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EXPLORATION OF ETHNOMATHEMATICS CONCEPTS IN THE PROCESS OF MAKING *BALA SUJI* AS A CONTEXTUAL LEARNING RESOURCE

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Abstract: *This study aims to identify and analyze mathematical concepts embedded in the form and function of Bala Suji, a traditional craft of the Pattinjo community in Pinrang Regency. Employing a qualitative approach with ethnographic methods, data were collected through participatory observation, in-depth interviews, and documentation in Kampung Kappe, a village that actively preserves the making of Bala Suji. The findings reveal that Bala Suji embodies various mathematical concepts, including plane and solid geometry (sulapa appa), arithmetic sequences, geometric transformations (reflection, rotation, translation, dilation), and linear equations in two variables. These concepts are applied intuitively by the community through daily cultural practices without formal mathematical terminology. This research affirms that Bala Suji holds not only symbolic and aesthetic value but also potential as a contextual and meaningful learning medium for mathematics. This study contributes to mathematics education by providing a concrete example of integrating local cultural practices into formal mathematics learning and serves as a reference for developing ethnomathematics-based learning resources that enhance conceptual understanding while fostering students cultural awareness.*

Keywords*: Ethnomathematics, Bala Suji, Contextual Learning Resource*

INTRODUCTION

Mathematics is one of the subjects considered difficult by most students at various levels of education (Sutarto et al., 2021). These difficulties generally arise because the material is presented in an abstract and less contextual manner (Nurhaswinda & Parisu, 2025). Concepts such as numbers, shapes, and functions are often delivered in symbolic forms that are far removed from daily life, making it difficult for students to understand the connection between mathematics and reality (Agustina, 2024). This condition affects students' learning outcomes and motivation in studying mathematics (Perdana & Suswandari, 2021). Several studies indicate that learning approaches that are irrelevant to students' cultural backgrounds contribute significantly to this issue (Prastica et al., 2025). Therefore, a learning approach that is closer to students' cultural experiences is needed so they can more easily understand mathematics and feel motivated to learn.

One approach that has developed over the past decades is ethnomathematics.

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This approach connects mathematical concepts with cultural practices of communities (Ajmain et al., 2020). Ethnomathematics highlights that activities such as counting, measuring, patterning, and shaping have long existed in traditional life (Husna et al., 2022). Through this approach, mathematics can be learned using contexts that are more familiar to students, making learning not only academic but also cultural (Anwar & Ramadhani, 2025). Indonesia has a rich cultural heritage, ranging from dances, architecture, and traditional fabrics to symbols used in customary ceremonies all of which hold potential as mathematical learning resources (Suhartik et al., 2025). However, many teachers are still unaware that the traditions surrounding students inherently contain mathematical concepts (Sape & Syamsuddin, 2025).

South Sulawesi is one of the regions rich in local culture and traditional wisdom (Arifin, 2025). One of the ethnic groups in South Sulawesi that still preserves its distinctive traditions is the Pattinjo community, located along the border of South and West Sulawesi, specifically in Kampung Kappe, Pinrang Regency. Among the traditions of the Pattinjo people with significant potential for ethnomathematical study is *Bala Suji*. *Bala Suji* is a traditional bamboo weaving found in both South and West Sulawesi, made from two or three bamboo strips crafted in various sizes depending on the intended use, such as for childbirth rituals (akikah) or wedding ceremonies (Wawan et al., 2024). *Bala Suji* has a rectangular form known as sulapa appa, symbolizing the four corners of the world. The creation of sulapa appa motifs in *Bala Suji* involves arranging structured patterns and forms that apply geometric transformations such as translation, rotation, reflection, and dilation (Aras et al., 2025). Its symmetrical and repetitive structure reflects fundamental geometric concepts (Asis & Halip, 2020).

Several previous ethnomathematics studies have examined cultural objects, such as woven fabrics (Labina et al., 2023), Bugis – Makassar traditional houses (Laukum et al., 2024), and the traditional game kaneker in Bitefa Village (Uskono et al., 2023). However, these studies generally focus on visual motifs and less on the structure of weaving as a representation of mathematical concepts. Meanwhile, *Bala Suji*, as a cultural symbol of the Pattinjo community with geometric patterns and numerical regularities, has not been widely explored from a mathematical perspective. Instead, it has mainly been studied from symbolic and philosophical aspects, such as in the work of Abdul Asis (Asis & Halip, 2020).

