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Ethnomathematics Exploration of West Tulang Bawang Tikew Woven

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ABSTRACT

This study explores ethnomathematical elements embedded in Tikew weaving, a traditional craft of the Lampung culture. To date, no ethnomathematics research has specifically examined Tikew weaving in West Tulang Bawang, indicating a gap in the literature regarding the mathematical and cultural values inherent in this local practice. Therefore, this study aims to identify mathematical concepts from an ethnomathematical perspective and to examine the cultural values reflected in Tikew weaving. This research employed a qualitative ethnographic approach using a multidisciplinary perspective. Data were collected through observations, interviews, and documentation. The research instruments consisted of interview guidelines and observation protocols. Data analysis was conducted using the Miles and Huberman interactive model, which includes data reduction, data display, and conclusion drawing. The findings reveal that Tikew weaving reflects Lampung cultural values while simultaneously exhibiting meaningful mathematical patterns, particularly geometric concepts. These concepts include plane geometry and three-dimensional forms manifested in the structural patterns of Tikew woven products. The results demonstrate that Tikew weaving can serve as a rich source of contextual mathematical ideas grounded in local culture. This study contributes to the enrichment of ethnomathematics literature by documenting mathematical concepts rooted in indigenous cultural practices. In addition, it supports cultural preservation and offers alternative instructional media for mathematics learning based on local culture. By integrating local cultural contexts, mathematics learning can become more meaningful, contextual, and engaging, while also fostering students' appreciation of cultural heritage.

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Introduction

Education plays an important role in human life and is often regarded as a lifelong process. Human life requires education, and education itself exists because of human life. Through education, students are encouraged to actively develop their potential, including spiritual and religious values, self-control, personality, intelligence, moral character, and skills needed both individually and socially (Adelia & Sarassanti, 2025). Education can also be understood as an effort to shape personality based on life principles and cultural values (Hakim & Darojat, 2023). Culture is reflected in the works of a society that are preserved and continuously developed without losing their intrinsic values. From the perspective of life and science, mathematics is a fundamental part of human life and originates from culture (Putri, 2017). Therefore, culture-based learning in mathematics represents an innovation that challenges the assumption that mathematics is inherently difficult. Integrating culture into mathematics learning can make mathematics more flexible, meaningful, and easier to understand (Solihin & Rahmawati, 2024). One mathematical topic that is closely related to culture is geometry (Dhiki & Bantas, 2021).

Geometry is a branch of mathematics that deals with points, lines, angles, plane figures, and three-dimensional shapes (Lestari et al., 2024). Geometric concepts are widely encountered in everyday life, including in students' surroundings (Dhiki & Bantas, 2021). However, in practice, many students still perceive mathematics as a frightening, difficult, and boring subject that only involves numbers, formulas, and calculations, and is far removed from daily life (Marian & Saputra, 2023). As a result, mathematics teachers have a responsibility to introduce mathematical concepts that are closely connected to everyday life to increase students' motivation and reduce anxiety in learning mathematics (Mauliyana et al., 2023). One approach that can address this issue, particularly in geometry learning, is culturally based mathematics learning known as ethnomathematics (Noprisa et al., 2024).

Ethnomathematics is considered one of the most appropriate approaches to demonstrate the close relationship between culture and mathematics. It contributes to meaningful and contextually relevant learning by linking mathematical concepts to cultural practices (Noprisa et al., 2024). Ethnomathematics is defined as a field of study that explores the relationship between culture and mathematics (Lestari et al., 2024). This approach aims to understand how cultural groups conceptualize and apply mathematical ideas in everyday activities, thereby expanding students' learning experiences through the integration of cultural values and crafts into mathematics learning (Sulistyani et al., 2019). Such an approach enables mathematics learning to be closely associated with local cultural contexts that are familiar to learners.

Geometry is often perceived as an abstract mathematical topic by students (Beadslet et al., 2024). It involves fundamental concepts such as points, lines, planes, and various geometric shapes, which are often difficult to understand without concrete learning media. To overcome this challenge, teachers commonly use real objects to support students' understanding of geometric concepts in classroom learning (Rindi Fatmawati & Yahfizham Yahfizham, 2024).

