis umbrella, unique to Tasikmalaya, illustrates the use of geometric transformations, including rotation, reflection, and translation (Ratnadewi et al., 2022). The motifs that adorn the surface of this umbrella are often arranged in a symmetrical circle, creating beautiful visual harmony. In addition, the process of making this umbrella involves precise proportion calculations to ensure the balance and stability of the umbrella's structure. These aspects demonstrate how mathematical concepts are applied in traditional arts and crafts.

The exploration of ethnomathematics in traditional Sundanese crafts is essential for understanding how mathematics is applied in a cultural context (Umbara, Prabawanto, & Jatisunda, 2023; Chyntia, Kurniati, & Afriansyah, 2025). This study not only reveals the richness of local culture but also provides a new perspective on mathematics learning (Rahman et al., 2025). By integrating ethnomathematics into the education curriculum (Sunzuma & Maharaj, 2021; Lidinillah et al., 2022), students can understand that mathematics is not just abstract theory, but something alive and relevant to their daily lives.

The ethnomathematics approach can also increase student motivation to learn (Mania & Alam, 2021), as they can see the connection between the mathematical concepts learned in class and their real lives (Machaba & Dhlamini, 2021). For example, students can be invited to analyze geometric patterns in bamboo weaving or calculate symmetry in geulis umbrella

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designs. These activities not only strengthen their understanding of mathematical concepts but also develop their appreciation of their cultural heritage.

While numerous primary studies have explored ethnomathematics in specific Sundanese crafts and regions, a comprehensive synthesis of these findings is currently lacking. A systematic literature review is necessary to consolidate this dispersed knowledge, identify overarching patterns, highlight research trends, and pinpoint gaps for future studies. This study aims to fill this gap by systematically reviewing and analyzing the existing research on ethnomathematics in Sundanese crafts from the last five years.

Therefore, a systematic study of ethnomathematics in traditional Sundanese crafts is urgently needed. This study aims to identify and analyze various mathematical concepts contained in traditional Sundanese crafts, as well as explore their potential as a contextual and meaningful learning resource. Thus, this research is expected to make a significant contribution to the development of mathematics education that is more inclusive and relevant to local culture.

II. METHOD

This study is a Systematic Literature Review (SLR). SLR is a literature review method that identifies, assesses, and interprets findings on a research topic to answer predetermined research questions. This SLR was conducted by identifying, reviewing, evaluating, and interpreting all available studies. Using this method, researchers conduct reviews and identify journals in a structured manner, following predetermined steps at each stage (Triandini et al., 2019). The design used in this study aims to summarize, review, and analyze several studies that utilize Ethnomathematics in Sundanese Crafts as a research theme, drawing on searches from various sources.

The research stages in this study include several systematic steps to ensure the validity and relevance of the data obtained. These stages include:

1. Formulation of Research Questions

Research questions are formulated based on the researcher's needs related to the topic being studied. These questions aim to guide the data collection and analysis process. The research questions (RQ) in this study are as follows.

RQ1: "What are the results of research related to ethnomathematics in Sundanese crafts published in the last five years?"

RQ2: "What forms of crafts have been analyzed in ethnomathematics articles on Sundanese crafts over the last five years?"

RQ3: "Which regions have been the focus of ethnomathematics analysis articles on Sundanese crafts in the last five years?"

RQ4: "What mathematical material has been associated with ethnomathematics analysis articles on Sundanese crafts in the last five years?"

2. Data Search Process

The data search process was conducted to collect references relevant to the research questions. The search was conducted using databases such as Google Scholar and Publish or Perish. The keywords used in the search included: "Ethnomathematics," "crafts," and "Sunda."

3. Inclusion and exclusion criteria

Inclusion and exclusion criteria are used to filter relevant data and ensure that the data is suitable for the research objectives. These criteria help determine whether the studies obtained are suitable for further analysis in this SLR research. Details of the inclusion and exclusion criteria are presented in Table 1 below.