This research therefore presents a research novelty that lies in the systematic identification and analysis of mathematical concepts embedded in the construction of *Bala Suji*, viewed from an ethnomathematics perspective. While previous studies have largely focused on the cultural meanings of *Bala Suji*, this research explicitly reveals its underlying mathematical structures, including number patterns, geometric transformations, and linear equations in two variables that naturally emerge from its construction process. Furthermore, this study contributes to mathematics education by positioning *Bala Suji* as a concrete learning medium, thereby bridging abstract mathematical concepts with students visual learning experiences. This approach not only broadens the scope of cultural objects examined in ethnomathematics literature but also offers innovation in creating more contextual and meaningful mathematics learning (Marlissa et al., 2024).

This study aims to identify and analyze the mathematical concepts embedded in the form and function of *Bala*

Suji. The main focus lies on number patterns, geometric transformations, and linear equations in two variables that emerge from the construction of *Bala Suji*. By incorporating *Bala Suji* into mathematics learning, students can learn from a concrete and culturally meaningful object. This approach supports the development of visual, kinesthetic, and contextual understanding, providing deeper academic comprehension. Teachers can use *Bala Suji* as a medium to explain materials such as symmetry, rotation, number patterns, and linear equations in two variables. Thus, the findings of this study have strong potential for implementing cultural integration within mathematics education.

METHOD

This study employs a qualitative approach with an ethnographic method (Pugu et al., 2024). This approach was chosen to understand mathematical concepts in the process of making *Bala Suji* as well as to explore the meanings and philosophies embedded within this cultural practice. The research location was purposively determined in Kappe Village, Duampanua District, Pinrang Regency, South Sulawesi, Indonesia. The subjects of this study consist of three categories of informants selected through purposive sampling (Nur & Utami, 2022). The first informant was Mr. Agussalim, a traditional leader in the Pattinjo community who possesses deep knowledge regarding the philosophical values, symbolic meanings, and cultural functions of *Bala Suji*. The second informant was Daeng Hasan, an experienced *Bala Suji* craftsman who inherited the skill through generations and actively participates in the construction of *Bala Suji* for traditional ceremonies. His explanations were particularly important in describing the practical process of making *Bala Suji*. The third informant was Mr. Pawajangi, a community member directly involved in the preparation and construction of *Bala Suji* during traditional events. These three informants contributed complementary perspectives, including cultural, technical, and practical insights related to the structure, patterns, and functions of *Bala Suji* in the Pattinjo community.

Data were collected through observation, interviews, and documentation (Romdona et al., 2025). Participatory observation was conducted to directly observe the process of making *Bala Suji* in relation to ethnomathematics referring to Bishop's theory: counting, locating, measuring, designing, and explaining (Viandrayanti et al., 2025). Semi structured interviews were conducted with informants selected based on their knowledge and involvement in the tradition (Riadi et al., 2025). Documentation was carried out through photos, videos, as well as notes on the processes and results of the observed cultural activities (Sadewo & Purnasari, 2021).

The collected data were analyzed using Spradley's ethnographic analysis model, which consists of four stages (Hadi et al., 2021). (1) Domain analysis was conducted to identify cultural meaning units from the practices of making and using *Bala Suji*. (2) Taxonomic analysis grouped the identified concepts and elements into specific categories and hierarchies, such as types of shapes, number patterns, and geometric transformations. (3) Componential analysis compared elements within each category to identify differing attributes and structural relationships among mathematical components in the cultural context. (4) Cultural theme analysis aimed to formulate deeper meanings and relationships between mathematical concepts and cultural values reflected in *Bala Suji*. To ensure the validity of

the data, source and method triangulation were used, and member checks were conducted with informants to ensure that the researcher's interpretation aligns with the cultural realities being studied (Husnullail et al., 2024).

RESULT AND DISCUSSION

The Process of Making *Bala Suji* in the Pattinjo Community

The results of observations and in-depth interviews conducted in Kampung Kappe, Kecamatan Duampanua, Kabupaten Pinrang, show that the process of making *Bala Suji* is an important part of local cultural practices that are not only functional but also closely connected to symbolic and social values. In the tradition of the Pattinjo community, *Bala Suji* is made as a container or complementary element in various customary ceremonies such as weddings and akikah. Its production is carried out across generations within the Pattinjo community, involving various social elements such as customary leaders, artisans, and community members who participate collectively in the preparation and construction process.

