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Ethnomathematics: Mathematical Concepts in Palm Oil Weaving Crafts

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ABSTRACT

The purpose of this study was to explore ethnomathematics in the woven craft of oil palm sticks. This research is qualitative research with an ethnomathematical approach. Data collection instruments use observation sheets, interview sheets, and field notes. The subjects of the study were the owner of the She Creaf production house and some of its employees. The data analysis technique used is data triangulation. The results of this study show that there are mathematical concepts found in the woven craft of oil palm sticks. The mathematical concepts found in the woven craft of oil palm weaving are measuring, calculating, set, comparison, relation, function, and according.
***Keywords**: ethnomathematics, palm oil weaving*

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INTRODUCTION

Indonesia has 38 provinces with a population of more than 273 million people, this is one of the references that the State of Indonesia has diverse cultures and traditions (Hafifah &; Putra, 2022). Indonesia's cultural diversity is the result of these various traditions and cultures. All cultures and traditions in Indonesia are national assets that need to be maintained and preserved so that their authenticity and existence are not lost along with the times (Hildigardis, 2019). Public understanding of the importance of maintaining and preserving cultural heritage is now getting higher. In fact, many lovers and observers of cultural heritage believe that cultural wealth is not only the heritage of the Indonesian nation, but also the heritage of the Indonesian nation (Ramadhina et al., 2021). Handicrafts are a well-known Indonesian cultural heritage, one type of handicraft that is highly preserved is woven crafts.

Woven craft is a form of traditional craft that has long been produced in Indonesia. This woven craft originally had a simple form as a work of art to meet daily needs. In the past, woven crafts were still a side activity of rural people in spending time while waiting for planting which became their main source of livelihood. In certain societies, this woven craft has its own artistic value and meaning which is made for traditional ceremonial purposes and for domestic purposes (Isnaini, 2019).

Cultural activity has a very close relationship with mathematics. The relationship between cultural activity and mathematics is called ethnomathematics. Ethnomathematics is defined as the customs used by a cultural group in mathematical activities. The term ethnomathematics was first coined and developed by Brazilian mathematician D'Ambrosio. According to D'Ambrosio, ethnomathematics is the study of the life patterns, habits, or habits of people in places that are connected to mathematical concepts, but are not recognized as part of mathematics by society (Fajar et al, 2018).

According to Zaenuri (2018), ethnomathematics is a learning approach carried out by teaching mathematics by linking mathematics learning and the nation's own cultural work and then also being involved with the needs and lives of the community. Ethnomathematics is mathematics that grows and develops in a particular culture. Ethnomathematics is perceived as a lens to view and understand mathematics as a cultural product (Puspadewi &; Putra, 2014). So it can be concluded that ethnomathematics is a knowledge that links mathematics with culture, life, and habits of society.

The association between mathematics and culture in an area must certainly have the main requirements for ethnomathematics, namely that the culture in the area has a relationship with mathematics (Khairunnisa &; Ginting, 2022). Palm Oil woven crafts are quite popular crafts in Indonesia. From the research that has been done, woven crafts from oil palm sticks can be related to some material on learning mathematics. Research conducted by Wahyuni (2021) entitled Ethnomathematical Analysis of Bamboo Weaving Crafts on Mathematics Learning in Sukabumi Regency, in his research it was stated that bamboo weaving has a relationship with mathematics learning, namely on flat building material and building space. Previous research that has also been carried out by Koriah (2021) entitled Ethnomathematical Exploration

on the Handicraft Process of Stacked Cloth Bros in Cantigi Kulon Village, Cantigi Indramayu District.

Based on the description above, researchers want to know more clearly about what mathematical concepts are carried out by oil palm woven crafts in Hamlet VIII of Seusirah Village, Besitang District. Therefore, it is necessary to conduct research related to ethnomathematical activities, with the title "Ethnomathematics: Mathematical Concepts in Palm Oil Weaving Crafts".

