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ETHNOMATHEMATICAL EXPLORATION OF BAMBOO WEAVING CRAFTS IN GEOMETRY LEARNING IN SUKABUMI REGENCY

EKSPLORASI ETNOMATEMATIKA KERAJINAN ANYAMAN BAMBU DALAM PEMBELAJARAN GEOMETRI DI KABUPATEN SUKABUMI

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Abstrak

Etnomatematika adalah salah satu pendekatan yang menghubungkan konsep matematika dengan budaya lokal. Penelitian ini bertujuan untuk mengeksplorasi nilai-nilai etnomatematika yang ditemukan dalam kerajinan anyaman bambu di Kabupaten Sukabumi dan relevansinya dengan pembelajaran geometri di sekolah. Penelitian ini menggunakan pendekatan kualitatif melalui metode etnografi. Data dikumpulkan melalui studi literatur, observasi, wawancara mendalam, dan dokumentasi yang melibatkan para pengrajin anyaman bambu tradisional. Sampel dipilih menggunakan purposive sampling, dengan fokus pada pengrajin yang aktif terlibat dan memahami proses anyaman tradisional. Data dianalisis menggunakan analisis tematik untuk mengidentifikasi pola-pola geometris yang ditemukan pada motif anyaman. Hasil penelitian menunjukkan adanya berbagai bentuk geometris seperti Cube, segitiga, Square, dan pola simetris dalam kerajinan anyaman bambu. Temuan ini mengindikasikan bahwa kerajinan tradisional dapat berfungsi sebagai media pembelajaran kontekstual yang memperkuat pemahaman siswa tentang konsep geometri sekaligus menanamkan nilai-nilai budaya lokal. Implikasi dari penelitian ini menunjukkan bahwa eksplorasi etnomatematika pada kerajinan anyaman bambu dapat menjadi dasar untuk pengembangan bahan ajar dan modul pembelajaran geometri yang kontekstual dan berbasis budaya.

Abstract

Ethnomathematics is one such approach that connects mathematical concepts with local culture. This study aims to explore the ethnomathematical values found in bamboo weaving crafts in Sukabumi Regency and their relevance to geometry learning in schools. This study employed a qualitative approach through ethnographic methods. Data were collected through literature studies, observation, in-depth interviews, and documentation involving traditional bamboo weaving artisans. The sample was selected using purposive sampling, focusing on artisans who are actively involved and understand the traditional weaving process. The data were analyzed using thematic analysis to identify geometric patterns found in the woven motifs. The findings reveal the presence of various geometric forms such as cuboids, triangles, squares, and symmetrical patterns within the bamboo weaving crafts. These findings indicate that traditional crafts can serve as contextual learning media that strengthen students' understanding of geometric concepts while also instilling local cultural values. The implications of this study suggest that the exploration of ethnomathematics in bamboo weaving crafts can serve as a foundation for developing contextual and culturally based geometry learning materials and modules.

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INTRODUCTION

Sukabumi Regency in West Java has a rich culture that is still preserved today, one of which is bamboo weaving. This craft is not only used as household items, but also as a means of preserving aesthetic values and local wisdom that have been passed down from generation to generation. Eight types of bamboo weaving that are still preserved today Aseupan, Ayakan, Boboko, Caping, Hihid, Nyiru, Tampir, and Tudung reflect the cultural skills of the community while also incorporating mathematical concepts, particularly geometry.

In elementary school mathematics education, geometry is one of the important subjects. According to Van Hiele (1986), geometry is a thinking process that develops gradually through five stages: visualization (recognition of shapes), analysis (identification of attributes), informal deduction, formal deduction, and precision. This approach emphasizes the importance of students' cognitive development in systematically understanding geometric concepts. Meanwhile, Ismiyani (in Manik et al., 2024) defines geometry as an understanding of geometric shapes, both two-dimensional and three-dimensional, along with their relationships to size, shape, and position. However, in practice, geometry is often taught abstractly in schools without being linked to students' concrete experiences. As a result, many students experience difficulties in understanding concepts such as flat shapes, spatial shapes, symmetry, and patterns.

