Jurnal MATH-UMB.EDU
Vol 13, (3), 2026

ETHNOMATHEMATICS IN BAMBOO WEAVING OF WEST JAVA: AN AUTOETHNOGRAPHIC PERSPECTIVE

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Received: 09-06-2026 Revised: 10-07-2026 Accepted: 31-07-2026 Published: 31-07-2026

Abstract

Cultural artifacts can be a good source for ethnomathematics studies, showing math ideas through their visual patterns and symbolic meanings. But there isn't much research yet that deeply looks at local cultural practices using a personal, autoethnographic approach. This study wanted to see what math ideas are hidden in bamboo weaving from West Java, and how useful it could be for teaching math. We used a qualitative approach, specifically autoethnography. This involved the researcher looking back at their own experiences, along with visually analyzing the weaving patterns and reviewing existing literature. We also talked to math education experts to make sure our interpretations made sense. We found three main math structures: tessellation, which means repeating patterns that fit together without gaps; shapes made from simpler geometric forms, arranged in layers; and visible in both the overall design and individual small motifs. Beyond that, bamboo weaving also has symbolic meanings. These reflect Sundanese cultural values like connection, balance, and togetherness. This study shows that bamboo weaving could be a great way to teach geometry in a real-world setting. Students could visualize things, build patterns, and analyze them. From a conceptual and method point of view, our study helps ethnomathematics grow. It does this by showing how a personal, autoethnographic approach can really help us systematically find math structures in local cultural items.

Keywords: Ethnomathematics, Bamboo Weaving, Autoethnography, Geometry, West Java

INTRODUCTION

Today, education around the world is dealing with tougher and tougher challenges. It's not just about getting better grades, but also about helping students understand their social lives, cultures, and who they are as the world becomes more connected (Vos et al., 2024). Schools aren't just supposed to teach facts; they're also expected to change things for the better, helping students think critically, understand people from different cultures, and value all sorts of differences. If education doesn't include culture in how we learn, kids might get confused about who they are and feel disconnected from their own communities and backgrounds. That's why teaching in a way that respects culture is so important now (Fouze & Amit, 2019). It helps connect what students learn in school with their real-life experiences. With this in mind, bringing cultural aspects into math class can be a really good and helpful way to teach.

Math class shouldn't just be about getting good at numbers. It can also be a strong way to teach human values, help kids appreciate different backgrounds, and understand the world better, all while still hitting those regular learning goals. So, math isn't just some subject separate from society and culture; it's actually a key part of human life, full of meaning. Math is one of those main subjects that's super important for helping students learn to think critically, reason logically, and solve problems. But even so, math education still runs into lots of difficulties, especially in countries that are still developing, like Indonesia. For example, the 2022 PISA test showed that Indonesia was 65th out of 81 countries. The results of the 2022 Programme for International Student Assessment (PISA) indicate that Indonesia experienced challenges in mathematics achievement, ranking 65th out of 81 participating countries with an average score of 366. This performance remained considerably lower than the OECD average score of 472 (Bilad et al., 2024). This really points to a big difference in how well students can do math. A big part of the problem seems to be that math is taught in a way that's too abstract and doesn't connect much to real life (Harun et al., 2021). Lots of research shows that students often see math as a hard, scary subject that has nothing to do with their lives. This leads to them not wanting to engage and, in turn, not learning well. This bad feeling usually comes from how math is taught, focusing too much on abstract symbols and not connecting them to everyday situations (Vos et al., 2024). Because of this, students miss out on seeing how math fits into culture and is useful in practical ways. On top of that, other studies show that even though students know math is important, they often keep what they learn in school separate from how it's used in real life (Kaya & Kesan, 2023). They find it tough to link those abstract ideas to their daily experiences. This situation really points out a big disconnect between the math taught in class and what people use every day, which ultimately stops students from truly understanding concepts.

This situation underscores the need for innovation in mathematics education that can provide a more contextual, relevant, and meaningful learning experience. One promising conceptual framework to address this issue is ethnomathematics, which integrates formal mathematical concepts with cultural knowledge and the everyday practices of students' communities. This approach was introduced by Ubiratan D'Ambrosio in 1985 as a response to the dominance of abstract mathematics learning, detached from its socio-cultural context. Over time, ethnomathematics has sought to make mathematics education more relevant by acknowledging the diverse ways cultures understand, express, and apply mathematical ideas in daily life (Rosa & Orey, 2020). In line with this, various empirical studies and meta-analyses consistently show that ethnomathematics-based learning has a positive impact on students' conceptual understanding and mathematics performance, although the results may vary depending on the context and timing of implementation (Sulistyowati & Mawardi, 2023). In addition to improving academic achievement, this approach also contributes to strengthening students' cultural identity, fostering moral character, and developing an appreciation for both local and global cultural heritage. Furthermore, ethnomathematics is closely linked to multicultural education, which emphasizes the importance of recognizing diversity and developing global citizenship through inclusive and participatory learning experiences.

However, most ethnomathematics research has focused on certain local cultural forms, such as batik, weaving, traditional houses, folk games, and calendrical systems, predominantly within the contexts of Java, Nusa Tenggara, and Lampung. This condition suggests that exploration of other cultural practices, which are also rich in mathematical values, remains relatively limited. As a result, the potential of cultural diversity as a source of contextual mathematics learning has yet to be fully optimally explored (Sari et al., 2023; Setiani et al., 2018).