Table 1.
Format Baku Tabel

Inclusion	Exclusion
National or international articles related to ethnomathematics in Sundanese crafts.	National or international articles that are not ethnomathematics in Sundanese crafts
National or international articles related to the topic or title of the research.	National or international articles that do not correspond to the research topic or title
Articles published between 2020 and 2024.	Articles published before 2020
The language used is Indonesian	Languages other than Indonesian or English

4. Quality Assessment

The next step is to assess the quality of the collected data. This assessment is based on the following criteria:

QA1: Was the article published between 2020 and 2024?

QA2: Does the article clearly State the research objectives, type of research, or research methods used?

QA3: Does the article specifically mention the Sundanese crafts being analyzed?

Each quality assessment (QA) question is answered with either "Yes" or "No" to facilitate the evaluation process.

5. Data Collection

The data collected in this study are primary data, obtained through various methods, including interviews, observations, surveys, and other techniques tailored to the study's specific needs. The collected data is then analyzed to answer the research questions (RQ) that have been formulated.

6. Data Analysis

Data analysis was conducted with reference to the research questions. This process involved processing and interpreting the data to obtain relevant and in-depth findings in accordance with the research objectives.

7. Deviations from the Protocol

During the research process, several adjustments were made to the initial protocol. One of the changes made was to modify the search keywords to improve the relevance and suitability of the data obtained.

III. Result and Discussion

A. RQ 1: "What are the results of ethnomathematics analysis research on Sundanese crafts from studies published over the past five years?"

The number of articles published in the last five years related to ethnomathematics in Sundanese crafts amounted to 13 articles, as summarized in Table 2.

Table 2.
Research Findings Related to Ethnomathematics in Sundanese Crafts

No	Research	Research Title	Research Result
1	Siska Ryane Muslim, Mega Nur Prabawati (2020)	Ethnomathematics Study of Umbrella Crafters	There is a connection between Payung Geulis and mathematics, as demonstrated by the presence of mathematical elements based on geometric

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No	Research	Research Title	Research Result
		Geulis Tasikmalaya, West Java	concepts. These geometric concepts include plane geometry, solid geometry, symmetry, geometric transformations (such as reflection, translation, and rotation), and congruence.
2	Nina Sri Wahyuni (2021)	Ethnomathematics Analysis of Bamboo Weaving Crafts in Mathematics Learning in Sukabumi Regency	From the bamboo weaving craft, several mathematical concepts can be taught, including learning about flat shapes and spatial shapes. These concepts can be linked to mathematics learning, one of which is the study of story problems to introduce ethnomathematics.
3	Dedi Nurjamil, Dedi Muhtadi, Ai Habibah (2021)	Ethnomathematics Study: Uncovering Mathematical Concepts in Bamboo Weaving Crafts in Cigalontang District, Tasikmalaya Regency	There are concepts of arithmetic sequences, multiplication, addition, and square diagonals in the activities of making nyiru, hihid, aseupan, boboko, and bilik weavings. There is also a philosophy behind the round shapes of nyiru, aseupan, and boboko weaving, namely tekad kudu buleud (life must have strong determination). And in the weaving of boboko and hihid, namely hirup urang kudu masagi (pengkuh agamana, luhung elmuna, jembar budayana jeung rancage gawena), which can be interpreted as meaning that as humans, we must be obedient in worship, master knowledge, have a strong sense of identity in holding on to culture, and be creative in our work.
4	Fitriani Muldiana, Shofa Laelatul Mukaromah, Neng Ani Karleni, Nani Ratnaningsih (2021)	The Mathematical Aesthetics of Songket Motifs in Tasikmalaya Mendong Weaving	There is mathematical aesthetics in Thomas Aquinas' theory. The mathematical concepts incorporated into the songket motifs on the weaving include repeating patterns of 1-2-3-4 and 4-3-2-1, as well as geometric concepts such as parallel lines, reflection, congruence, and rhombus shapes.
5	Sidiq Aulia Rahman, Ramanda, Rachma Sundhari (2022)	Exploring Payung Geulis Tasikmalaya with the Concept of Ethnomathematics Assisted by the Geogebra Application	Exploring Tasikmalaya's Payung Geulis with the Concept of Entomathematics, Assisted by the Geogebra Application, revealed mathematical concepts in Payung Geulis handicrafts that can be utilized as learning resources for educators and students, particularly in subjects such as flat shapes, spatial shapes, and geometric transformations, including reflection and rotation.
6	Tri Koriah Mellawaty (2022)	Exploring Ethnomathematics in the Handicraft Process of Fabric Brooches by the Community of Cantigi Kulon Village, Cantigi District, Indramayu	Mathematical concepts are applied in the process of making brooches. The mathematical concepts employed in the process of creating handmade fabric brooches include geometry and arithmetic. Geometric concepts, such as squares, circles, semicircles, and triangles, are utilized in creating the necessary patterns, including brooch petals and brooch covers. In addition to geometry, the concept of arithmetic sequences is used by brooch artisans to determine the difference between the petals in each layer.
7	Abdul Karim, Nurhayati, Andri Suryana (2023)	Exploratory Study on Bamboo Weaving Media from an Ethnomathematics Perspective	The ethnomathematics explored in this study concerns mathematical concepts related to spatial figures in cone-shaped objects without bases, tubes without lids, and blocks found in woven bamboo crafts, such as hats, baskets, and containers.