This condition contradicts the Learning and Assessment Guidelines (Kemendikbudristek, 2022), which emphasize that mathematics learning must pay attention to students' cognitive development and diversity of characteristics, as well as provide meaningful and enjoyable learning experiences. Therefore, innovative learning approaches are needed to bridge the gap between abstract concepts and students' real-world experiences through the context of local culture.

Ethnomathematics emerges as one alternative approach. D'Ambrosio (1985) views ethnomathematics as the way cultural groups understand and express mathematical concepts based on their social activities. Rosa and Orey (2006) emphasize that ethnomathematics lies at the intersection of culture, mathematics, and modeling, thereby enabling more contextual learning. In the context of Sundanese society, activities such as making Nyiru, Hihid, or Caping can be seen as real-life applications of geometric concepts in daily life.

A number of ethnomathematics studies have highlighted the potential of local culture as a contextual medium for mathematics learning, particularly in geometry. Fitriyah (2021) examined the weh-wehan tradition in Kendal using Bishop's framework of fundamental mathematical activities and found that the tradition contained five mathematical activities, namely counting, locating, designing, playing, and explaining. Riski et al. (2020) identified the ethnomathematics potential in Brajan bamboo weaving crafts in Yogyakarta, while Yudianto et al. (2020) studied the bamboo weaving of the Osing community in Banyuwangi and found concepts of measurement, comparison, quadrilaterals, and number sequences that were developed into geometry problem sets. Iskandar et al. (2022), through a systematic review of 24 ethnomathematics articles in the field of geometry, confirmed that various mathematical concepts are contained in cultural objects such as batik, weaving, traditional houses, and religious architecture. Wahyuni (2021) explored Indramayu batik motifs that contain various geometric concepts such as symmetry, transformation, and flat shapes. Loviana et al. (2020) studied tapis cloth and traditional houses in Lampung and found concepts of two-dimensional shapes and geometric patterns.

Mauliyana et al. (2023) research on pandan mat crafts in Padang Tikar shows that there are concepts of sets, logic, comparison, multiples, symmetry, geometry, and measurement that can be utilized as sources for learning mathematics. In line with this, Pahmi et al. (2022) implemented

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project-based learning using batik motifs on the topic of circles, which was proven to enhance mathematical concept understanding while reducing learning anxiety. Furthermore, Astuti et al. (2025) applied an ethnomathematics-based learning model using bamboo weaving media in fifth-grade elementary school classes and reported a significant improvement in two-dimensional geometry learning outcomes. However, most previous studies are still limited to one type of artifact or only emphasize the implementation aspect of learning. There has been no research that specifically and comprehensively explores the eight types of traditional bamboo weaving artifacts from Sukabumi Regency and their geometric concepts in depth.

Therefore, this study focuses on exploring geometric concepts, such as two-dimensional shapes, three-dimensional shapes, fold symmetry, and rotational symmetry, contained in the eight types of Sukabumi bamboo weaving. Using a qualitative ethnographic approach through direct observation and interviews with craftsmen, this study aims to provide an authentic description of the relationship between local culture and geometry learning. The findings of this study not only enrich ethnomathematics research in Indonesia but also serve as a theoretical foundation for the development of context-based mathematics education rooted in Sundanese culture in elementary schools.

METHOD

This research uses a qualitative approach with ethnographic methods. As Clifford (in Faustyna, Rudianto, & Santoso, 2023:140) states, ethnography is a form of intensive field research involving in-depth observation of the cultural context under study. This method allows researchers to engage directly with the daily lives of bamboo weavers in Ciseupan Village, Sukabumi, while simultaneously identifying the cultural meanings and mathematical values inherent in each stage of the weaving process. Participatory observation was conducted by observing the weaving process, documenting geometric patterns and structural shapes, and recording the measurement techniques used by the artisans.