In this context, the practice of bamboo weaving in West Java, particularly within Sundanese culture, represents a local wisdom with great potential but has received limited attention in ethnomathematics studies. Bamboo weaving is not only a traditional craft but also represents various mathematical concepts such as geometry, patterns, symmetry, measurement, and spatial reasoning (Zuraidah et al., 2020). The complex motifs and structures of the weave reflect implicit mathematical knowledge passed down through generations via cultural practices, rather than through formal education. Nevertheless, studies on ethnomathematics that highlight bamboo weaving practices are still limited, especially those using the autoethnographic approach. Most previous research has been descriptive and has not been able to uncover deeper dimensions of experience and meaning from these cultural practices. In contrast, the autoethnographic approach enables researchers to explore the relationships between personal experiences, culture, and the construction of mathematical knowledge in a more reflective and contextual manner.

Based on the above, this study aims to

explore the mathematical concepts embedded in the bamboo weaving practices of West Java through an autoethnographic approach. Specifically, this research focuses on: (1) identifying the forms and structures of bamboo weaving motifs, (2) analyzing the mathematical concepts contained within them, (3) examining the autoethnographic experiences of the researcher in understanding the relationship between culture and mathematics, and (4) exploring the potential use of bamboo weaving as a source of contextual mathematics learning. The novelty of this study lies in the use of the autoethnographic approach in ethnomathematics research focusing on bamboo weaving practices in West Java. Unlike previous studies, which have tended to focus on the descriptive identification of mathematical aspects, this research reveals the implicit dimensions of experience, meaning, and the construction of mathematical knowledge within cultural practices. Therefore, this study not only contributes to the methodological development of ethnomathematics research but also offers pedagogical implications for the development of more contextual, reflective, and culturally-based mathematics learning as a response to the low mathematics literacy achievement in Indonesia. The importance of linking mathematics with culture.

METHOD

The method used in this research is autoethnography, which studies and describes the culture of a community (Ellis et al., 2011; Sari et al., 2023). This method was chosen to gain insight into the West Javanese people's worldview and culture, particularly in the practice of bamboo weaving, which is rich in local values. This method aligns with ethnomathematics, which seeks to understand the mathematical ideas, techniques, procedures, and socio-cultural values possessed and developed by the West Javanese people in facing life's challenges, as seen in the complex and structured bamboo weaving techniques (Risdiyanti & Prahmana, 2018). Data were collected through review of ethnomathematics literature and photo documentation that recorded the bamboo weaving process in detail. The results of the data collection were explained using source triangulation techniques to explore the relationship between the mathematical knowledge systems hidden in bamboo weaving practices and traditional West Javanese textiles. This study aims to explore the mathematical concepts used and developed by the community in creating bamboo weaving works that are closely related to culture and identity. Finally, the findings and data analysis are explained in this study to reveal insights into ethnomathematics in the context of West Javanese bamboo weaving. In this study, ethnomathematics is conceptualized as an analytical approach that explores how the cultural knowledge and mathematical ideas embedded in bamboo weaving practices, writing, and practice are expressed in the bamboo weaving craft of West Java. Ethnomathematics serves as an interpretive lens to understand bamboo weaving patterns not merely as traditional craft products, but as cultural representations containing mathematical structures that develop from the daily practices of the community. This perspective allows for the identification of mathematical elements such as symmetry, geometric patterns, repetition (iteration), and transformation that are integrated into the weaving techniques and the resulting visual designs. This study uses a qualitative design with an autoethnographic approach, a reflective method that places the researcher's experience as the primary data source in uncovering the cultural and social meanings of a phenomenon (Ellis et al., 2011). This approach was chosen because the researcher's long-term involvement and exposure to bamboo weaving practices allows for in-depth, contextual, and authentic observation of the geometric patterns that emerge implicitly in the production process, which are often not identified through visual analysis alone (Anderson, 2006).The research process began with systematic narrative writing, in which the researcher recorded and reflected on personal experiences interacting with bamboo weaving practices to construct comprehensive meaning (Carless & Douglas, 2013). Next, a narrative inquiry approach was used to identify and interpret the mathematical structures contained within these experiences. The researcher served as the primary instrument, conducting reflective documentation and analysis of the bamboo weaving patterns. To ensure analytical rigor and conceptual validity, a mathematics education expert specializing in ethnomathematics was engaged as an academic consultant. The expert was selected based on the criteria of having a doctoral degree in mathematics education, a minimum of five years of teaching experience, and a track record of research in ethnomathematics.

Bamboo weaving motifs were purposively selected from traditional craft practices that exhibit clear and repetitive geometric structures. The selection criteria included: (1) the presence of repeating pattern units, (2) authentic representation of local West Javanese culture, and (3) the potential to identify geometric concepts within the school mathematics curriculum. The number of patterns analyzed was limited to allow for in-depth exploration and comprehensive interpretation. In accordance with the research flow, mathematics education experts did not serve as independent data sources, but rather as dialogical partners in validating interpretations, refining the identification of mathematical concepts, and ensuring consistency between empirical experience, literature review, and mathematical analysis. The research instruments included autoethnographic reflection journals, literature-based interpretive notes, and semi-structured interview guides. The data collection and analysis process was carried out systematically and in stages to produce credible and academically accountable findings.