Numerous ethnomathematics studies have explored local cultural practices, particularly weaving. Previous research by Dhiki & Bantas (2022) revealed that Ende weaving contains geometric concepts embedded in the motif creation process. Similarly, Adelia & Sarassanti (2025) examined ethnomathematics in mat weaving within the Padang Tikar community and identified geometric concepts such as lines, plane figures, and three-dimensional forms. Research conducted by Hartoyo & Siregar (2023) on woven products of the Dayak community in the Seratus Coast of Landak Regency also demonstrated that weaving activities are closely related to various geometric concepts.

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The growing number of ethnomathematics studies on weaving highlights the potential of local culture as an authentic resource for mathematics learning. However, research on ethnomathematics in other regions remains limited, including studies on Tikew weaving in West Tulang Bawang, Lampung Province. Tikew weaving is a form of cultural heritage with high historical and philosophical value within the local community. This study seeks to uncover the philosophical meanings embedded in Tikew weaving and to identify the geometric concepts contained within its patterns.

Understanding the ethnomathematical aspects of Tikew weaving is expected to contribute to the development of more meaningful and contextually relevant mathematics learning, while also supporting the preservation of local cultural heritage. Although Tikew weaving is a distinctive characteristic of the West Tulang Bawang community, no prior ethnomathematics research has specifically examined this cultural practice. Therefore, exploring Tikew weaving through an ethnomathematical lens is important for raising awareness of the mathematical values embedded in local cultural heritage. Ethnomathematics can serve as a bridge between abstract mathematical concepts and the lived cultural experiences of society. For this reason, this study focuses on exploring Tikew weaving as a source of ethnomathematical knowledge.

Method

Types of research

This study employed a qualitative research design using an ethnographic approach. Ethnography is a research approach that involves the systematic description and analysis of a community's culture and is grounded in direct observation of social practices (Sugiyono, 2018). This approach was selected because the study aims to explore mathematical concepts from an ethnomathematical perspective and to examine the cultural values embedded in Tikew weaving as a form of local cultural heritage..

Research subjects

The technique used to determine the research subjects was purposive sampling. Purposive sampling is a sampling technique that selects data sources based on specific considerations and research objectives. In this study, the researchers conducted intensive interactions with expert informants who possess in-depth knowledge of local culture in West Tulang Bawang, as well as local MSME practitioners who are directly involved in Tikew weaving and therefore serve as key data sources. The researchers linked observational data with the philosophical context of Tikew weaving to identify and illustrate the mathematical ideas embedded in this cultural practice. Through this approach, mathematical concepts reflected in Tikew weaving could be systematically traced and interpreted within an ethnomathematical framework.

Instrument

To ensure the validity of the data, the researchers applied technical triangulation by combining observations, interviews, and documentation. Observations were conducted directly at the research site to examine Tikew weaving in depth, focusing on various patterns and structural elements. These observed features were then analyzed in relation to geometric concepts, such as plane and three-dimensional shapes, within the context of mathematics learning. In addition, interviews were conducted with expert informants to strengthen and

validate the findings obtained from the observations. The documentation process was carried out to further substantiate and refine the research findings, providing supporting evidence collected at the research location. Table 1 presents the interview instrument used in this study.