To gain a deeper understanding, in-depth interviews were conducted with purposively selected artisans. Informants were chosen based on their knowledge and experience with eight types of traditional bamboo crafts: Aseupan, Ayakan, Boboko, Caping, Hihid, Nyiru, Tampir, and Tudung. The interviews used open-ended questions designed to explore the artisans' thought processes in designing patterns, determining dimensions, and interpreting the cultural meanings behind woven motifs. The observation and interview stages were supported by visual documentation in the form of photos and videos that captured details of the construction and production stages for further analysis. The data in this study were obtained through observation, interviews, and documentation. Once collected, the data were reduced by filtering and focusing on information relevant to the research objectives. The reduced data were then presented in narrative or tabular form to facilitate interpretation. The final step was verification and drawing conclusions, where researchers identified patterns and meanings by systematically analyzing relationships between pieces of information.

Moleong (2007) describes qualitative data as verbal expressions, behaviors, documents, and field notes that serve as raw materials for analysis. In ethnographic exploration, data are not simply records of events but representations of cultural meanings that require in-depth interpretation through contextual understanding.

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Data analysis was conducted using thematic analysis based on Braun and Clarke (2006). This process involved the following stages:

1. Familiarization with the data through repeated reading of interview transcripts and review of visual materials,
2. Initial coding of data fragments demonstrating two-dimensional and three-dimensional techniques, symmetry, and measurement,
3. Organizing these codes into potential themes representing key geometric ideas in bamboo weaving practices,
4. Reviewing and refining these themes to ensure accuracy and coherence,
5. Labeling each theme to reflect the essence of the findings (e.g., "Representation of Spatial Form and Symmetry in Weaving Patterns"),
6. Synthesizing the findings into a comprehensive narrative connecting traditional weaving practices to the geometry learning content.

To ensure the credibility and reliability of the data, this study utilized triangulation by cross-validating information obtained through observation, interviews, and documentation. Member checks were also conducted, allowing artisans to review and confirm the researcher's interpretation of their responses.

RESULTS AND DISCUSSION

Result

After conducting a series of observations, interviews, and documentation at the research site, supported by literature review as secondary data, various findings were obtained that reflect the relationship between local cultural activities and mathematical concepts. The results of this study are presented to provide a comprehensive overview of weaving practices in Ciseupan Village, the mathematical potential contained therein, and its relevance in ethnomathematics-based mathematics learning.

Bamboo Weaving in Ciseupan Village

Ciseupan Village, located in Caringin Subdistrict, Sukabumi Regency, is one of the few areas that still preserves local wisdom through traditional bamboo weaving. Weaving has been passed down through generations and has become an integral part of daily life for the villagers. Local artisans, referred to as Artisan A, Artisan B, and Artisan C, are among those who continue to uphold this tradition.

Artisan A (80 years old) began weaving after marrying Artisan B (70 years old), who has been practicing this craft since the age of ten. In an interview, Artisan A explained that he learned the skill from Artisan B, who is highly skilled in creating various bamboo crafts. Among the products they commonly make are Aseupan (rice containers), Boboko (rice baskets), Caping (farmers' hats), Hihid (bamboo fans), and Tudung (head coverings). Tudung functions as a head covering but differs in shape and context of use from Caping; Tudung is more often used for household purposes or traditional ceremonies.

Meanwhile, artisan C (aged 70) produces Ayakan (used to separate bean sprouts from their skins), Nyiru (used to separate grains), and Tampir (for holding large quantities of material). Each artisan applies different techniques and dimensions tailored to the functional needs of daily life.

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Weaving activities are generally carried out at home using simple tools. The bamboo used is sourced from the surrounding environment, specifically chosen for its flexibility and durability. The production process begins with cutting and smoothing the bamboo strips, followed by hand weaving without the aid of modern machinery. Each artisan applies their own techniques and dimensions, tailored to the specific household functions of each product.

This weaving craft is not only functional but also holds deep cultural value. It is often used in traditional ceremonies as a symbol of the community's connection to nature and ancestral heritage. However, this tradition faces serious challenges, particularly regarding succession. Younger generations in Ciseupan Village show limited interest in continuing this craft, preferring instead to work in the industrial sector. “It's hard to find successors, even though bamboo is all around us,” said Craftsman C.