Information about the meaning, process, and use of *Bala Suji* was obtained from three key informants who have different roles in the community. Mr. Agussalim, a traditional leader, provided explanations regarding the cultural values and philosophical meanings embedded in *Bala Suji*. Daeng Hasan, a skilled craftsman who inherited the skill of making *Bala Suji* from previous generations, explained the technical stages of its construction. Meanwhile, Mr. Pawajangi, a community member actively involved in preparing *Bala Suji* during traditional ceremonies, shared practical insights regarding the communal process and the social values reflected in its production.

Figure 1. The Process of Making *Bala Suji*

Figure 1 shows that the initial stage of making *Bala Suji* begins with selecting the main raw material, namely Awo (bamboo), which is not taken arbitrarily. The bamboo is chosen based on sufficient maturity so that it is strong but not too hard, and it is cut using a machete. After being cut, the bamboo is sawn to create the frame of the *Bala Suji* from whole bamboo pieces that function as corner pillars and connectors between sides. The frame is assembled by arranging four vertical bamboo rods and connecting them with four horizontal rods at the top and bottom, forming a cube-like structure. The joints of the frame are then secured by binding them with durable raffia rope to ensure structural stability. Mr. Pawajangi explained that the strength of the frame is important because *Bala Suji* must be able to support various ceremonial items placed inside it during traditional events.

After completing the frame, the next stage involves splitting the bamboo into thin strips using a machete, done carefully to ensure uniform thickness. These strips are then measured and cut to size using a ruler or measuring tape to maintain symmetry and precision, before being smoothed so they can be woven easily and are not prone to breaking. The weaving process becomes the core of the *Bala Suji* structure, where the bamboo strips are crossed in a diagonal pattern to form a diamond or square-grid motif known as sulapa appa. As stated by Daeng Hasan:

"If you want to start making *Bala Suji*, the bamboo strips must first be prepared. We first count how many bamboo strips are needed,

then measure them using a measuring tape so that they are balanced and not mistaken in number. The strips must also be cut to the same size so that the weaving becomes neat. Therefore, when making *Bala Suji*, everything must be measured first so that the structure fits properly and does not cause problems during the process." (Interview with Daeng Hasan, 2025).

The final result of the weaving and assembling process produces a complete *Bala Suji* structure made of bamboo frames and woven diagonal patterns.

Figure 2. The Complete Form of *Bala Suji*

Figure 2 shows the complete form of *Bala Suji* after the entire process of construction and weaving has been completed. The structure of *Bala Suji* is formed from a bamboo frame consisting of four vertical poles connected by horizontal poles at the top and bottom, creating a geometric structure resembling a cube. The diagonal weaving pattern that forms the sulapa appa motif not only serves a structural function but also contains philosophical meanings within the Pattinjo community's cultural traditions. According to Mr. Agussalim, the sulapa appa pattern symbolizes balance, harmony, and the relationship between humans and nature in Pattinjo cultural traditions. These symbolic meanings strengthen the role of *Bala Suji* not only as a ceremonial object but also as a representation of the community's worldview. Furthermore, the process of making *Bala Suji* is generally carried out collectively, involving neighbors and family members in an atmosphere of togetherness. According to Mr. Pawajangi, this collaborative activity reflects important social values such as *sipakatau* (mutual humanization), *sipakainge* (mutual reminding), and *sipakalebbi* (mutual respect).

The symmetrical weaving pattern reflects orderly thinking, while the use of measuring tools such as rulers or measuring tapes reflects the application of measurement concepts in daily life, even though it is not conducted through formal mathematical approaches. These values are in line with the principles of ethnomathematics, in which mathematical knowledge and practices naturally emerge within cultural activities (Marlissa et al., 2024). Based on the results of observations and interviews, it can be concluded that the process of making *Bala Suji* in the Pattinjo community reflects the application of mathematical activities consistent with Bishop's theory, namely counting, locating, measuring, designing, and explaining (Viandrayanti et al., 2025).