The first author served as the main research instrument (Lincoln & Guba, 1985), engaging directly with the bamboo weaving practices in Kampung Ereng Kulon, Solokan Jeruk Village, West Java. As an autoethnographic study, the researcher conducted reflexive documentation, personal reflection, and interpretive analysis of the weaving processes, patterns, and cultural meanings embedded in bamboo weaving practices. The researcher directly observed bamboo weaving practices and conducted an interview with one bamboo craftsman as the key informant. The researcher's lived experiences and interactions with the local weaving tradition were treated as primary sources of data, which were critically examined and connected with ethnomathematical perspectives.

To support analytical rigor and ensure theoretical precision, a mathematics education expert specializing in ethnomathematics was engaged as an academic consultant. The expert was selected based on three criteria: (1) possession of a doctoral degree in mathematics education, (2) a minimum of five years of teaching experience, and (3) a demonstrable research record or publication in ethnomathematics. The expert contributed to the validation of the interpretation of mathematical ideas identified within bamboo weaving practices.

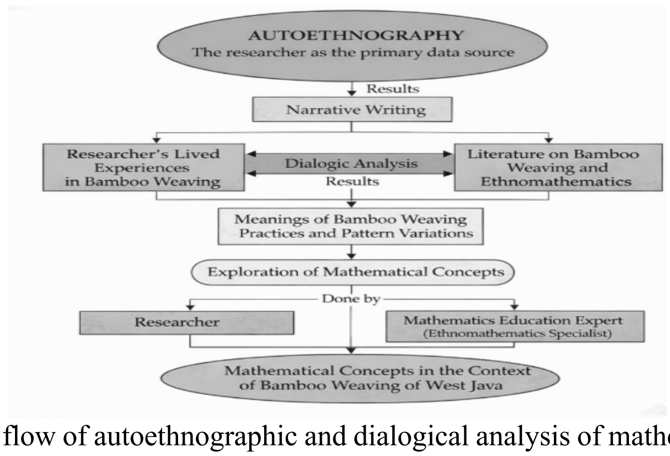

Figure 1. Research flow of autoethnographic and dialogical analysis of mathematical concepts in

bamboo weaving patterns.

In this study, an autoethnographic framework integrates three interrelated components: narrative writing, a literature review on ethnomathematics and bamboo weaving practices, and dialogue with experts into a coherent methodological structure. The study adopts autoethnography as the sole methodological approach, characterized by the researcher's personal experience as the primary source of inquiry, critical self-reflection (reflexivity), and the interpretation of lived experiences in relation to broader cultural and social contexts. This approach is used to deeply examine bamboo weaving practices in West Java as cultural representations containing mathematical concepts. Through the researcher's engagement with local weaving traditions, personal narratives are critically interpreted and connected with ethnomathematical theories and cultural knowledge to generate a rich understanding of the phenomenon.

The research was conducted from April to May 2026 in Kampung Ereng Kulon, Solokan Jeruk Village, West Java, through four sequential stages, where each stage systematically builds on the previous one to ensure methodological transparency and in-depth interpretation of the cultural meanings and mathematical structures embedded in bamboo weaving practices.

The research was conducted through four sequential stages, where each stage systematically builds on the previous one to ensure methodological transparency and in-depth interpretation of the cultural meanings and mathematical structures contained in bamboo weaving practices.

This study adopts an autoethnographic approach because the researcher has direct experience and long-term engagement with the bamboo weaving practices of the community in Kampung Ereng Kulon, Solokan Jeruk Village, West Java. Such involvement provides access to cultural knowledge, local meanings, and weaving practices that may not be fully captured through conventional observation alone. The researcher's lived experiences are therefore treated as the primary source of data and are critically reflected upon to understand the mathematical ideas embedded in the weaving process. These personal narratives are further contextualized through a review of the ethnomathematics literature and bamboo weaving studies, as well as dialogue with experts, ensuring that the interpretations extend beyond individual experience and are situated within broader cultural and scholarly perspectives.

Stage 1: Autoethnographic Narrative Writing in Bamboo Weaving Practices

The first stage focused on reflective observation of bamboo weaving practices in West Java. The researcher engaged in direct involvement and reflected on previous experiences interacting with the weaving activities, weaving patterns, and production techniques used by local artisans. After each observation, the researcher compiled a reflective journal documenting the observations, questions that arose, and initial interpretations regarding the mathematical meanings contained in the weaving patterns. This narrative process followed an autoethnographic protocol that emphasized a balance between subjective reflection and academic rigor (Fathir et al., 2025). The reflective writing functioned not only as data documentation but also as a process of constructing meaning (writing as inquiry), where personal experiences were transformed into sources for scientific analysis. Thus, this stage produced initial data in the form of experiential narratives that were rich in context and sensitive to cultural practices.