Nevertheless, the spirit to preserve this tradition remains strong among the craftsmen. They hope this skill can continue to be passed down and even integrated into school curricula as a means to introduce local culture to students from an early age.To better illustrate the form and function of each bamboo craft produced by the artisans of Ciseupan Village, visual representations of selected woven products and their uses in daily life are presented in the following section.

Table 1. Visualization of the shape and function of bamboo weaving

Name of Weaving	Visualization	Function
Aseupan		Aseupan is a cone-shaped household tool used to steam rice in traditional cooking.
Ayakan		Ayakan is a round tool used to sift or separate fine and coarse grains, such as sifting flour or bran from rice. It is similar in shape to a Nyiru, but with larger and more widely spaced holes.
Boboko		Boboko is a traditional rice container made of woven material that is used to keep rice warm and prevent it from spoiling quickly. Boboko is also often called “bakul nasi” in Indonesian.
Caping		Caping is a cone-shaped head covering used by farmers to protect themselves from the sun or rain while working in the fields. It is made of lightweight and strong woven bamboo.
Hihid		Hihid is a traditional fan-shaped tool used to fan the fire, especially when cooking with firewood. Hihid is made of woven bamboo with a handle made of bamboo slats.
Nyiru		Nyiru is a flat circular tool used to scoop or clean rice from debris by shaking it. Nyiru can also be used to dry food ingredients such as spices, grains, or chips.
Tampir		Tampir is a larger version of Nyiru, with almost the same function but with a larger diameter. It is commonly used to sift or sort larger quantities of ingredients.

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Name of Weaving	Visualization	Function
Tudung		Tudung, also known as dudukuy, is a traditional head covering commonly worn by Sundanese women, especially when doing activities outside the home or in the fields.

The table above shows that each type of weaving not only has different shapes and functions, but also reflects local wisdom that is rich in practical and cultural value. This diversity is proof that traditional crafts such as bamboo weaving have great potential to be integrated into the context of education and the preservation of local culture.

Geometric Concepts Found in Bamboo Weaving

Table 2 presents a mapping of geometric concepts found in traditional bamboo weaving in Ciseupan Village.:

Table 2. Geometric Concepts Identified in Bamboo Weaving

Name of Weaving	3D Shape	2D Shape	Fold Symmetry	Rotational Symmetry
Aseupan	Cone	Circle	Infinite	Infinite
Ayakan	-	Circle	Infinite	Infinite
Boboko	Cube	Square	4	4
	Block	Rectangle	2	2
		Circle	Infinite	Infinite
Caping	Cone	Circle	Infinite	Infinite
Hihid	-	Rectangle	2	2
		Isosceles triangle	1	0
Nyiru	-	Circle	Infinite	Infinite
Tampir	-	Circle	Infinite	Infinite
Tudung	Hemisphere	Circle	Infinite	Infinite

This mapping illustrates that all types of bamboo weaving observed combine basic geometric concepts. Aseupan and Caping, for example, feature a conical structure with rotational symmetry and infinite folds. Boboko combines cube and rectangle shapes, demonstrating the practical application of three-dimensional geometry in household utensils. In addition, the circular patterns commonly found in Ayakan, Nyiru, Tampir, and Tudung reflect infinite symmetry, which contributes to the aesthetic and functional aspects of woven products.

The potential of bamboo weaving as a medium for mathematics education

Observations of bamboo weaving in Ciseupan Village demonstrate a relationship between woven forms and geometric concepts. This research focuses on two-dimensional and three-dimensional forms. The geometric forms observed in each weave are based on its physical appearance (overall shape, top/side view). Three-dimensional forms emerge when the weave has volume, while two-dimensional forms are seen from its surface pattern or basic shape. Fold and rotational symmetry are observed from the possibility of forms being folded or rotated in the same position.

1. Three-Dimensional Shapes

According to Suharjana, quoted in the e-book Learning to Build Space with Microsoft Excel VBA by Siti Ruqoyyah, M.Pd., et al., space construction is a part of space that is limited by a set of points on the entire surface of an object. Observations of bamboo woven products in Ciseupan Village show that certain objects have three-dimensional characteristics, while others remain flat.