Table 1. Guidelines Interview

No Aspect Question	Interview Questions	Purpose of Question
Woven Background	What is the history of the West Tulang Bawang area?	Understand the history and origins of Tikew Woven
Philosophy and Meaning of Tikew Weaving	What is the philosophy or meaning contained in Tikew Weaving?	Identifying cultural values and symbols in Tikew Weaving
Production process	What are the stages of the Tikew Weaving process?	Understand the weaving production process from start to finish
Tikew woven crafts	What are the typical Tikew woven crafts?	Identifying the Typical Tikew Woven Craft
The relationship between weaving and mathematics	Are there any particular geometric patterns that are characteristic of Tikew Weaving in the process of making Tikew weaving?	Identifying mathematical elements in Tikew Weaving
Mathematical Concepts in Weaving	Are there any specific calculations such as symmetry, patterns, or measurements?	Exploring the mathematical concepts used in making Tikew Woven Fabrics
Craftsmen's Knowledge of Mathematics	Are the craftspeople aware of the mathematical elements in the Tikew weaving they make?	Understanding the extent of craftsmen's awareness of mathematical concepts
The Use of Mathematics in Tikew Weaving Crafts	How is the Tikew weave structured? Is there a specific pattern to consider?	Identifying mathematical patterns in the form of Tikew weave
Cultural Preservation	What efforts are being made to preserve Tikew weaving?	Understanding the steps for preserving Tikew weaving as a cultural heritage
The Impact of Tikew Weaving on the Local Economy	How big is the contribution of Tikew weaving to the economy of the local community?	Identifying the economic impact of Tikew weaving production
Production Challenges	What are the main challenges faced in Tikew weaving production?	Understanding the obstacles faced by craftsmen
Suggestions and Hopes	What are your hopes for the future development and preservation of Tikew weaving?	Gaining informants' perspectives on the future development of Tikew weaving

Data Collection Procedures

Data collected through three techniques that is observation, interviews, literature studies, and Documentation. First, we identified the informants, one informant in this study, approximately 45 years old, who had a strong understanding of the culture to be analyzed. Second, we interviewed two informants, approximately 32 years old, to obtain additional information needed for the study. Third, we took ethnographic notes and asked several questions based on the interview guide. Fourth, the collected data were analyzed descriptively to produce findings.

Data analysis

Analysis data is done in three stage with using analysis Miles & Huberman (Zaini et al., 2023), namely (1) reduction data; (2) interpretation of the data that has been collected according to the researcher's point of view; and (3) presentation of data that refers to the research findings. which is obtained summarized and focused accordingly with the intention of research, then arranged in a manner systematic in narrative form descriptive. If required data also served in the form of table or visual categories to strengthen understanding readers of

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the findings research. Through the approach this is expected research result not only make a contribution towards learning mathematics based local culture but also enrich understanding about history mathematics that live in community life.

Research Findings

Figure 1. Tikew Plant *Source* Bahrisy et al. (2024)

Tikew originated and developed in Gedung Ratu Village, West Tulang Bawang Regency, Lampung Province. Initially, Tikew was a wild plant that grew in swamp areas. Through the knowledge and skills passed down by ancestors, the plant was processed and woven into seating mats. Over time, Tikew mats evolved into a medium of exchange and were traded for essential goods such as rice, clothing, and other household necessities. However, with the advancement of technology, the use of Tikew mats has gradually declined, as communities increasingly prefer products made from plastic and similar synthetic materials (Bahrisy et al., 2024). The widespread use of plastic has become a major environmental problem in Indonesia. In this context, Tikew crafts not only represent cultural heritage but also offer an alternative solution for reducing plastic waste through the use of environmentally friendly materials.

Tikew is an endemic plant of West Tulang Bawang Regency, Lampung Province. Although it grows naturally in the wild, Tikew provides numerous benefits, including maintaining ecological balance. Beyond its ecological function and use as a raw material for crafts, Tikew also embodies deep spiritual and social values. Many Tikew motifs carry symbolic meanings. For example, the *apai* motif with *puring* symbolizes simplicity in daily life; the *selop* motif is commonly used in wedding ceremonies; and the *andak* motif is worn during funeral processions, symbolizing the straight journey of human life.

The process of producing Tikew crafts requires considerable time and a series of carefully performed stages. It begins with a ritual of respect for nature, which is believed to maintain harmony between humans and the natural environment and to ensure community safety during the harvesting process. The next stage is harvesting the Tikew plant, locally known as *ngarap*. The ideal harvesting age is approximately one year, when the plant reaches a height of about two meters. Harvesting is carried out by cutting the plant to allow regrowth.