No	Research	Research Title	Research Result
			Mathematical concepts of flat shapes, such as circles, squares, and rectangles, found in woven bamboo crafts like nyiru, hihid, and bakul, can be applied in mathematics learning.
8	Dike Ratih Yulistiyani, Ida Nuraida, Nur Eva Zakiah (2023)	Utilization of Ethnomathematics in Rajapolah Pandan Weaving Crafts in Mathematics Learning	Ethnomathematics in Rajapolah pandan weaving crafts, particularly pandan weaving and its relevance to mathematics learning, is as follows: (1) There are mathematical concepts in Rajapolah pandan weaving crafts, namely geometric and algebraic concepts. These include rectangles, squares, trapezoids, blocks, cylinders, and SPLDV. (2) Rajapolah pandan weaving crafts are suitable as objects for ethnomathematics-based mathematics learning.
9	Yati Restiani, Hetty Patmawati, Ratna Rustina (2023)	Study of Ethnomathematics in Bamboo Weaving Crafts in Salawu Village	(1) There is a philosophy in bamboo weaving crafts, namely in Tolombong weaving products, sieves, and community activities in the process of making weaving materials that are connected to life as a way of life. (2) There are mathematical concepts contained in Tolombong weaving crafts, including rotation, flat shapes, and arithmetic sequences; Karawng weaving crafts, including reflection, translation, and congruence; and Mata Itik crafts, including reflection. (3) There are mathematical aesthetic values contained in bamboo weaving crafts, which are divided into three, namely integrity of perfection, proportion or harmony, and brightness of clarity.
10	Anisa Umi Kulsum, Fani Fadilawati, Fira Aini Lutfiana, Lutfiah Fathul Hasanah (2023)	Ethnomathematics in Bamboo Weaving Crafts as Household Equipment from West Java	There are mathematical concepts contained in the process of making bamboo weaving, especially in geometry. Some geometric shapes found in bamboo weaving crafts include circles, squares, rectangles, cubes, and blocks. The results of this exploration are expected to inform the sustainability of bamboo weaving crafts and increase appreciation for mathematical cultural heritage among the people of West Java.
11	Radika Lesmana, Dindiin Abdul Muiz Lidinillah, Pidi Mohamad Setiadi (2024)	Hypothetical Learning Trajectory Design for Measuring the Volume of Spatial Figures based on Ethnomathematics in Rajapolah Crafts	Hypothetical learning trajectory design for learning how to measure the volume of spatial figures based on Rajapolah ethnomathematics crafts. This hypothetical learning trajectory design can provide educators with an overview of how to implement and develop learning tools for measuring the volume of spatial figures based on Rajapolah ethnomathematics crafts.
12	Zahira Auladina Solihah, Rika Nurhayati, Faza Tsamrotul Apipah, Nuraly Masum Aprily, Riva Sutisna (2024)	The Values of the Geulis Umbrella of Tasikmalaya City in Early Childhood Education	The use of geulis umbrellas as a learning tool has great potential to introduce local wisdom to future generations. Integrating geulis umbrellas into early childhood education can strengthen children's sense of cultural identity and enrich their learning experiences.
13	Intan Maharani, Tria Ramadani, Zahra Salsa Sabila, Ghenia Tasya Nugraha,	Traditions and Symbolic Meanings of the Geulis	The results of the study show that the geulis umbrella is a cultural heritage of Tasikmalaya with a long history and symbolic meaning in its motifs, such as prosperity and harmony. The production process is