Stage 2: Bamboo Weaving Investigation Based on Literature and Visual Sources

The second stage aims to contextualize personal reflections through engagement with scientific literature and visual exploration related to bamboo weaving and ethnomathematics. Sources used include academic publications, cultural documentation, and visual representations of bamboo weaving patterns developed in West Javanese society. In this study, a "weaving motif" is defined as a repeating geometric unit within the structure of bamboo weaving. Analysis is conducted at two levels: the overall global structure of the weaving, and the geometric subunits that form the pattern.

Visual analysis techniques are used to systematically identify mathematical relationships within the weaving pattern. The analysis procedure includes: identification of repeating pattern units (repetitions), tracing geometric transformations such as translations, reflections, and rotations, symmetry mapping, and comparison with geometric concepts in mathematics education literature.

A pattern is categorized as a mathematical concept only if its visual characteristics are consistent with theoretically recognized mathematical definitions. This stage connects empirical experience with a broader conceptual framework in ethnomathematics.

Stage 3: Comprehensive Interviews with Mathematics Education Experts

The third stage involved in-depth semi-structured interviews with mathematics education experts with expertise in ethnomathematics. In this study, the experts did not serve as the primary data source, but rather as validation partners to ensure the accuracy of interpretations. After completing the initial analysis of the bamboo weaving patterns, the researchers presented the findings in narrative form and visual documentation to the experts. The interview process encompassed three main focuses: (1) validation of the identified mathematical concepts to ensure alignment with mathematical theory, (2) evaluation of the relevance of the findings to the school mathematics curriculum, (3) recommendations for integrating ethnomathematics concepts into learning practices.

With the informants' consent, the entire interview process was audio-recorded and transcribed verbatim to maintain data authenticity and comply with research ethics standards. Input from the experts was used to refine the mathematical accuracy and strengthen the pedagogical reinforcement of the research findings.

Stage 4: Analysis of Themes and Interpretation of Meaning

The final stage was a thematic analysis of all data obtained, including journal reflections, visual documentation, and interview transcripts (Braun & Clarke, 2006). The analysis was conducted systematically to identify key themes representing the relationship between bamboo weaving cultural practices and the mathematical concepts they contain.

The results of the analysis are presented in the form of in-depth descriptions (thick descriptions) that integrate: the researcher's lived experiences, visual evidence of the weaving patterns, and interpretations based on theory and expert validation. Each narrative is supported by annotated visual illustrations to highlight geometric elements such as patterns, symmetry, and transformations. The presentation of the results follows the principles of qualitative storytelling, emphasizing coherence, credibility, and interpretive relevance.

To ensure the validity and credibility of the findings, this study employed two triangulation strategies (Carter et al., 2014): data triangulation, and methodological triangulation

Combining two main approaches: autoethnography and literature analysis. The combination of these two strategies allows for cross-verification between empirical experience, visual evidence, theoretical frameworks, and expert perspectives, thereby strengthening the validity of the interpretation and the accuracy of the ethnomathematical analysis in the context of bamboo weaving.

RESULTS AND DISCUSSION

This research, using an autoethnographic approach, focuses on how mathematical concepts emerge in bamboo weaving practices in West Java. Generally, autoethnography is a research approach that combines the researcher's personal experiences with broader cultural or social studies. In the context of this research, the researcher not only analyzes bamboo weaving practices objectively but also incorporates her own experiences and experiences as part of the analytical process.

In an autoethnographic approach, the researcher's positionality is considered an integral part of the analysis, not something to be avoided or minimized. This means that the researcher openly acknowledges that her personal perspective influences how she views and interprets the phenomena under study. In this regard, the researcher does not attempt to remain "objective" in the traditional sense, but rather utilizes her subjectivity as a rich source of information that can provide deeper insights.

The ethnographic research tradition teaches that revealing the researcher's background, such as personal experiences, beliefs, and perspectives, is crucial to enhancing research reflexivity. Reflexivity here refers to the researcher's ability to consciously consider and recognize the influence of personal experiences on the data collection and analysis process. By explicitly explaining their positionality, researchers can provide readers with transparency regarding how they construct meaning in the study.

This also relates to interpretive credibility. When researchers disclose their backgrounds and perspectives, readers can further analyze how they make decisions in and interpret the data. Readers can then see how the meanings emerging in the study derive not only from the objective data but are also influenced by the researcher's experiences and perspectives.

Thus, in this study, the researchers' positionality is explained with the aim of clarifying the interpretive lens used. This means that the researchers openly state how their personal experiences, mathematical understanding, and perspectives on West Javanese culture in the context of bamboo weaving influence how they view and interpret the phenomenon. This approach emphasizes that research is not only about finding facts, but also about how those facts are understood, constructed, and conveyed based on the perspectives of the researchers involved.

Researcher Perspective

I (the first author) am a lecturer in mathematics education with a focus on developing instructional media and planning mathematics lessons. This academic and professional experience provides a strong foundation in understanding how mathematical concepts particularly in geometry, such as symmetry, patterns, and transformations can be represented contextually and applied in learning. My involvement in mathematics education extends beyond theoretical aspects to developing learning strategies that integrate cultural context as a learning resource. In this case, the practice of bamboo weaving in West Java is viewed not only as a traditional craft activity but as a cultural representation containing mathematical structures that can be utilized as a contextual learning medium. As part of a community closely connected to the local culture, my experience interacting with bamboo weaving practices provides an empirical perspective that enriches the analysis. The resulting reflections are not merely subjective experiences but are contextualized through a review of ethnomathematics literature, which emphasizes that everyday cultural practices contain implicit yet systematic mathematical concepts.