After harvesting, the Tikew undergoes a drying process by being exposed to sunlight for approximately two days, followed by an overnight resting phase known as *condensing*. This step aims to prevent the fibers from becoming brittle during weaving. The subsequent stage involves flattening the Tikew fibers, a process that requires substantial time and physical strength, as the traditional pestle used typically weighs between 5 and 10 kilograms. The final stage is coloring the fibers, known as *pacing*. The colors commonly used are green, red, and yellow, each carrying specific philosophical meanings: green symbolizes coolness and

harmony, red represents courage, and yellow signifies social prosperity. The mathematical concepts embedded in the activities of Tikew weavers are presented in Table 2.

Table 2. DraftlMathematics onlcraftsman activitieslTikew weaving

Activity which is conducted	Activities that incorporate mathematical concepts	Mathematical Concepts	Ethnomathematics Activities
Determining which Tikew is suitable for use	Grouping the proper length of the tiew used and selected appropriate tikew criteria	Sets and Logic	Count
Determining the Length of the Tikew	Measure Tikew Length with rope that has been measured	Measurement	Measure
Cleaning and determine the width of the Tikew	Determining the width of the Tikew and determine many tikew that produced to make one tikew weaving	Measurement and comparison	Measuring and calculating
Boiling Tikew	Determining volume water and time time boiling tikew and determine the number of Tikew that will boiled every the stages	Measurement and multiples	Measuring and Calculating
Tikew Immersion	Determining volume water used	Measurement	Measure
Tikew Drying	Determine the estimate time required to accompany Tikew	Measurement	Measure
Tikew Coloring	Determining the dosage color and volume water used	Measurement	Measure
Making woven motifs	Weaving patterns based on on the pattern previously and determine the layout location inner motif woven, where move from the motif will form flat building geometry	Fold symmetry, distance, and geometry	Designing and count
Determining Length and the width of the Tikew weave	Determining Length and width based on the number of Tikew that used	Multiplication on integers	Count

Cultural values are shared values that are embedded within a society and reflected in its social organization, environment, and collective life. These values are rooted in customs, beliefs, and symbols, and possess distinctive characteristics that differentiate one community from another. Cultural values function as behavioral guidelines that shape how individuals respond to situations that occur in everyday life. They are reflected in social behaviors such as mutual assistance, cooperation, deliberation, loyalty, self-respect, orderliness, and other forms of social interaction. Cultural values tend to be relatively permanent and are difficult to change or replace with other value systems. The following are examples of cultural values identified in

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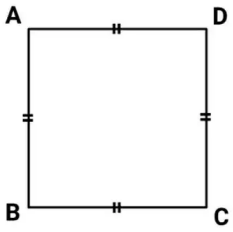
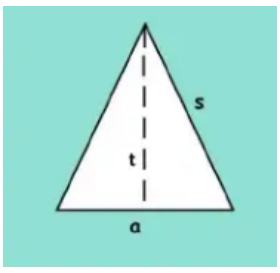
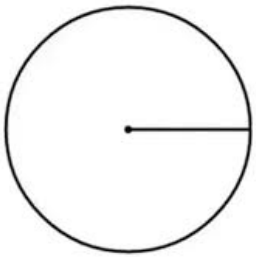
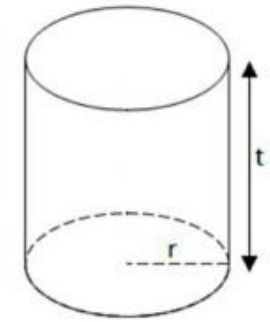
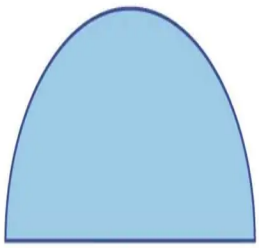
Tikew crafts. *First,* Material values refer to everything that is useful for humans, both individually and collectively. In Tikew crafts, material values are reflected in the selection of materials and physical components used in the production process. The use of natural materials and the practice of preserving the surrounding environmental ecosystem demonstrate an awareness of sustainability and environmental balance.