a. Counting
   This activity appears when artisans count the number of bamboo strips, weaving knots, and sides of the frame to obtain a *Bala Suji* that is balanced and proportional.
b. Locating
   This activity is seen when artisans determine the position and direction of the bamboo strips in the diagonal sulapa appa weaving pattern, as well as when placing each corner of the frame to produce a precise cube shape.
c. Measuring
   The element of measuring is manifested through the use of tools such as rulers and measuring tapes to ensure that the length, width, and thickness of the bamboo strips are uniform, indicating the

presence of measurement concepts and unit consistency in traditional practice.

d. Designing
The designing process is reflected in the way the community arranges the weaving patterns and constructs the *Bala Suji*, paying attention not only to its function but also to aesthetic and symbolic values, such as the balance of the four cardinal directions.

e. Explaining
This activity is evident in the community's ability to explain the philosophical meanings behind each pattern and process, which represent life balance, the relationship between humans and nature, and the traditional values of the Pattinjo community.

Mathematical Concepts and Models in the Process of Making *Bala Suji*

This study reveals that *Bala Suji* is not only of cultural and spiritual value to the Pattinjo indigenous community but also contains a wide range of rich mathematical concepts. Through an ethnomathematical approach, these concepts can be identified and analyzed, opening opportunities for *Bala Suji* to serve as a contextual mathematics learning medium.

Plane Geometry and Basic Forms (*Sulapa Appa*)

The basic form of *Bala Suji* resembles a rhombus known as sulapa appa, which represents the four cardinal directions and symbolizes perfection, stability, and life balance. In mathematics, a rhombus has parallel sides, congruent angles, and line symmetry (Hawa, 2021). Mathematically, the rhombus pattern in *Bala Suji* can be analyzed using basic plane geometry formulas, for example:

Area of a rhombus: $L = \frac{1}{2} \times d_1 \times d_2$, where d_1 and d_2 are the lengths of the diagonals (Apriani et al., 2022).

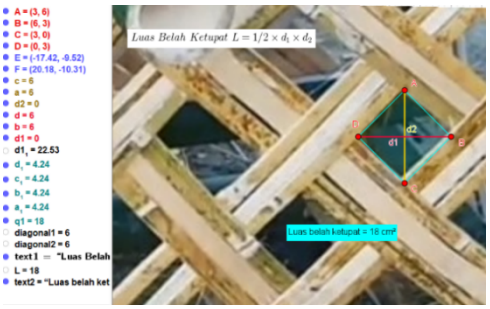

Figure 3. Representation of the Rhombus in *Bala Suji* Weaving

Figure 3 shows a representation of the rhombus shape that appears in the weaving pattern of *Bala Suji*. The arrangement of intersecting bamboo strips forms a regular rhombus with diagonals that intersect perpendicularly. The figure also displays the illustration of the diagonal lengths d_1 and d_2, which are essential elements in calculating the area of a rhombus. The presence of coordinate points at each vertex further clarifies that this pattern can be analyzed using an analytic geometry approach, where the position of each corner can be represented within the Cartesian coordinate system.

Given a rhombus shaped weaving structure with coordinate points $A = (3,6), B = (6,3), C = (3,0), D = (0,3)$.

First diagonal ($d_1 = DB$)

$$d_1 = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d_1 = \sqrt{(6-0)^2 + (3-3)^2}$$
$$d_1 = \sqrt{6^2 + 0^2} = \sqrt{36} = 6\ cm$$

Second diagonal ($d_2 = AC$)

$$d_1 = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d_1 = \sqrt{(3-3)^2 + (0-6)^2}$$
$$d_1 = \sqrt{0^2 + (-6)^2} = \sqrt{36} = 6\ cm$$

Area of the rhombus:

$$L = \frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 6 \times 6 = 18cm^2$$

The frame structure of *Bala Suji* also contains a cube as a three-dimensional geometric form. A cube has 12 edges, 8 vertices, and 6 faces (Suryawati et al., 2022). For a *Bala Suji* shaped like a cube with a side length of 60 cm. Volume of the cube: $V = s^3$

$$V = s \times s \times s$$
$$V = 60 \times 60 \times 60$$
$$V = 216000cm^3$$

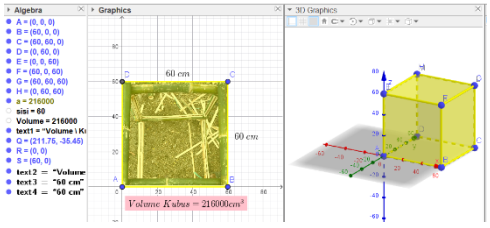

Figure 4. Representation of Cube Volume in *Bala Suji* Framework

Figure 4 presents a visual representation of a cube constructed using the *Bala Suji* weaving pattern. The incorporation of bamboo-weaving textures on the cube illustrates how traditional cultural motifs can be integrated into the understanding of three-dimensional geometric concepts. The woven pattern reinforces the idea that each face of the cube is a square with equal side lengths, aligning with the fundamental properties of a cube.