RESEARCH METHODS

The method used in this research is a qualitative method with an ethnomathematical approach. Qualitative methods are research that uses procedural to obtain descriptive data from observed objects in both oral and written form (Sawita &; Br Ginting, 2022). Qualitative research is research that can be used to examine community life, behavioral history, organizational functionalization, social movements or kinship relationships (Putra et al., 2021). While the ethnomathematical approach means an approach that relates mathematical concepts in a particular culture. According to Ajmain et al (2020), the ethnomathematics approach is a mathematics learning approach that emphasizes more on how students can understand and build mathematical concepts based on cultures that grow and develop in the local community.

When making observations, researchers use data collection instruments. There are several things that must be prepared by researchers such as observation sheets, interview sheets, and field notes. Observation sheets are used to obtain information on a variable that is relevant to the research objective with the highest possible validity and reliability (Sintiani, 2023). Interview sheets are used to ask questions to craftsmen to obtain information. While field notes serve to record all observations obtained. This is done so that researchers are more focused on making observations.

The data collection techniques used in this study were observation and interviews. Observations are made on the process of making matting to the resulting product. The purpose of this observation method is to describe something related to the process of making woven oil palm lidi and draw conclusions from the observations compiled into a relevant report. While interviews were conducted with the owner of the production house She Creaf and some of his employees. The selection of this subject is based on the opinion of Hasan & Budiarto (2022) conveyed by Spardley that a good informant must be qualified: (1) full enculturation of his culture, (2) informants are directly involved in the culture, (3) researchers do not know the chosen cultural atmosphere, (4) informants have sufficient time to be interviewed, and (5) non-analytical. The interview conducted is an unstructured interview. An unstructured interview is a free interview in which the researcher does not

The data analysis technique used in this study is data triangulation. According to Helmawati et al (2023), triangulation is a technique to test the credibility of data carried out by checking data that has been obtained from the same source using different techniques.

RESULTS AND DISCUSSION

This research was conducted for four months in stages by conducting observations and interviews at the She Creaf production house which is located in Hamlet VIII, Seusirah Village, Besitang District. From the observations

and interviews, an analysis of ethnomathematics in the woven craft of oil palm sticks will be carried out. To get data, researchers go to the production house and see directly the product to be studied. Researchers found many woven products from oil palm sticks in production houses such as plates, decorative brooms, rice baskets, grilled fish holders, fruit holders, pencil holders, jars, decorative lights, and so on. The example of woven oil palm sticks can be seen in the following picture:

Figure 1. Examples of woven results

To get more information, researchers conducted interviews with the owner of the production house She Creaf and some of his employees. Researchers get information about activities that occur in production houses starting from the activities of obtaining materials, the production process which turns out that craftsmen not only produce woven products, but also produce products made from palm oil sticks, but use weaving techniques using tools. Then researchers looked at the process of making matting.

Based on observations and interviews on the manufacturing process and the results of woven oil palm sticks, there is ethnomathematics. This research focused on the ethnomathematics of making palm oil woven handicrafts. The mathematical concepts obtained from the results of this study are the concept of measuring, the concept of counting, the concept of sets, the concept of comparison, relations and functions, the concept of geometry and equivalence. The results of the study are described as follows:

Measure

Measurement is the determination of magnitude, dimension, or capacity, usually against a standard or unit of measurement. Measuring is an activity that is usually carried out in the process of buying and selling or bartering, designing, determining height, length, circumference, area, depth, speed and so on (Rakhmawati, 2016). The measurements made on this woven craft are that the craftsman ensures that the stick has a length of ± 90 cm. With a calculation of 90 cm can make the work of the craftsman more effective and efficient, because if the size of the stick does not reach 90 cm, the craftsman must insert the stick in the middle of the weaving process**.**

The Concept of Counting Counting is one of the sciences related to efforts to train students' intelligence and skills, especially in solving problems that require calculation (Hakim &; Sari, 2019). To make a webbing, first a pattern is made shaped like a bracelet (circle) made of 3 sticks, on the bracelet inserted sticks on 6 sides, each side consists of 3 layers and on each insert consists of 3 sticks. If using this pattern, 57 pieces of sticks are needed. If you want to make a larger webbing, you can add the number of sticks to each insert. Meanwhile, to make the woven cavity smaller, and make the webbing more sturdy, you can add the number of sticks on each insert. Then, if the number of sticks is less than 57 pieces, it is feared that the woven results obtained are not as expected.