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No	Research	Research Title	Research Result
	Risky Achmad Hidayat, Mutia Apriani, Mina Kameliya Humairah, Zahra Amelia Putri, Randy Fadillah Gustaman, Lilis Rosita (2024)	Umbrella in Sundanese Society	traditional and has been passed down through generations, making it a cultural identity that is utilized in various traditional events.

B. RQ 2: "What types of crafts have been selected in ethnomathematics analysis articles on Sundanese crafts in the last five years?"

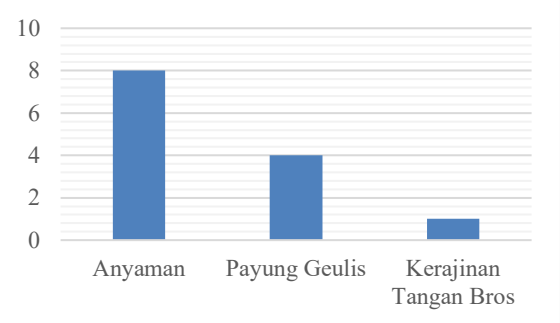

Figure 1. Form of crafts

Based on Figure 1, it can be seen that weaving is the most analyzed form of craft in ethnomathematics articles on Sundanese crafts over the last five years. This demonstrates that weaving is highly relevant to the concept of ethnomathematics, as it involves geometric patterns, symmetry, and complex mathematical structures in the manufacturing process. Geulis umbrellas are also quite often the subject of study, although fewer than woven crafts. This craft is fascinating to analyze because it incorporates elements of pattern, symmetry, and aesthetics closely related to mathematical concepts, particularly in its design and decorative motifs. Handcrafted brooches are the least analyzed form of craft. However, brooches remain relevant in the context of ethnomathematics because their designs often incorporate simple geometric patterns. This low frequency may be due to the limited number of articles that discuss this craft in depth. Based on this data, weaving is the most dominant form of Sundanese craft analyzed in ethnomathematics articles over the past five years. This is likely due to the richness of mathematical patterns found in weaving compared to other forms of craft.

C. RQ3: "Which regions have been selected in ethnomathematics analysis articles on Sundanese crafts in the last 5 years?"

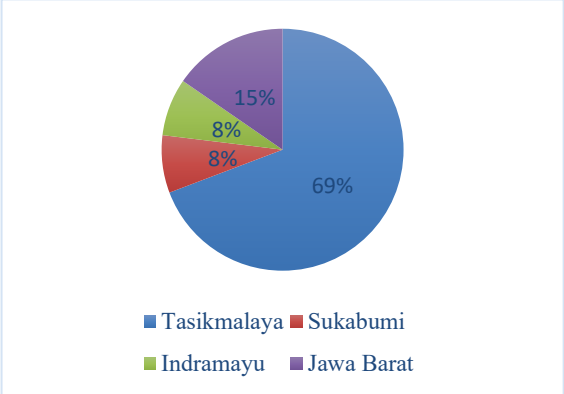

Figure 2. Name of region

Based on Figure 2, Tasikmalaya is the most dominant region analyzed in ethnomathematics articles related to Sundanese crafts. This dominance suggests that Tasikmalaya has a rich craft tradition, including bamboo weaving and geulis