The figure also displays the cube in a Cartesian coordinate system, where each vertex is marked with coordinate points. This analytic geometry approach enables a more precise understanding of spatial relationships, as the positions of vertices, edges, and faces can be represented mathematically. The geometric model on the right side of the figure emphasizes the cube's spatial structure, showing its width, height, and depth through coordinate axes.

Additionally, the figure includes a calculation of the cube's surface area using the formula

$$L = 6s^2$$

Where s represents the side length of the cube. With a side length of 60 cm, the computed surface area is

$$L = 6 \times 60^2 = 21{,}600 \text{ cm}^2$$

This calculation highlights the direct relationship between geometric representation and mathematical computation.

Patterns and Number Sequences

In the making of *Bala Suji*, the repeated arrangement of bamboo strips on the four sides of the cube frame creates an orderly grid pattern. Each side of the weaving requires three bamboo strips arranged repeatedly. Thus, one unit of *Bala Suji* requires twelve bamboo strips to complete the full weaving pattern. This regularity forms a consistent number sequence, in line with the characteristics of arithmetic patterns that frequently appear in crafts based on structural repetition (Yohanes et al., 2025). For example, if 10 units are to be made, the total bamboo strips follow an arithmetic sequence:

$$3, 6, 9, 12, \ldots, 30$$

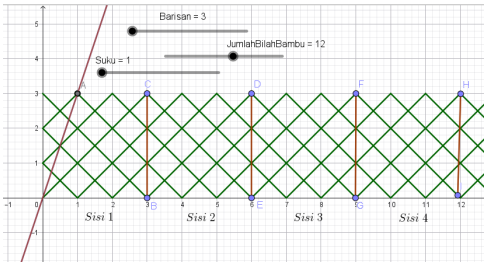

Figure 5. Representation of Patterns and Number Sequences in 1 Units of *Bala Suji*

Figure 5 illustrates the representation of patterns and number sequences that emerge within one unit of the *Bala Suji* weaving design. The image displays an arrangement of green lines forming a

repetitive series of rhombus shapes. This pattern reflects the fundamental structure of the *Bala Suji* weave, which is created through the consistent and continuous intersection of diagonal bamboo strips along the length of the woven piece.

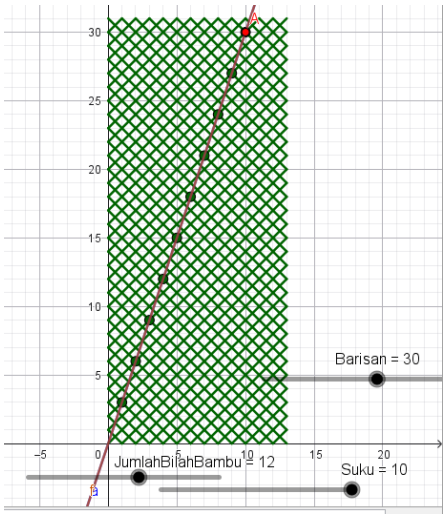

Figure 6. Representation of Patterns and Number Sequences in 10 Units of *Bala Suji*

Figure 6 illustrates the *Bala Suji* weaving pattern in 10 units, forming a repeated sequence of rhombus shapes. The expanded area of the pattern shows how the basic structure of the weave develops as the number of units increases.

The red diagonal line on the graph represents a linear relationship between the number of weaving units and the number of pattern elements formed. Markers such as "Term = 10" and "Barsan = 30" indicate that the pattern's growth follows an arithmetic sequence, where each additional unit results in a consistent increase in the number of elements. This representation in the Cartesian coordinate system reinforces that the *Bala Suji* pattern can be mathematically analyzed through concepts of geometry and number sequences.