Furthermore, previous research experience in the field of mathematics learning also shaped the direction of this research. Collaboration with mathematics education experts specializing in ethnomathematics enabled an interpretive dialogue that strengthened the validity of the analysis. The integration of pedagogical experience, research involvement, and an understanding of the local cultural context positioned me to comprehensively analyze bamboo weaving practices from mathematical, pedagogical, and cultural perspectives.

Thus, the researcher's position in this study is not merely that of an observer, but also of a reflective participant, bridging cultural practices and mathematical concepts, connecting them to the needs of contextual and meaningful mathematics learning.

Empirical and Cultural Context of Bamboo Weaving Exploration

My exploration of mathematical concepts in the bamboo weaving tradition of West Java began in early 2024, when I became increasingly interested in how local crafts incorporate mathematical principles. As a researcher and educator in the field of ethnomathematics, I have increasingly recognized the intellectual and cultural significance of bamboo weaving, particularly as it has been practiced in West Java for centuries. Through fieldwork and direct experience with local craftspeople, I observed how geometric patterns and symmetry are manifested in bamboo crafts. This research was inspired by my previous work on cultural symbols, but focused on exploring the mathematical structures inherent in bamboo weaving.

During my visits to bamboo weaving villages in West Java, I spent time interacting with the craftspeople, learning from their techniques, and reflecting on how mathematical concepts such as symmetry, pattern repetition, and spatial thinking are integral to the weaving process. The bamboo weaving tradition of West Java is not only an art form, but also a cultural expression closely linked to local identity, agricultural practices, and even philosophical views on nature. These insights reveal how bamboo crafts are more than simply aesthetic products; they are imbued with mathematical logic that is highly relevant to broader ethnomathematics principles.

This in-depth research, influenced by my background in mathematics education and my growing understanding of cultural practices, led me to the realization that bamboo weaving is a crucial site for ethnomathematics. These weaving techniques, passed down through generations, represent a living form of mathematics that speaks to the cultural identity and knowledge systems of indigenous communities. Using ethnographic and autoethnographic methods, this study aims to highlight the ways in which West Javanese bamboo craftspeople create complex geometric designs that are not only visually compelling but also mathematically significant. These weavings, rich in local knowledge, exemplify how mathematical thinking is embedded in everyday cultural practices, which in turn deepens our understanding of how mathematics intersects with traditional arts and local identities.

Figure 2. Examples of Images with Good Resolution

The figure above shows a nyiru tray, a traditional bamboo craft product. From an ethnomathematics perspective, this nyiru tray can be analyzed using the mathematical principles inherent in its weaving technique.

In this nyiru tray, the weaving pattern reflects the principles of repetition and symmetry, where each part of the weave follows a regular sequence to create a consistent pattern across the entire surface. The pattern seen on this nyiru tray is a type of tessellation, where geometric shapes (usually squares or rectangles) are placed repeatedly without gaps or overlap, creating a unified and structured surface. The pattern on this nyiru tray demonstrates geometric regularity, incorporating mathematical principles into the bamboo craftmaking process. In nyiru crafts, this repetitive pattern utilizes simple shapes, such as squares or triangles, that connect to each other and efficiently fill space. The weaving technique on this nyiru not only creates an aesthetically pleasing visual structure but also illustrates the mathematical thinking inherent in local culture. The uniform weaving, symmetrical arrangement, and precise placement of each bamboo element all reflect a geometric understanding that has been passed down through generations within the bamboo craft community in West Java.

This comparative observation serves as an analytical entry point for a systematic examination of the mathematical structures underlying bamboo weaving motifs. Building on descriptive ethnographic observations, this study employs formal visual analysis supported by ongoing consultation with a mathematics education expert to interpret these patterns through mathematical reasoning. This iterative process translates personal reflections and embodied experiences into rigorously grounded interpretations, establishing the foundation for the formal identification of mathematical concepts discussed in subsequent sections.

Pattern

The pattern shown in the image below is a repeating bamboo weaving pattern, with elements arranged regularly using the "top" and "bottom" principle. Each element in this pattern represents a basic unit that is then repeated both horizontally and vertically to form the overall weaving structure. Mathematically, this pattern is a repeating pattern, which can be described as an arrangement of elements that follows a certain rule and is repeated at certain intervals. In this case, the repeating pattern is an alternating arrangement of elements that are above (over) and below (under). The basic motif unit of this pattern can be identified as a complete cycle of the arrangement of elements above and below.

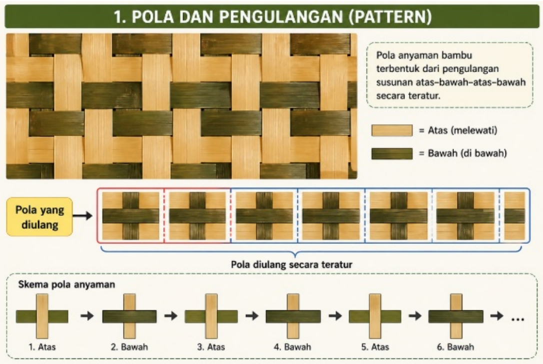

Figure 3. Patterns On Woven Bamboo

Bamboo weaving is a traditional craft that incorporates mathematical concepts, particularly in the aspects of pattern and repetition (Nurjamil et al., 2021; Sari et al., 2023). The patterns in woven bamboo are formed through the interlacing of bamboo slats in two main directions: warp (vertical) and weft (horizontal). These two elements interact through a regular arrangement system based on the basic principle of top-bottom-top-bottom repetition.