Second, Vital values refer to everything that is useful for humans in carrying out activities and sustaining life. The vital values of Tikew crafts can be observed in their role within local culture and heritage. The production of Tikew crafts contributes to increased household income while simultaneously serving as a medium for preserving cultural traditions.

Based on field observations, visual documentation, and interviews with local artisan informants, various geometric forms were identified in the structural elements of Tikew crafts. These forms reflect the application of mathematical concepts that serve not only aesthetic functions but also embody cultural values and symbolic meanings that can be analyzed through an ethnomathematical approach. In general, the geometric forms identified in Tikew crafts can be classified into two main categories: two-dimensional figures and three-dimensional forms. Based on documentation of various Tikew craft products, Table 3 presents an exploration of geometric forms that are mathematically relevant within the framework of ethnomathematics.

l**Table 3.** Exploring Geometry ConceptslTwo-dimentional figureland Wake UplSpace onlTikew Weaving

No	Ethnomathematics	Mathematical Concepts	Linking Learning
1		 Perimeter of a Square $4 \; x \; S$	Implementing the square concept, students can learn the definition of the square concept, its properties, and the formulas for calculating its area and perimeter. Students can also learn the square concept by utilizing surrounding objects.
2		 Around Side (a+b+c) Wide $\frac{1}{2} x \; a \; x \; t$	Implementing the triangle concept, students can learn about the concept of a circle, its properties, and formulas for calculating its area and circumference. Perimeter = Side (a+b+c)

3		 Circumference $2\pi r$ Area of a Circle $\pi r2$	Implementing the concept of circles in mathematics, students can learn the definition of a circle, its properties, and the formulas for calculating its area and circumference. Furthermore, students can relate the concept of circles to their surroundings.
4		 Wide$2\pi \times r(r+t)$ Volume $\pi \times r2 \times t$ Circumference of $2\pi r$	By implementing the cylinder concept, students can learn the definition of a cylinder, its properties, and formulas for calculating its area, volume, and circumference. They can also relate these concepts to surrounding objects.
5		 $k = \pi \, x \, r + 2 \, x \, r$ $L = \frac{1}{2} \, x \, \pi \, x \, r^2$	Implementing the concept of a semicircle, students can learn the definition, properties and formulas. In addition that, students can link it with surrounding objects.

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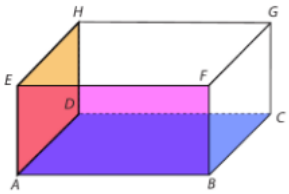
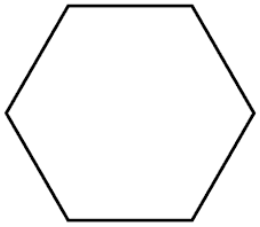
6		 Perimeter of a Rectangle $2\times(p+l)$ Area of Rectangle $p\times l$	Implementation of the concept of flat shapes, namely rectangles, in mathematics learning in class, students are able to learn about the definition, properties of area formulas and the perimeter of rectangular shapes.
7		 Wide $2\{(p\times l)+(p\times l)+(l\times t)\}$ Around $4\times(p+l+t)$ Volume $p\ x\ l\ x\ t$	Implementation in mathematics learning related to the concept of cuboids, students can learn the meaning of cuboids such as the properties, area formulas, and volume of these shapes.
8		 Area $=\frac{3\sqrt{3}}{2}\ s^2$ Perimeter = 6 x s	Implementation in learning mathematics related to the concept of hexagons, students can learn hexagon formulas and also the definition of hexagons.

Discussion

This research was conducted to examine ethnomathematical elements embedded in Tikew weaving in West Tulang Bawang Regency, with a focus on identifying mathematical concepts and the cultural meanings reflected in each Tikew woven product. Ethnomathematics is understood as a learning approach that connects cultural elements with mathematics instruction (Fauzi & Lu'lu'ilmaknun, 2019). In this study, data were collected through observations, interviews, and documentation to obtain information relevant to the research objectives. Through these methods, the study successfully identified various mathematical aspects involved in the Tikew weaving process and compared them with characteristics of weaving practices from other regions.