Mathematically, this applies the concept of an arithmetic sequence with:

First term $(a) = 3$

Common difference $(d) = 3$

The n - th term of the sequence can be calculated using the formula:

$$\begin{aligned} a_n &= a + (n-1)d \\ &= 3 + (n-1).3 \\ &= 3n \end{aligned}$$

To calculate the total number of bamboo strips after $n$units, the formula for the sum of the first n terms is used:

$$\begin{aligned} S_n &= \frac{n}{2}\ (a + a_n) \\ &= \frac{n}{2}(3 + 3n) \\ &= \frac{3n(n+1)}{2} \end{aligned}$$

For example, if we want to determine how many bamboo strips are needed to make 10 units of *Bala Suji*:

$$\begin{aligned} S_{10} &= \frac{3 \times 10(10+1)}{2} \\ &= \frac{3 \times 110}{2} \\ &= 165 \end{aligned}$$

This means that a total of 165 bamboo strips are required to complete 10 units of *Bala Suji*. This arithmetic sequence model illustrates that the Pattinjo community intuitively understands the concept of numerical regularity and linear growth, even without using formal mathematical symbols. The calculations they perform through repeated multiplication and addition represent a concrete application of sequence concepts and basic arithmetic, which can serve as a bridge toward understanding formal mathematical concepts in schools, particularly in the topic of sequences and series.

Geometric Transformations (Reflection, Rotation, Translation, and Dilation)

The *Bala Suji* woven patterns that are arranged repeatedly and regularly contain various complex geometric transformations.

a) Reflection

Reflection is a type of transformation that maps each point in a plane by using the mirror-image property of the point being transformed (Edi, 2021).Reflection occurs when the arrangement of bamboo strips is arranged symmetrically with respect to the central line. In the context of Cartesian coordinates, reflection across the y-axis, for example, is written as:

$$(x, y) \rightarrow (-x, y)$$

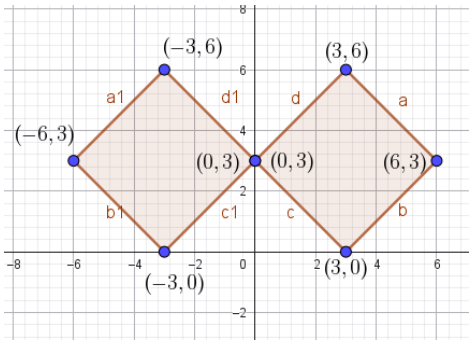

Figure 7. Representation of Reflection Concept in *Bala Suji*

Figure 7 illustrates the representation of the reflection concept that appears in the *Bala Suji* weaving pattern. The figure shows two rhombus shapes that have the same form, size, and orientation, but are positioned opposite each other with respect to the y-axis. Each vertex is labeled with coordinates to emphasize the symmetrical relationship between the two shapes.

The rhombus on the left contains points such as $(-6,3)$, $(-3,6)$, $(-3,0)$, and $(-6,-3)$, while the rhombus on the right includes points that are reflections of these coordinates across the y-axis, such as $(6,3)$, $(3,6)$, $(3,0)$, and $(6,-3)$.

This can be seen in the weaving pattern, which has two sides that mirror each other both horizontally and vertically. Such a pattern creates a balanced and symmetrical visual effect on both sides, indicating that the artisans naturally understand the principle of congruence through reflection.

b) Rotation

Rotation is evident when the weaving motifs are arranged in a circular orientation or at specific angles such as 90°, 180°, or 270°, while the overall shape remains similar. In the coordinate system, a 90° clockwise rotation can be represented as:

$$(x, y) \rightarrow (y, -x)$$

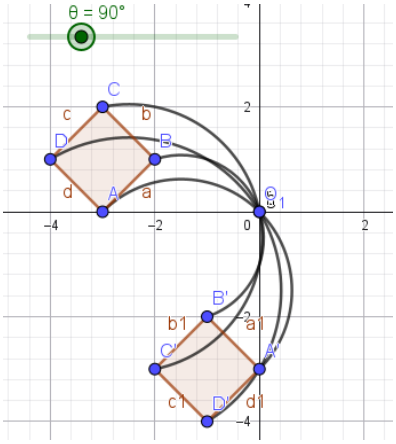

Figure 8. Representation of the 90° rotation concept in *Bala Suji*

Figure 8 demonstrates how a rhombus shape, representing the basic unit of the *Bala Suji* weaving motif, undergoes a geometric transformation in the form of a 90-degree clockwise rotation about a fixed center point. The original rhombus and its rotated image have the same size, shape, and proportions, indicating that the transformation preserves congruence.