umbrellas, which incorporate numerous mathematical elements, such as flat shapes, spatial shapes, geometric transformations, and number patterns. Several articles also discuss Sundanese crafts in general in the West Java region, without explicitly referring to a particular region. This indicates a focus on cultural and craft diversity at the provincial level, with various forms of crafts spread across different regions. Sukabumi has a smaller share in ethnomathematics studies. However, this region remains of interest due to its unique local craft potential, such as traditional weaving, which contains mathematical values. Similar to Sukabumi, Indramayu is also the subject of study, albeit with lower frequency. Based on this data, Tasikmalaya is the region most frequently analyzed in ethnomathematics articles related to Sundanese crafts in the last five years. This shows that Tasikmalaya has made a significant contribution to the preservation and development of traditional crafts rich in mathematical elements.

D. RQ4: "What mathematical material is related to ethnomathematics analysis articles on Sundanese crafts in the last 5 years?"

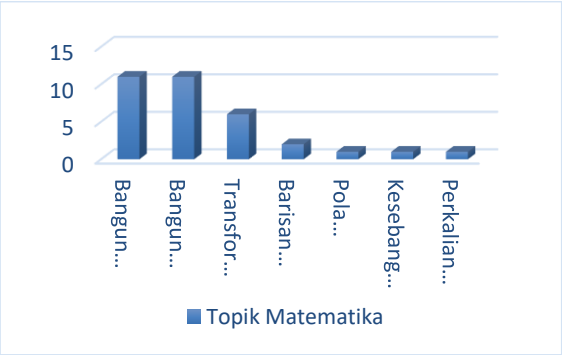

Figure 3. Mathematics topic

Based on Figure 3, material on flat shapes is the topic most frequently associated with ethnomathematics analysis articles. This indicates that many patterns and designs in Sundanese crafts, such as weaving and decorative motifs, employ the concept of flat shapes, including triangles, squares, rectangles, and circles. Similar to flat shapes, material on spatial shapes is also very dominant. Crafts such as bamboo weaving, geulis umbrellas, and traditional container shapes are highly relevant to the concept of solid figures because they involve three-dimensional structures, such as cubes, cones, pyramids, and cylinders. Geometric transformations, such as translation, rotation, reflection, and dilation, also appear quite frequently. Symmetrical and repetitive patterns in craft designs, such as those found in weaving and decorative motifs, reflect the application of this concept. Arithmetic sequences are used to analyze patterns that develop regularly in the design or arrangement of craft elements, such as those found in weaving. Although not as common as other topics, this concept is still relevant in understanding the regularity of patterns in crafts. Meanwhile, number patterns, similarity, and congruence, as well as multiplication and addition, are also found in craft designs. Flat and solid shapes are the mathematical topics most frequently associated with the ethnomathematical analysis of Sundanese crafts in the last five years. This demonstrates that geometric elements, both two-dimensional and three-dimensional, play a crucial role in understanding the structure and design of traditional Sundanese crafts.

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According to the study's analysis of 13 articles, all authors were researchers from Indonesia. This finding indicates that the development of ethnomathematics research in Indonesia, particularly in the West Java region, has considerable potential for further growth. Currently, research focusing on ethnomathematics in Sundanese crafts is still limited to areas such as Tasikmalaya, Sukabumi, and Indramayu. In fact, West Java boasts a rich cultural heritage, with various types of Sundanese crafts that have not been widely explored in the context of ethnomathematics. Research development can be directed to other areas in West Java that have distinctive craft traditions, such as Cirebon with its batik art, Garut with its distinctive leather crafts, or Cianjur with its bamboo weaving art. Each of these regions has unique cultural characteristics and craft motifs that can be studied to uncover the mathematical concepts embedded within them, such as flat shapes, spatial shapes, number patterns, geometric transformations, and even basic arithmetic concepts.