Mathematically, this pattern can be categorized as a repeating pattern, meaning an arrangement of elements that follows a specific rule and is repeated consistently at specific intervals. In the context of bamboo weaving, the basic unit of the pattern (motif unit) can be identified as a complete cycle of top-bottom patterns. This unit is then replicated horizontally and vertically to form a complete woven structure.

Furthermore, the repetitive patterns in woven bamboo exhibit characteristics of regularity, consistency, and continuity (Alawiyah et al., 2021). Regularity is evident in the arrangement of the slats, which are not random but follow specific rules. Consistency is evident in the similarity of the patterns in each woven section, while continuity is demonstrated through the continuous repetition of motifs.

From an ethnomathematics

perspective, woven bamboo patterns not only reflect abstract mathematical concepts but also represent contextual cultural practices (Nurjamil et al., 2021; Zuraidah et al., 2020). These repetitive patterns can be used as a learning medium to introduce the concepts of patterns, sequences, and structures in mathematics, particularly at the elementary level. Thus, it can be concluded that woven bamboo embodies the concepts of systematic patterns and repetition, which implicitly represent basic principles in mathematics, particularly those related to repeating patterns and geometric structures (Supriyadi et al., 2022).

This image provides information that mathematical semiotics is visible, namely the presence of a repeating pattern (top-bottom-top-bottom) indicating the concept of regular repetition, which is related to series and repeating structures in mathematics. The symbols (top, bottom) and schematic diagrams explain the order and structure of mathematics, connecting the concepts of symmetry and relations. This image effectively represents and conveys mathematical ideas through visualization and text that illustrate the concepts of order and symmetry**.**

Symmetry in Bamboo Weaving

Bamboo weaving not only contains repeating patterns but also demonstrates the concept of symmetry, an important principle in geometry. Symmetry in bamboo weaving can be identified in two main forms: reflection symmetry and rotational symmetry. In bamboo weaving, the woven pattern can be divided into two congruent parts along a specific line (the axis of symmetry). If the weave is folded along this axis, the two parts will overlap exactly. This demonstrates a balance of form between the left and right sides, or top and bottom, depending on the orientation of the pattern.

Furthermore, bamboo weaving also exhibits rotational symmetry, where a pattern remains the same after being rotated at a certain angle from a central point. In some woven motifs, the pattern will return to its original shape after being rotated 90°, 180°, or 360°. The existence of rotational symmetry indicates a regularity in the distribution of pattern elements around the central point. From a mathematical perspective, these two types of symmetry reflect geometric transformations involving reflections and rotations. In the context of ethnomathematics, the existence of symmetry in bamboo weaving shows that traditional societies have indirectly applied geometric concepts in their daily life practices.

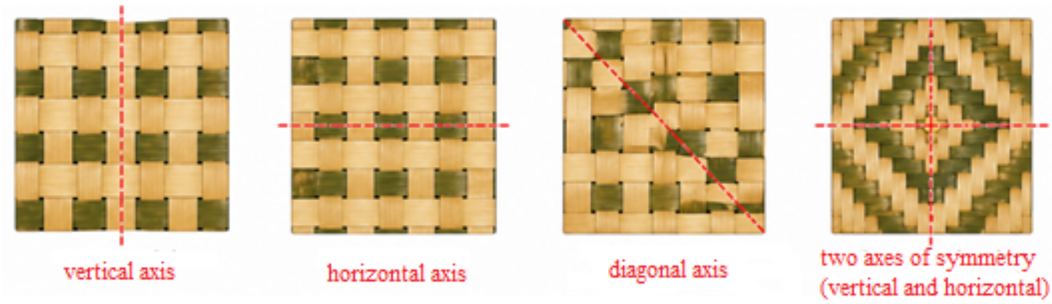

Figure 4. Symmetry in Bamboo Weaving

In the image above, this bamboo weave demonstrates vertical symmetry, where the pattern on one side of the mirror will be reflected on the other side. Vertical symmetry (vertical axis) is a mathematical concept that falls under reflective symmetry or mirror symmetry. Specifically, it is a type of symmetry in which an object can be divided into two mirror parts along a vertical line (vertical axis). The two parts will face each other and have identical shapes, but are on opposite sides of the line. Furthermore, horizontal symmetry (horizontal axis) is similar to vertical symmetry, dividing the pattern into two identical parts along a central horizontal line. For diagonal symmetry (diagonal axis) shows that this pattern also reflects diagonal symmetry, meaning the pattern on the upper left side will match the pattern on the lower right side if rotated on the diagonal line. Diagonal symmetry (diagonal axis) is a mathematical concept that describes the symmetry of an object through a diagonal line as its axis of symmetry. In this case, the object can be divided into two identical parts by reflecting one side to the other along the diagonal line. Meanwhile, double symmetry (vertical and horizontal axes of symmetry) is a combination of vertical and horizontal symmetry, creating a highly regular shape, with four identical parts. This provides students with a learning experience by combining cultural dimensions with learning (Fouze & Amit, 2023)

