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ETHNOMATHEMATIC EXPLOITATION AT TRADITIONAL HOUSE OF BUI-LO, SUB-VILLAGE LACODALA, LACOLIU VILLAGE, QUELICAI POST, BAUCAU MUNICIPALITY

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A B S T R A C T

The objective of this research is to explore the ethnomathematical activities or concepts in the Bui-Lo language community, about the mathematics taught in schools. The research methodology used is ethnography. Data collection techniques used are observation, documentation, and interviews, while data analysis techniques are based on fundamental activities according to Bishop, especially for activities such as counting, locating, measuring, designing, and explaining. From the interpretation of research results and discussions, it is concluded that there exist ethnomathematical activities in the Bui-Lo language community. In addition, the concepts of Mathematics are related to the mathematics taught in schools, which can be found and applied in the Bui-Lo language community, such as basic mathematical operations like area and diameter, object distance and location, flat figures (square, isosceles triangle, and trapezoid), and solid figures (parallelepiped and cylinder).

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INTRODUCTION

Culture is part of our society's way of life. Society refers to groups or communities, ethnicities, races, and tribes within a nation. As part of the heritage and assets of society, it is necessary to transmit and preserve it from generation to generation, so its existence can continue and rebel. According to Deby & Yahfizham (2023), Culture is an idea that comes from long ago or from habits that have been done many times in a way that is the same. In another part, according to Taylor, culture is a complexity that involves knowledge, belief, art, ethics, law, customs, capacity, and other habits that people acquire as members of another society, Tjahyadi et al., (2019). Because culture has become an important part of both ancient and modern society, it affirms their fundamental expression and belief.

Concerning the fundamental belief in the existence of culture is divided into three parts namely ideas, activities, and things. Thus, culture can be the complexity of the ideas, activities, and things that the forefathers have and allow the new generations to preserve and preserve. Through the existence of cultural activities, it has become an important tradition or pillar to consider, value, and to each other. Therefore, culture is a means to strengthen the needs of a person or group related to family education.

The basic needs of education are basic, each person must learn, and seek during his life because education has no limit and end. According to Ahdar, (2021), education is the life or experience of a study that occurs in an environment or situation that is only in a person's life. While education when linked to culture can be defined as the interaction between the development of human potential and the inter-generational cultural heritage Kosim (2021). From these thoughts, it can be defined that culture and education have become an important identity in people's lives. Therefore, it is necessary to value and be aware of one's identity as an individual or as a society. This context exists in all nations including Timor-Leste's national society and culture.

Timor-Leste society existed long before they gained their freedom. According to João's words, culture, like the custom of horse rearing was established and practiced gathering, respect, and valuing each other as uncles, grandparents, parents, and children. To ensure and preserve Timorese culture that was once abandoned, nowadays, it has become a national identity. As a national heritage, the Timor-Leste state guarantees every citizen's right to culture and education, according to Article 59 of the Constitution of the Democratic Republic of Timor-Leste. (TEAM, 2011). Through this guarantee, it means that education and culture cannot be separated, especially

which is fundamental in the science that is directly linked to it. The science of education can be applied in the idea of building a culture of society such as the application of the concept of mathematics in building traditional houses.

Mathematics is a part that is not divided by culture and traditional houses. In the context of studying mathematics, whether society or students do not feel and be aware that in the process of building a traditional house, they have applied the concept of mathematics (Zega, 2022). Given the existence of the construction of traditional houses, from the beginning of construction to the end. This means that the application of mathematics in culture is commonly called ethnomathematics. Ethnomathematics is a bridge to connect education, especially mathematics education, and the culture of a society.

The first, ethnomathematics is to design mathematics practices in cultural groups to define and consider as a study of mathematical ideas found in each culture, (Deby & Yahfizham, 2023). According to Zaenuri et al., (2018), ethnomathematics is a mathematics learning approach, where mathematics is taught by connecting the culture of a country and by connecting the needs and lives of its people. Therefore, ethnomathematics helps to shape the goal awareness of the role of mathematics in society and culture, meaning ethnomathematics becomes a reflection of how the role of traditional mathematics in the culture of society, (Kurniawan & Hidayati, 2019).

Ethnomathematics in the construction culture of the traditional Timorese houses has already existed through the application of science and the concept of mathematics as a concept of geometry. The concept has been formally applied by all traditional houses in the territory of Timor-Leste. One of the traditional houses is Bui-lo.

The Bui-Lo traditional house is a traditional house of the other traditional houses located in Lacodala, Lacodala Sub-Village, Lacoliu Village, Baucau Municipality. The traditional house is modeled according to the culture of the Quelicai post, namely according to the culture of the village of Lacoliu, which has four round air and is covered with maunlae grass and a black rope. It was constructed during the Portuguese occupation, but it was destroyed and destroyed by a person who did not have a sense of Timorese nationality because of the difference in ideas and policies and was unable to be built back from the generation of the home's continuer.