Furthermore, in line with research Acharya et al. (2021), Cayubit (2022), Davidovitch & Dorot (2023), Novikasari, Muttaqin, & Elebiary (2024), Akumbu (2024), and Yanti (2025), linking mathematical material to everyday life, primarily through local culture, has significant benefits in increasing student motivation. When students see that the material they are learning is relevant to their surroundings, they will feel more interested and motivated to understand these concepts more deeply. This approach not only enhances students' understanding of mathematics but also cultivates a love for local culture and preserves the nation's cultural heritage.

The findings of this study, which show the dominance of geometric concepts in Sundanese crafts, reinforce the fundamental proposition of situated learning theory (Lave & Wenger, 1991). Activities such as weaving bamboo or designing geulis umbrellas constitute authentic communities of practice in which geometric knowledge of symmetry, transformation, and spatial structures is not taught abstractly but applied as functional tools for creating cultural artifacts. This aligns with the findings of Leksmono, Budiarto, & Ekawati (2021) and Daniel et al. (2025), which reveal the complexity of fractal patterns and geometry in Rajapolah weaving, thereby demonstrating that mathematics is a living, contextual practice. The dominance of geometry also offers a powerful bridge for a constructivist approach to learning. The physical process of assembling a craft, as studied by Nurjamil, Muhtadi, & Habibah (2021) in bokor weaving, allows students to build an abstract understanding of shape and space through concrete experience, facilitating the transition from concrete operational thinking to formal thinking.

The implications of these findings for curriculum development are significant. The crafts analyzed can serve as a basis for designing contextual learning modules, a step supported by research by Umbara, Prabawanto, & Jatisunda (2023) on mathematical literacy combined with Sundanese ethnomathematics. The integration of woven motifs or geulis

umbrella designs into geometry lessons not only increases relevance but also realizes the principle of culturally responsive pedagogy (Gay, 2018), in which local wisdom is used as a bridge to academic achievement, as advocated by Mania & Alam (2021) and Sunzuma & Maharaj (2021). However, the success of this integration depends heavily on teacher readiness. This review's finding that research is still dominated by academics and focused on specific regions such as Tasikmalaya—as indicated by the numerous studies from Karim et al. (2023) to Lesmana et al. (2024)—confirms the gap between research and classroom practice. Therefore, teacher professional development programs that focus on improving "ethnomathematics literacy" are a must, as suggested by Machaba & Dhlamini (2021), so that teachers can identify and transform mathematical concepts embedded in culture into effective pedagogical strategies.

Although the benefits of ethnomathematics in increasing learning motivation have been widely recognized, as in the studies by Cayubit (2022) and Davidovitch & Dorot (2023), this synthesis highlights the need for a future research agenda that extends beyond motivation. Further studies using design-based research (DBR) or experimental methodologies, such as those pioneered by Lesmana, Lidinillah, & Setiadi (2024) in designing hypothetical learning trajectories, are needed to empirically test the impact of this approach on students' conceptual understanding and spatial abilities. In addition, the tendency for research to focus on the Tasikmalaya region and weaving opens up opportunities for broader exploration. Future research is strongly encouraged to reach other untapped Sundanese regions and crafts, such as Cirebon batik or Garut carving, to enrich the map of Indonesian ethnomathematics and prevent excessive generalization, while responding to the call of Lidinillah et al. (2022) for a more systematic integration of Sundanese ethnomathematics into the curriculum. Thus, the potential of ethnomathematics does not end with enriching knowledge; it can be implemented in tangible ways to create a more inclusive and meaningful mathematics education.

IV. CONCLUSION

This study contributes to the field by providing the first systematic synthesis of ethnomathematics research focused specifically on Sundanese crafts, mapping the current landscape and revealing a strong emphasis on geometric concepts and the Tasikmalaya region. To build on this foundation, educators are suggested to develop teaching modules using the identified crafts, while researchers are encouraged to investigate the crafts of other Sundanese regions and conduct design-based research to create and test ethnomathematics-based learning tools.

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