This is done to make it easier for craftsmen to adjust to consumer demand. As for the initial pattern of picture:

Figure 2. Early pattern of webbing

This counting concept can also be seen in the time needed to make matting, As for the time needed to make 1 plate ± 20 minutes, so in a matter of 1 hour craftsmen can make at least 3 plates. The manufacturing time depends on the speed and goods you want to produce. With this calculating concept, craftsmen can estimate consumers who demand products in large quantities.

SET

A set is a member that can be expressed in the form of a collection of objects (Sonya, 2021). In the woven craft of oil palm sticks, the concept of set is found, namely in the main function of the product. The component set A is expressed, A = {urn, decorative broom, decorative lamp, pencil holder}. And the component of the set B is expressed, B = {plate, rice basket, fruit holder, decorative lamp, pencil case}. It can be mathematically illustrated in the following venn diagram.

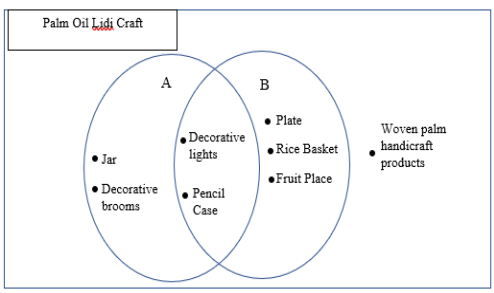


Figure 3. Palm Oil Craft Association Venn Diagram

With the use of the association, craftsmen can group handicrafts according to their usefulness, making it easier for consumers to ask about the types of each product.

COMPARISON

Comparison is the process of analyzing two or more things to look for similarities and differences (Sutrisno, 2021). In 1 kg of sticks craftsmen can make 5 plates and with 1 kg of sticks craftsmen can also make 3 baskets of rice, so that when viewed from the results of the product obtained a comparison value of 5: 3. By knowing this comparison, craftsmen can determine the costs that must be incurred to prepare woven staples.

RELATIONSHIPS AND FUNCTIONS

A function is a relation that has a function or mapping from set A to group B that pairs every member of A with one member of set B. A relation from set A to set B is said to be a function if it meets the following conditions: (1) Each member of set A has a pair (2) Each member of set A is paired with one member of set B (Rahman, 2018). The concept of relationship and function can be seen from the selling price of each product. This can be described in terms of relationships and functions with the following arrow chart:

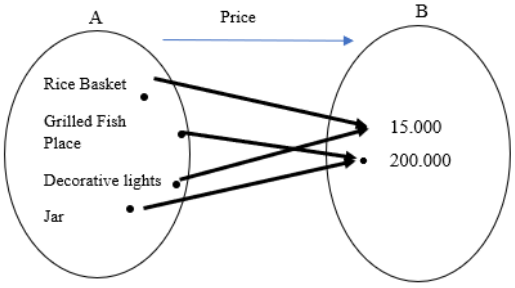
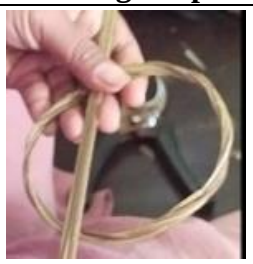
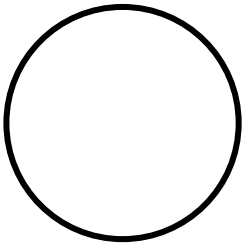
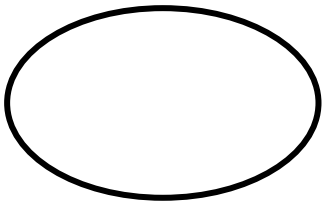
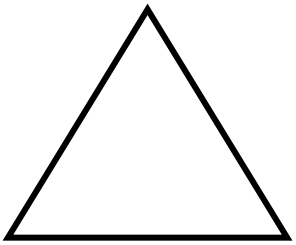
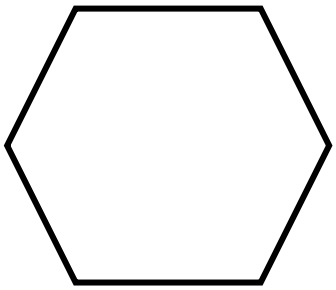