During this time, the continuous generation began to build the traditional Bui-lo house during the Indonesian occupation. Concerning the time and existence of the

house, the condition of the house is less favorable and severe, the family of the traditional house starting from the children and the offspring consciously starting and re-reconstructing the traditional house of Bui-Lo for the second phase according to the old model that has been inheritance to them after Timor-Leste's self-determination.

METHOD

The type of research that the researcher uses is qualitative descriptive research with an ethnographic approach. The objective of qualitative research is to explore phenomena that cannot be quantified and have a descriptive nature. This includes the process of working stages, one formula from revenue, understanding various concepts, and characteristics of goods, one cultural procedure, and the physical model of an artifact, (Yuningsih et al., 2021). On the other hand, the ethnography approach is to find out the explanation of culture, by the purpose of studying and understanding it, (Saranga et al., 2023).

The study aims to explore and describe mathematical concepts related to geometry, particularly concerning traditional house construction in the Bui-Lo language area, and to establish a connection between these concepts and mathematics teaching in schools. The research methodology involved collecting data through observation, documentation, and interviews. The data collection technique used was direct observation of traditional houses in the Bui-Lo language area and documentation of any related inheritance information. Interviews were also conducted to obtain information related to the research objectives. Data analysis was carried out according to Bishop's model, particularly focusing on activities such as counting, locating, measuring, designing, explaining, and finally drawing conclusions (Prinanda and Anaperta 2020).

RESULT AND DISCUSSIONS

Result

Concerning the research objective, the uma-lisan (named clan) that became an object of the study is not traditional, but rather the Bui-Lo uma-lisan located in Lacodala village, Lacoliu suku, Baucau municipality. The uma-lisan is located on a hilltop in the Lacodala village area, close to the Lacodala cemetery, which is also known as the site of the Lacodala Massacre. The uma-lisan has only one entrance

and is shaped like a trapezium and an isosceles triangle at the top. It is the first uma-lisan model that our ancestors found following this shape. As a generation and successor, we cannot make another model or increase the entrance because if we do so, they will get angry with us, and we will also get various diseases and may eventually die.

Figure 1: The traditional house of Bui-lo

Ethno-mathematic Activities

Accounting Activities

From the interview result with the only surviving member Cosme Belo, it was decided that the construction of a traditional house should be carried out, which must be counted or erected using various traditional materials such as bamboo, wood, thatch, rattan, and other traditional supports, stones, bata, reeds and other types of traditional support that were used before. He also emphasized that when all the necessary materials are complete, women, men, older brothers, younger brothers, and sisters should be invited to decide and carry out the construction through a ritual ceremony or traditional Quili-kai. Later the inauguration can be carried out to use for cultural activities according to the tradition of the Bui-Lo tribe.

From the interview results and direct observation in the research place, it was found that the amount of ai-rin (thatched roof) used in the Bui-Lo tribe's traditional house is about four (4bundles), which is then increased with the addition of more than two (stem (thatched roof with bamboo) with the name "kai", to connect and reinforce each additional ai-rin tightly. In the two (2) named "bata", and in the ten (10) board named "rese," which then becomes a place for people to gather and sleep. This counting activity, when observed properly, is related to basic mathematics operations and supports the understanding of basic mathematical operations.

Figure 2: Kai

Locationing Activities

From the interview results with Mr. Cosme, it is affirmed that this traditional house was built with four pillars and cannot be increased since it was originally built this way. From observations, the location activity in this traditional house is in Bui-Lo, and of the four pillars that there are, the first pillar must correspond to the position of the sun. Similarly, in the fireplace in the traditional house, the position must be above the first pillar. There are also two large bamboo platforms, where one is parallel to the first pillar and the other is on the left side and used for placing food and blessings. This means that in the activity of locating, if observed, one can note the context of Mathematics, particularly in geometric shapes for locating objects in construction sites.

Measurement activities

From the interview results with Mr. Cosme, it is necessary to measure the sloping of his land precisely by measuring the height, width, length, and size of his smock, once the construction phase continues. From observation activities, it is noted that the measuring activity in Bui-Lo village is the same as the height and diameter of the used air-rin to build the village with a cylindrical shape and a height of 250 cm. The measuring activity takes place in a research venue relevant to Mathematics about the concepts of area, diameter, volume, and distance from one object to another.

Designing Activities

From the interview results with Mr. Cosme, it is required to select and teach the best quality candidates for the lab coat (bata), gloves (rese), and masks (kai) so that they can last for many years. From observing the designing activity in Bui-Lo village, it can be seen how to build a strong and lasting house with good quality

building materials or instruments, reinforce the connection between its parts, close the roof tightly, and bury the posts deep.