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The identification of geometric solid objects is determined by analyzing the physical structure and construction of each product. A weaving is categorized as a solid shape if it has volume (e.g., cone, cube, block), while objects that do not have height or volume are categorized as two-dimensional objects.

Table 3. Three-Dimensional Shapes in Bamboo Weaving

Name of Weaving	Three-Dimensional Shapes	Volume Formula	Surface Area Formula	Reason/Explanation
Aseupan	Cone	$V=\frac{1}{3}\pi r^2 t$	SA=πr(r+s)	Aseupan is cone-shaped with a circular top and sides that curve downward, resembling an inverted pyramid when in use.
Ayakan	-	-	-	Ayakan is flat with no height, so it does not form a three-dimensional space.
Boboko	Block	V=p×l×t	SA=2(pl+pt+lt)	Boboko has a rectangular base.
	Cube	$V=s^3$	$SA=6s^2$	If the dimensions are symmetrical, boboko resembles a cube.
Caping	Cone	$V=\frac{1}{3}\pi r^2 t$	SA= πr(r+s)	Caping is cone-shaped to cover the head and drain water.
Hihid	-	-	-	Hihid is flat and does not have significant height as a building space.
Nyiru	-	-	-	Nyiru is flat, resembling a round tray without significant height.
Tampir	-	-	-	Tampir is flat, resembling a flat circle.
Tudung	Hemisphere	$V=\frac{1}{2}\times\frac{4}{3}\pi r^3=\frac{2}{3}\pi r^3$	$SA=2\ \pi r^2$	Tudung is curved like a hemisphere to cover the head. • Area of a hemisphere (without a base) = $2\pi r^2$ • Area of a hemisphere (with a base) = $3\pi r^2$

Example of a contextual question: Mrs. Ojan made a cone-shaped cap with a base radius of 14 cm and a height of 21 cm. She wants to know how many cm² of bamboo are needed to cover the entire surface of the cap.

Solution

If the hat has a base

- Calculate the slant height (s):

$s = \sqrt{(r^2 + t^2)} = \sqrt{(14^2 + 21^2)} = \sqrt{(196 + 441)} = \sqrt{637} \approx 25{,}2$ cm

- Calculate the surface area of the cap:

$L = \pi \times r \times (r + s) = 3{,}14 \times 14 \times (14 + 25{,}2) = 3{,}14 \times 14 \times 39{,}2 \approx 1.722{,}43\ cm^2$

Answer: ± **1.722,43 cm²**

If the cap does not have a base (e.g., open at the bottom), the surface area required is only the lateral area of the cone, which is:

Lateral Surface Area (L lateral) = $\pi \times r \times s = 3{,}14 \times 14 \times 25{,}2 \approx$ **1.106,80 cm²**

2. Two-Dimensional Shapes

According to the book Pintar Matematika Bangun Datar (Smart Mathematics: Flat Shapes) by Arief Goenarso and Drs. Josias D. Tantotos (2014: 3-8), flat shapes are geometric shapes whose

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entire parts lie on a flat plane. These shapes only have two dimensions, namely length and width. The elements that form flat shapes include points, lines, and angles. Observations show that the surface patterns of woven products in Ciseupan Village consistently reflect two-dimensional geometric shapes. These shapes, such as circles, squares, rectangles, and isosceles triangles, appear from the base or top of the object, depending on its structure and design.

Table 4. Two-Dimensional Shapes in Bamboo Weaving

Name of Weaving	Two-Dimensional Shapes	Area Formula	Perimeter Formula	Reason/Explanation
Aseupan	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The top part of the aseupan is circular.
Ayakan	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The entire ayakan is round in shape.
Boboko	Square	$L = s^2$	$P = 4 \times s$	The base of the boboko is square.
	Rectangle	$L = p \times l$	$P = 2 \times (p + l)$	The sides of the boboko base are rectangular.
	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The top of the boboko is circular.
Caping	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The caping base is circular.
Hihid	Square	$L = s^2$	$P = 4 \times s$	The center of the hihid is square.
	Rectangle	$L = p \times l$	$P = 2 \times (p + l)$	The handle on the hihid is elongated.
	Isosceles triangle	$L = ½ \times a \times t$	$P = a + b + c$	There is a pointed part resembling a triangle.
Nyiru	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The nyiru is circular from above.
Tampir	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The tapir has a circular shape.
Tudung	Circle	$L = \pi \times r^2$	$P = \pi \times d$	The tudung base is circular.