Geometric Shapes in Bamboo Weaving

Bamboo weaving not only represents repeating patterns and symmetry, but also embodies the concept of geometric shapes, particularly plane figures (Nare et al., 2022). The regularly intersecting bamboo slats create various visually identifiable geometric shapes, such as squares, rectangles, and rhombuses. The square shape arises from the intersection of symmetrically arranged bamboo slats with relatively equal side sizes. This pattern is formed when the spacing between the slats is consistent, resulting in small, equilateral planes. Squares in weaving reflect the regularity and uniformity of the structure.

Furthermore, the rectangular shape is characterized by the arrangement of bamboo slats forming planes of varying lengths and widths. This occurs due to variations in spacing or pressure during the weaving process, resulting in an elongated shape. The rectangle shows variation in the pattern without losing the basic regularity of the weave (Nadila, 2023). The rhombus shape is formed from an arrangement of slanted or diagonal weaves.

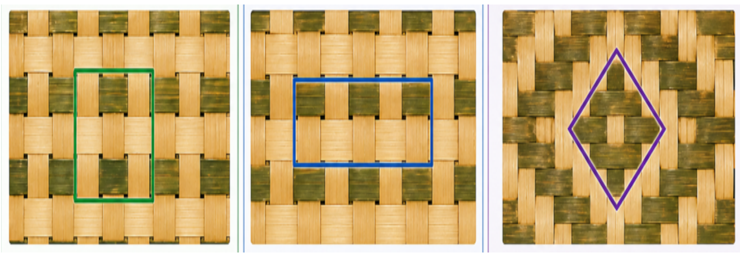

Figure 5. Geometric Shapes in Bamboo Weaving

This pattern appears as a weave arranged at a certain angle, resulting in a plane with four sides of equal length but with angles that are not right angles. This shape is often found in more complex weaving motifs and has high aesthetic value. Mathematically, the presence of these geometric shapes indicates that bamboo weaving contains the concept of plane shapes that can be analyzed based on their properties, such as side lengths, angles, and symmetry. From an ethnomathematics perspective, this indicates that traditional cultural practices have implicitly integrated geometric concepts into everyday life (Alawiyah et al., 2021; Nurjamil et al., 2021) . Thus, bamboo weaving can be used as a contextual medium in mathematics learning, particularly to introduce the concept of plane shapes in a concrete and meaningful way.

Transformation (Translation/Shift) in Bamboo Weaving

In addition to containing patterns, symmetry, and geometric shapes, bamboo weaving also represents the concept of geometric transformation, specifically translation (shift). Translation is a transformation that moves an object from one position to another without changing its shape, size, or orientation. In bamboo weaving, the concept of translation can be observed in the repetition of motifs that shift regularly in a specific direction, either horizontally (sideways) or vertically (up or down). The basic unit of the weave pattern, consisting of warp and weft, is replicated by shifting a specific distance to form a continuous pattern.

Mathematically, translation in bamboo weaving can be expressed as the displacement of each point in a motif by a specific vector. For example, a basic pattern can be shifted by a distance (a, b), where a represents the horizontal shift and b represents the vertical shift. Although the pattern's position changes, the shape and size remain identical, resulting in visual uniformity throughout the weave. This learning outcome aims to enhance mathematical mastery through cultural studies rather than diminish it (Supriyadi et al., 2022).

The characteristics of translation in bamboo weaving are demonstrated by:

a. Similarity of shape → the shifted motif remains identical
b. Similarity of size → no change in scale
c. Constant direction of shift → following a horizontal or vertical pattern
d. Continuous repetition → forming a complete woven structure

From an ethnomathematics perspective, the presence of translation in bamboo weaving indicates that traditional societies have implicitly applied the concept of geometric transformation in their daily activities. This makes bamboo weaving an effective contextual medium to help students understand the concept of translation concretely. Thus, translation in bamboo weaving not only functions to create aesthetic patterns but also represents systematic mathematical principles, particularly in the study of geometric transformations.

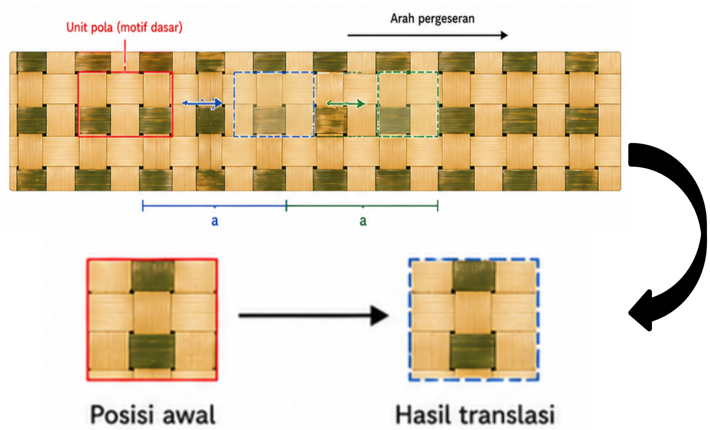

Figure 6. Transformation (Translation/Shift) in Bamboo Weaving

This image uses symbols and arrows to depict translation, a basic geometric transformation that shifts pattern units without changing their shape. The basic pattern unit moves a constant distance (a), illustrating the concepts of repetition and translation in mathematics. From an ethnomathematics perspective, the presence of translation in bamboo weaving indicates that traditional societies have implicitly applied the concept of geometric transformation. Although these communities do not formally study mathematics as is done in school, they intuitively understand and use basic geometric principles in their daily lives. This aligns with the intersection of mathematics and culture in ethnomathematics, a field that explores how various communities apply mathematical concepts (Risdiyanti & Prahmana, 2018).