Meanwhile, the 180° rotation:

$$(x, y) \rightarrow (-x, -y)$$

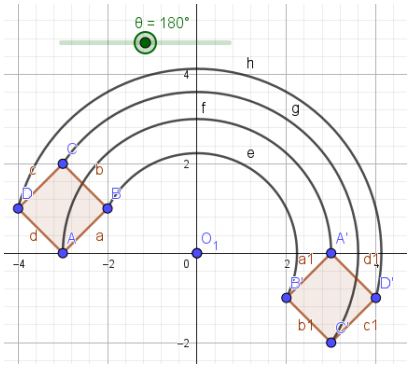

Figure 9. Representation of the 180° rotation concept in *Bala Suji*

Figure 9 illustrates the application of the 180° rotation concept in the *Bala Suji* weaving pattern. The rhombus, as the basic unit of the motif, is rotated 180° around a fixed center point, causing its position to shift to the opposite side. Although the orientation and location change, the size and shape remain the same, preserving congruence. This rotational pattern reflects the balance and symmetry characteristic of *Bala Suji* weaving.

c) Translation

Translation refers to shifting a pattern in a certain direction without changing its shape (Taneo et al., 2025). In *Bala Suji*, translation is visible when the same motif is moved by a fixed distance along the x-axis or y-axis, producing a uniform grid pattern. Mathematically:

$$(x, y) \rightarrow (x + a, y + b)$$

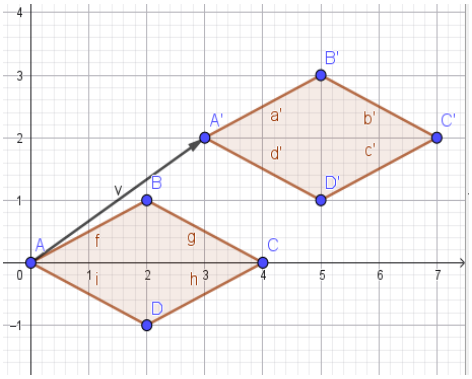

Figure 10. Representation of the translation concept in *Bala Suji*

Figure 10 shows the application of the translation concept in the *Bala Suji* weaving pattern. The two rhombus shapes have the same size and form, where the second shape is the result of translating the first shape according to the transformation rule. All points shift by the same distance and in the same direction, so the shape remains congruent.

With a and b as the horizontal and vertical translation vectors. This uniformity ensures that the structure remains stable and the visual appearance remains harmonious.

d) Dilation

Dilation occurs when *Bala Suji* is made in various sizes while still maintaining a similar pattern. If the size is doubled, then all dimensions are enlarged by a scale factor $\boldsymbol{k}$. In the coordinate system:

$$(x, y) \rightarrow (k \cdot x, k \cdot y)$$

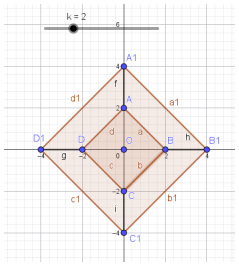

Figure 11. Representation of the dilation concept in *Bala Suji*

Figure 11 shows the application of the dilation concept in the *Bala Suji* weaving pattern. The two rhombus shapes appear similar, where one is the result of enlarging or reducing the original shape using a scale factor k, according to the transformation rule. If $k = 2$, then every element in the pattern enlarges twofold, while the shape and proportions remain the same. This concept is also related to similarity in geometry.

Linear Equations in Two Variables

The making of *Bala Suji* in various cultural contexts of the Pattinjo community, such as wedding ceremonies or aqiqah, requires careful planning of the exact amount of materials. This process indirectly reflects the application of the mathematical concept of linear equations in two variables, namely the relationship between the size of the *Bala Suji* and the number of bamboo poles needed. For example, in a wedding ceremony, a *Bala Suji* with dimensions of 60 cm in length, 60 cm in width, and 40 cm in height requires 5 bamboo poles. Meanwhile, for another wedding event, a larger *Bala Suji* 90 cm in length, 90 cm in width, and 50 cm in height requires 8 bamboo poles. As stated by the *Bala Suji* craftsman, Daeng Hasan:

"When Bala Suji is made for an aqiqah ceremony, the size is usually smaller. The length and width are about 60 cm, while the height is around 40 cm, because the contents placed inside are not too many. However, for a wedding ceremony, the size is made larger. The length and width are usually 90 cm, and the height is about 50 cm, because the contents placed inside are more." (Interview with Daeng Hasan, 2025).