Contextual Question Example: Mrs. Ijah made a circular bamboo ayakan with a diameter of 28 cm. She wants to know how many cm² of bamboo are needed to cover the center of the ayakan.

Solution
- Calculate the radius (r): r = 28/2 = 14 cm

- Calculate the area of the circle:

$L = \pi \times r^2 = 3.14 \times 14^2 = 3.14 \times 196 = 615.44$ cm²

Answer: ± **615,44 cm²**

3. Symmetry

According to the book Patas Matematika SD by Sobirin (2007: 61), fold symmetry is defined as the number of folds in a plane figure that can make the parts of the figure overlap perfectly. In mathematics, fold symmetry is also called axial symmetry. According to Zuliana (2017: 153): Rotational symmetry is included in the scope of geometry as part of transformation, which is an object of study in mathematics education, especially plane geometry. Rotational symmetry is the ability of a two-dimensional figure to return to its original shape when rotated less than one full rotation (360°), with a certain point as the center of rotation. For example, if a square is rotated 90° clockwise about its center, its shape remains the same. In mathematics, symmetry is categorized as reflection symmetry (also called axial symmetry) and rotation symmetry (rotation). A figure has fold symmetry if it can be folded along one or more lines so that both parts are perfectly parallel. Rotational symmetry refers to the ability of a figure to return to its original position after being rotated less than 360° around a center point. For the purposes of analysis in this study, a plane figure is defined as having rotational symmetry only if it can return to its frame after being rotated less than

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one full rotation (360°). A figure that only returns to its original position after a 360° rotation is considered to have no relevant rotational symmetry and is given a value of zero. Observations in this study identified both types of symmetry in woven bamboo products in Ciseupan Village. The following table summarizes the symmetry properties found in each type of weaving:

Table 5. Symmetry in Bamboo Weaving

Name of Weaving	Two-Dimensional Shapes	Fold Symmetry	Rotational Symmetry	Reason/Explanation
Aseupan	Circle	Infinite	Infinite	The top of the aseupan is perfectly round, with many folds and rotational symmetry.
Ayakan	Circle	Infinite	Infinite	The ayakan is round, giving it infinite symmetry.
Boboko	Square	4	4	The base of the boboko is square, giving it four fold symmetries and four rotational symmetries.
	Rectangle	2	2	If the base of the boboko is rectangular, it only has two fold symmetries and two rotational symmetries.
Caping	Circle	Infinite	Infinite	The base of the caping is circular, so it has many symmetries.
Hihid	Square	4	4	It is square if the hihid is made with equal lengths on both sides.
	Rectangle	2	2	The handle of the hihid is elongated, resembling a rectangle with 2 symmetries.
	Isosceles triangle	1	0	There is a part of the hihid shaped like an isosceles triangle, which has only 1 fold symmetry.
Nyiru	Circle	Infinite	Infinite	The nyiru is circular, so it has many symmetries.
Tampir	Circle	Infinite	Infinite	The tapir is also symmetrically round.
Tudung	Circle	Infinite	Infinite	The hood has a circular base with a circular weaving pattern.

Contextual problem example: Mrs. Amir's bamboo boboko is square-shaped with sides measuring 20 cm. Determine:

The number of fold symmetries on the boboko.

The number of rotational symmetries on the boboko (in one full rotation (360°)).

Solution:

The shape of the boboko is square.