a. Understanding Geometry in Everyday Life: Making bamboo weaving involves understanding the position and displacement of elements in two-dimensional space. This illustrates how traditional societies apply the concept of translation in a very practical and direct way.
b. Traditional Mathematical Knowledge: Traditional communities, although not always formally educated in mathematics, still possess practical knowledge of geometric transformations, including translations,

rotations, and reflections, which are intuitively applied in their crafts, such as bamboo weaving.

Overall, this image illustrates how sophisticated mathematical concepts, such as translations, can be found in traditional cultures, demonstrating the long-standing application of geometric concepts in people's lives. Therefore, teachers have a responsibility to enhance the learning experience by integrating cultural elements, such as local objects or traditional music, into the learning process. In this way, students can more easily understand mathematical concepts through connections to their familiar culture (Utami et al., 2021).

During the fieldwork from April to May 2026 in Kampung Ereng Kulon, Solokan Jeruk Village, West Java, the researcher directly observed and interacted with bamboo artisans throughout the weaving process. The researcher documented how artisans selected bamboo, prepared the strips, arranged patterns, and maintained proportions through practical knowledge and experience. These encounters led the researcher to reflect that bamboo weaving practices contain embedded mathematical ideas, such as symmetry, repetition, measurement, and spatial organization, which are expressed through cultural practices rather than formal mathematical language. These personal reflections became an important part of the autoethnographic interpretation of bamboo weaving as both a cultural practice and a source of mathematical knowledge.

The researcher's personal experiences during engagement with bamboo weaving practices became the basis for interpreting the relationship between cultural knowledge and mathematical ideas. Through direct observation and interaction with one bamboo craftsman in Kampung Ereng Kulon, the researcher recognized that weaving activities were not merely technical processes but cultural practices containing mathematical reasoning. The researcher's reflections on observing the arrangement of bamboo strips, repeated patterns, proportions, and symmetrical structures revealed how geometric concepts were naturally embedded in local craftsmanship. These experiences connected personal encounters with broader cultural meanings, showing that bamboo weaving represents both a form of inherited cultural knowledge and an expression of mathematical thinking within everyday practices (Amirah & Budiarto, 2022; Ga'a et al., 2025)

The ethnographic sources in this study included direct observation of bamboo weaving practices, interviews with one bamboo craftsman from Kampung Ereng Kulon, field documentation, and records of the researcher's reflections during engagement with the local weaving tradition. These sources provided insights into the cultural meanings, local knowledge, and practical techniques involved in bamboo weaving practices.

The craftsman determines the direction, spacing, and intersection points of the strips to maintain balance and produce consistent patterns. For example, the repeated crossing of horizontal and vertical bamboo strips creates a regular grid structure, demonstrating spatial relationships, alignment, and symmetry. This process can be mathematically modeled by representing each woven unit as a repeated geometric element that expands through translation to form a larger pattern. Thus, the weaving process reflects spatial reasoning and mathematical modeling through practical construction rather than formal mathematical procedures (Thompson, 2000)

CONCLUSION

Bamboo weaving is a clear example of how local cultures incorporate elements of mathematics into everyday life, even without us realizing it. This demonstrates that mathematics is not simply something separate from everyday life, but an integral part of cultural activities.

This study contributes to ethnomathematics by revealing how bamboo weaving practices in Kampung Ereng Kulon represent a form of local mathematical knowledge embedded in cultural activities. The findings demonstrate that concepts such as geometric patterns, symmetry, measurement, repetition, and spatial organization are naturally practiced by artisans through experience and cultural transmission, even without explicit reference to formal mathematical terminology.

From an autoethnographic perspective, this research contributes by highlighting the role of the researcher's lived experiences, interactions, and reflections in understanding cultural mathematical practices. Rather than positioning bamboo weaving solely as an object of observation, the study demonstrates how personal engagement with the tradition enables deeper interpretation of the relationship between cultural knowledge and mathematical thinking.

Furthermore, this study contributes to contextual geometry learning by providing bamboo weaving as a meaningful cultural context for introducing geometric concepts in mathematics education. The patterns and structures found in woven bamboo products can serve as authentic learning resources that connect abstract geometric ideas with students' everyday cultural experiences. Therefore, this research bridges ethnomathematics, autoethnographic inquiry, and mathematics education by demonstrating how local cultural practices can enrich both mathematical understanding and appreciation of cultural heritage.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to IKIP Siliwangi for the support and assistance, both morally and materially, provided throughout this research process. Hopefully, this article will provide useful benefits for the development of education and future research.

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