If the length of *Bala Suji* is denoted by the variable p, the width by l, and the height by t, then the total bamboo requirement $b$can be written in the form of a system of linear equations in three variables:

$$60p + 60l + 40t = 5\ (Aqiqah)$$
$$90p + 90l + 50t = 8\ (Wedding)$$

Since the length and width have the same value (a square shape), the system can be simplified into one variable, namely $x = length = width$. Thus, the system becomes:

$$2 \times 60x + 40t = 5$$
$$\rightarrow 120x + 40t = 5 \quad \text{(Aqiqah)}$$
$$2 \times 90x + 50t = 8$$
$$\rightarrow 180x + 50t = 8 \quad \text{(Wedding)}$$

This algebraic model illustrates that the amount of bamboo required is not merely the result of adding the length and width; it also considers the contribution of the height, which determines the total material needed. By processing this system, we can formulate a linear mathematical model relating the dimensions of *Bala Suji* to the amount of bamboo required. As an alternative approach, we can also examine the relationship between the volume of *Bala Suji* and the amount of bamboo used.

Volume of *Bala Suji* for aqiqah:

$$60 \times 60 \times 40 = 144.000\ cm^3$$

Volume of *Bala Suji* for wedding:

$$90 \times 90 \times 50 = 405.000\ cm^3$$

Bamboo requirements:

$$Volume\ 144{,}000 \rightarrow 5\ bamboo$$
$$Volume\ 405{,}000 \rightarrow 8\ bamboo$$

Using these data, we model a linear relationship between volume (V) and the bamboo requirement (b):

$$b = aV + c$$

Use two-point elimination:

$$a(144000) + c = 5$$
$$a(405000) + c = 8$$
$$\rightarrow 261000a = 3 \rightarrow a = \frac{1}{87000}$$

Substitute into the first equation:

$$\frac{144000}{87000} + c = 5$$
$$\frac{16}{9} + c = 5$$
$$c = 5 - \frac{16}{9}$$
$$c = \frac{29}{9}$$

Thus, the approximate linear model between volume and bamboo requirement is:

$$b = \left(\frac{1}{87000}\right)V + \frac{29}{9}$$

This model represents an approximation indicating that the need for materials increases as the volume of *Bala Suji* increases, even though in traditional practice, considerations also include structural and aesthetic aspects. This shows that material requirements are not merely determined by adding the length and width but may also involve different weighted contributions depending on structural requirements or the type of weaving used. This system of linear equations in two variables is an important topic in secondary school mathematics and can be taught through local cultural contexts to help students better understand the connection between formal mathematics and real-life situations (Bupu et al., 2021). This model also demonstrates the importance of planning and estimation within traditional cultural practices that are rich in mathematical concepts.

CONCLUSIONS

This study shows that the process of making *Bala Suji* in the Pattinjo community contains various mathematical concepts that naturally emerge through cultural activities. These concepts include plane and solid geometry, number patterns, geometric transformations, and linear equations in two variables. *Bala Suji* also represents mathematical activities according to Bishop's theory counting, locating, measuring, designing, and explaining all of which appear in every stage of its construction. The use of *Bala Suji* as a learning resource has the potential to enhance students' conceptual understanding because it provides a cultural context that is concrete, visual, and closely connected to daily life.

Based on the findings of this study, several recommendations can be considered. Mathematics teachers should make use of cultural objects such as *Bala Suji* as instructional media to present more concrete and meaningful contexts for students. Future research is expected to examine the implementation of *Bala Suji* in classroom learning scenarios to determine its effectiveness on learning outcomes and students' mathematical thinking abilities. In addition, further exploration of other cultural objects in the Sulawesi region is needed so that the variety of ethnomathematical contexts becomes richer and can broaden its application across various mathematical topics.

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