Fold symmetry: there are 4 axes (2 diagonals + 2 vertical/horizontal) → 4

Rotational symmetry: can be rotated 90°, 180°, 270°, and 360° → 4

Answer:

Fold symmetry = 4

Rotational symmetry = 4

Based on the table of identified three-dimensional shapes, two-dimensional shapes, and fold symmetry and rotational symmetry, the findings for each type of weaving are further explained. This explanation is based on observations, interviews with craftsmen, and field documentation (see photo documentation in Table 1) so that the data presented is not merely a summary but also includes a more in-depth description in line with its contextual use.

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1. Aseupan.

Based on observations, Aseupan has a cone shape with a circular base. This shape is clearly visible in the arrangement of bamboo slats that curve upward from the base to the top. From interviews, craftsmen stated that the cone shape was chosen because it facilitates the process of steaming rice, allowing hot steam to collect at the top and spread evenly. Photographic documentation supports this, showing a distinct cone silhouette and a perfect circular top with unlimited folding and rotational symmetry.

2. Ayakan.

Observations show that the ayakan is round with a flat surface used to sift rice or flour. Interviews with craftsmen reveal that the circle shape was chosen so that the ayakan can be easily shaken in all directions, making the separation function more effective. Photographic documentation confirms the consistent Circle shape, complete with a thin rim around it, as well as fold symmetry and unlimited rotational symmetry visible from the top view.

3. Boboko.

From observations, the Boboko appears to be a container with a flat Square base and vertical sides that are smaller than the base. Interviews with craftsmen explain that this shape was chosen so that the boboko is easy to stack, sturdy when used, and allows air circulation when rice is stored inside. Photographic documentation shows a cross-patterned arrangement of bamboo slats forming a square grid on the base, with four-fold symmetry and four-fold rotational symmetry in accordance with the properties of a square.

4. Caping.

Observations show that the caping has a conical shape with a wide circular base. Interviews with craftsmen confirm that the conical shape was chosen because it protects the head from the sun and rain while allowing water to flow down easily. Photographic documentation reinforces this finding, showing the caping with a pointed top and circular base, as well as unlimited fold symmetry and rotational symmetry on the circular part.

5. Hihid.

Based on observations, the Hihid has a square main surface with a rectangular handle located on one side. In the center, there is an additional isosceles triangle-shaped bamboo weave that functions as a finger support to make the fan more stable when in use. Interviews with craftsmen explain that the combination of Square, Rectangle, and Triangle shapes is designed to make the fan lightweight, easy to grip, and effective at generating airflow. Photographic documentation supports this by clearly showing the Square-shaped woven pattern, Rectangle handle, and Isosceles Triangle field in the center as a reinforcing element.

6. Nyiru.

Observations show that nyiru has a round shape with a flat surface used for sifting rice or grains. Interviews with craftsmen mention that the Circle shape allows for more balanced and effective rotational movement when sifting. Photographic documentation supports this explanation by showing a large, flat Circle, complete with fold symmetry and unlimited rotational symmetry in accordance with the nature of the Circle.

7. Tampir.

Observations show that the tampir has a round shape similar to the nyiru, but is larger in size, allowing it to hold a greater quantity of material. Interviews with craftsmen confirm that the large size and circular shape of the tampir are highly beneficial for both drying and storing harvested crops.

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Photographic documentation displays a clear circular pattern, with flat edges showing fold symmetry and unlimited rotational symmetry.

8. Tudung.

Observations show that the tudung is shaped like a hemisphere covering the head, with a circular base wider than the hemisphere. This shape allows the tudung to fit snugly on the head while providing protection from the sun. According to interviews with craftsmen, the ratio between the hemisphere and the circle at the base is designed for user comfort and optimal protection. Photographic documentation shows the hemispherical structure resting on a large circle, with fold symmetry and unlimited rotational symmetry in the circular shape.

Discussion

Based on the findings, eight types of bamboo weaving in Ciseupan Village, namely Aseupan, Ayakan, Boboko, Caping, Hihid, Nyiru, Tampir, and Tudung, consistently reflect geometric concepts relevant to mathematics learning. First, the representation of three-dimensional shapes (e.g., the cone in Aseupan and Caping, the cube in Boboko, and the hemisphere in Tudung) provides students with opportunities to explore concepts of volume and surface area using real-world objects. Second, the presence of two-dimensional shapes (e.g., Circle in Aseupan, Ayakan, Caping, Nyiru, Tampir, Tudung, Square and Rectangle in Boboko and Hihid) demonstrates how weaving patterns serve as concrete media for introducing formulas for perimeter and area.