Figure 4. Relationships and not functions

THE CONCEPT OF FLAT SHAPE GEOMETRY

Geometry is a branch of mathematics that studies shape, space, composition and its properties, sizes, and relationships between one and another (Surya et al., 2021). In woven clay, there is a study of flat geometry which is in the process and results of webbing such as circles, ellipsoids, triangles and hexagons.

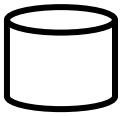
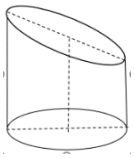
Table 1. Flat Build Geometry on Palm Oil Woven Sticks

Webbing Shape	Geometric Shapes	Information
		The initial pattern of webbing is circular because the stick has inelastic properties and is easily broken, so webbing can only be made with curved sides.
		The place where the grilled fish is made elliptical because it follows the shape of the fish, which is elongated.
		The initial pattern of webbing is triangular. The pattern is made so that each webbing is connected to each other and the cavity between webbing is not too large.
		The middle cavity of the initial pattern of woven is hexagon due to the many woven triangles that are intertwined. When viewed from another perspective, it will look Hexagon-shaped.

THE CONCEPT OF GEOMETRY BUILD SPACE

According to Satria & Prihandoko (2018), building space is one of the materials studied in mathematics. Build space is a three-dimensional building that has space and is limited by sides. Each type of space construct has its own shape, area and volume. In woven clay, there is a study of the geometry of building space which is in the process of woven results, including tubes and decapitated tubes.

Table 2. The Geometry of Building Space on the Weaving of Oil Palm Sticks

Webbing shape	Geometric Shapes	Information
		In making webbing with the concept of building space must have a base size that is adjusted to the volume of the building space. Because if it does not match the volume, the webbing cannot stand upright.
		

AWAKENING

According to Wahyudi et al (2021), awakening is the concept of two or more buildings that correspond to each other proportionally (comparable). The characteristics of awakening are: (1) the angles that are adjusted (located) on both flat buildings are equal, (2) the ratio of the lengths of the corresponding sides (located) on both flat buildings is the same. The awakening of the webbing can be seen in the picture below:

Figure 5. The concept of awakening in the initial pattern of webbing

From figure 5 it can be seen that the woven braid of the stick is arranged in a triangular shape. Mathematically it can be seen that the triangle is green and the triangle is blue. If it is not awake, then the cavity between the webbing produced is not in accordance with the

Conclusion and Advice

Based on the results of research and discussion, it can be concluded that there is ethnomathematics in the woven craft of oil palm clay covering material measuring, counting, comparison, relations and functions, geometry, and awakening. Palm matting can only be formed with curved sides because the clay has inelastic properties and is easily broken. Then making webbing with the concept of building space must have a base size that is adjusted to the volume of the building space, because if it is not adjusted then the webbing cannot stand upright.

Ethnomathematics in woven oil palm sticks is expected to be a new breakthrough to promote the concept of mathematics learning by linking matting, especially woven oil palm sticks. Suggestions for future researchers, it is recommended to examine mathematical concepts in the culture in the area where the researchers are located, so that the concept of learning mathematics will be richer and

students who think that mathematics is difficult

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