From a mathematical perspective, this study reveals several mathematical activities integrated into the weaving process, including counting, measuring, and designing. These findings extend previous ethnomathematics studies by highlighting the distinctive forms and

motifs found in Tikew weaving, which reflect unique structures and meaningful cultural values. The results indicate that Tikew weaving in West Tulang Bawang possesses specific characteristics that differentiate it from weaving traditions in other regions.

Several previous studies provide relevant comparisons. Kupang (2025), in a study on ethnomathematics in Amarasi ikat weaving motifs in Kupang Regency, found geometric shapes such as triangles, rhombuses, squares, and rectangles, as well as the application of numerical concepts in repeating patterns. Similarly, Ethnomatematics and Bari (2025) examined ethnomathematical elements of the Bari Pesirah House Hall for junior high school mathematics learning, focusing on geometric and measurement concepts embedded in architectural ornaments and designs. Their findings confirmed that mathematics is not limited to textbooks but is integrated into everyday community life. Furthermore, Adelia & Sarassanti (2025) reported that woven mats in Padang Tikar Village function not only as craft products but also as cultural heritage containing rich mathematical values, including concepts of lines, perpendicular lines, plane figures, and three-dimensional shapes.

In contrast to these studies, the present research emphasizes the uniqueness of Tikew woven crafts, particularly in the geometric forms and motifs that characterize Tikew weaving in West Tulang Bawang. These findings suggest that Tikew weaving can serve as an effective medium for ethnomathematics, supporting the revitalization of mathematics learning by demonstrating that mathematical concepts are deeply embedded in daily cultural practices. Integrating Tikew weaving into mathematics education therefore provides an opportunity to connect abstract mathematical ideas with students' lived cultural experiences.

Conclusion

This study examines the ethnomathematical aspects of geometric forms embedded in Tikew weaving and demonstrates that, beyond its cultural richness, Tikew weaving contains substantial mathematical knowledge, particularly in geometry. Geometric shapes such as squares, triangles, cylinders, and cubes frequently appear in Tikew woven products. These patterns reflect fundamental geometric concepts and provide evidence of the close relationship between traditional weaving skills and mathematics. Furthermore, the presence of diverse geometric forms in Tikew weaving illustrates local wisdom and community creativity in applying mathematical ideas within everyday practices. These characteristics position Tikew weaving as a valuable source of contextual and practical teaching materials for mathematics learning. The findings also reinforce the view that mathematics is not confined to textbooks but is deeply integrated into the daily lives and cultural activities of the community. However, this study is limited to the exploration of Tikew weaving culture in West Tulang Bawang. Many other cultural practices in the region remain unexplored and hold potential for revealing additional mathematical concepts that could further enrich students' cultural and mathematical understanding. Overall, Tikew weaving should be regarded not only as a traditional handicraft but also as a meaningful and contextual medium for mathematics learning. Its integration into educational contexts can enrich ethnomathematics literature while simultaneously supporting the preservation of local cultural heritage.

Conflict of Interest

The authors declare that this article was prepared as part of fulfilling the requirements for the completion of a student's final project. Aside from this purpose, there are no other conflicts of interest that influenced the planning, implementation, analysis, or writing of the research results.

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Authors' Contributions

N.H. actively participated in the implementation, data collection, preparation of instruments, article narrative, discussion of results, and editing of the manuscript for the final version. F.L. and N. contributed to understanding the main research ideas, theoretical development, methodology, data organization and analysis, discussion of results, and approval of the final version of the manuscript. All authors confirm that they have read and approved the final version of this paper. The total percentage of contribution to conceptualization, writing, and manuscript revision is as follows: N.H.: 40%, F.L.: 30%, and N.: 30%.

Data Availability Statement

The authors declare that data sharing is not applicable, as no new data were created or analyzed in this study.

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