Additionally, the presence of fold and rotational symmetry, from infinite symmetry in the Circle shape to limited symmetry in the Square, Rectangle, and isosceles motifs, illustrates how these weaving patterns can support students in identifying lines of symmetry and degrees of rotation. Through thematic observation, this study highlights the integration of aesthetic values of local culture with geometric principles. Weaving motifs not only beautify the final product but also represent mathematical balance and repetition. These findings reinforce those of Fitriyah (2021), who identified symmetry in Kendal weaving, and Yudianto et al. (2020), who linked Osing weaving crafts to geometric base materials. However, this study expands its scope by systematically exploring eight different bamboo weavings within the specific cultural context of the Sundanese community.

From a pedagogical perspective, these findings support D'Ambrosio's (1985) theory that ethnomathematics promotes contextual learning. Bamboo weaving can be integrated into mathematics education, where students can be guided to measure, sketch, and replicate weaving patterns to better understand concepts such as perimeter, area, and volume. This approach has the potential to bridge the gap between abstract textbook content and students' concrete daily experiences, while fostering an appreciation for local cultural heritage. These findings also align with Rosa and Orey's (2006) assertion that mathematics can be learned more meaningfully when connected to cultural practices.

The main contribution of this study lies in the development of a systematic classification of geometric concepts that include three-dimensional shapes, two-dimensional shapes, folding symmetry, and rotational symmetry found in eight traditional bamboo weaving crafts from Sukabumi Regency. Unlike previous studies such as Wahyuni (2021) and Mauliyana et al. (2023), which only focused on certain types of weaving or specific geometric elements, this study provides a more comprehensive and structured analysis. These findings support the idea that local cultural practices such as bamboo weaving can be an effective learning tool for abstract mathematical concepts. Previous classroom-based research by Astuti et al. (2025) implemented ethnomathematics learning using bamboo weaving media in a fifth-grade geometry class, resulting in a significant increase in

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students' average scores from 22.50 to 70.63, as well as an increase in classical mastery from 0% to 75%. This empirical evidence further underscores the practical impact of integrating contextually and culturally relevant mathematics into instructional design.

Despite its contributions, this study has several limitations. It focused on a single artisan community and did not assess the implementation of weaving-based learning in the classroom. Therefore, further research is recommended to implement and evaluate the integration of bamboo weaving in mathematics education, including the development of standardized teaching modules based on local crafts.

CONCLUSION AND RECOMMENDATION

The results of this study indicate that eight types of bamboo weaving in Ciseupan Village clearly represent basic geometric concepts. In terms of three-dimensional shapes, Aseupan and Caping reflect the shape of a cone, Boboko represents a cube or rectangular prism, and Tudung depicts a hemisphere structure. For two-dimensional shapes, the weaving patterns include circles, squares, rectangles, and isosceles triangles. These motifs also demonstrate symmetry, with circular patterns providing rotational symmetry and infinite folds, while squares and rectangles depict limited symmetry according to the axis and angle of rotation.

By applying an ethnomathematics approach, this study affirms that bamboo weaving serves as an effective contextual medium for introducing mathematical concepts such as area, perimeter, and volume. This also enables students to connect abstract mathematical ideas with concrete experiences rooted in their cultural environment, thereby fostering deeper understanding and appreciation for local wisdom.

The main contribution of this study is to offer a foundation for exploring the integration of traditional crafts into culturally relevant teaching materials. Moving forward, it is necessary to design thematic learning modules based on bamboo weaving and conduct further research to evaluate their implementation in the classroom and their impact on students' conceptual understanding and motivation. This research reinforces the importance of culture-based mathematics learning and encourages further exploration of how local cultural heritage can enrich the teaching of abstract mathematical ideas in meaningful and engaging ways.

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