Explaining Activities

Based on the interview result with Lia's Cosme about his activity explanation at Bui-Lo customary law, some of the members' function in the customary law is based on their beliefs. Likewise, the big wooden post or pole must touch the position of the sun, so that from generation to generation, they can still receive the blessing from the sun, especially from the the first generation that created the sky and placed the sun. In another part, the fireplace is an essential place inside the house for keeping sacred items and the mutual sharing of food.

Analysis of the Dominion

1) Counting activity. This activity is to determine the quantity of firewood and other firewood used for the construction of traditional houses in Bui-Lo.
2) Locating activity. This activity is to determine the position of the main door, the position of the small platforms, the position of the fireplace, and the position of the hearth.
3) Measuring activity. This activity is to measure the size of the house, the distance between one firewood and another, the height of the firewood, the size of the thick flat firewood, and the size of the split bamboo.
4) Designing activity. This activity is to plan how to establish a quality, strong traditional house, with a connection between the parts of the house and the formation of the house and the platforms.
5) Explaining activity. This activity is to explain the tradition and the values of the culture based on the beliefs and customs of the community and their parts of the house.

Analyze Tasonomia

1) Counting activity. The mathematical concept used to determine the quantity of other objects is called basic operation four (4) of Mathematics.
2) Locating activity. The mathematical concept is used to determine the location and size of objects such as lids, doors, flames, and platforms according to their position.
3) Measuring activity. The mathematical concept is used to measure the size of objects such as diameter, distance between objects, height and diameter of

flames, and area, diameter, distance, and height of an object.

4) Designing activity. The mathematical concept is used to determine the shape of objects such as queues, platforms, fires, and parts of traditional objects, such as flat and solid figures.

Discussions

Regarding the research results conducted through interviews and direct observations in the research site, it was noted and detected that ethnomathematical activities through the concept of geometry in applied mathematics were indeed present in the construction of traditional Bui-Lo huts. According to the ethnomathematical concept applied to the construction of Bui-Lo huts, based on custom or community belief through their naturalistic sentiments, they make plans for counting, determining size, design, and explanation.

1) The concepts of mathematics are the four basic operations (4) of mathematics. The concept of basic mathematical operations refers to a Bui-Lo tradition, used to determine quantities and to form queues, planks, stretchers, and other parts to support the goal of constructing a traditional house, according to their customs and beliefs.

2) Area and diameter. The concept of area and diameter is related to the Bui-Lo custom, but it is used to determine the size of their customs platform by connecting with other customs. Meanwhile, the concept of diameter is used to measure the diameter of the ai-rin drum according to the design or model that has been done in the past and teach it to future generations.

3) The distance and location of the stems. The concept of connecting the distance to the Bui-Lo customary law house is to determine the distance from one lamp post to another, the distance from the fireplace, and the distance from other parts of the house. However, this concept refers to the distance and location of the main lamp post or the initial location, and its connection with other locations such as the position of the platform, fireplace, and entrance location.

Figure 4: The distance between the stems

4) Planning Figure. The construction of houses according to the concept of ethnomathematics and the mathematical concept that the interconnection of the concept of flat figures in its application is the same as:

i) Square. The squared concept is a concept that consists of four equal straight lines forming as many right angles as possible. This concept can be found in a Bui-Lo traditional column design, especially in the basic part of the column, with space between the four wooden posts that support it. In this context, one of the posts occupies a position with others in its determined size. Thus, the model of the house becomes beautiful according to the outcome of the planning.

Figure 5: Spatial between the four pillars (4)

ii) Isosceles Triangle. An isosceles triangle is a triangle with two equal sides and uniform angles. The concept of an isosceles triangle exists in the Bui-Lo tradition and can be found on the top ridge of a traditional house when looking from the left or right side. The purpose of having this form on the top of the house is to allow water during the rainy season to flow quickly and not concentrate on one spot only. Therefore, the duration of the house can endure for a long time.

Figure 6: The back of the house looks on the right side

iii) Trapezium. The concept of a trapezium is a concept with a two-dimensional plan that is formed by four parallel ribs of unequal distance. In the Bui-Lo tradition, you can see the concept of a trapezium in the top ridge of their traditional roof, when viewed from the front and sides. This concept is used for the same purpose as an isosceles triangle to provide a model and ensure quality according to their beliefs.

Figure 7: The back of the house looks back

5) Solid Figure. The concept of the image is linked to the traditional house of Bui-Lo as follows:

i) Parallelpiped. The concept of a parallelepiped is a concept that has a narrow, wide, and tall shape. In the Bui-Lo tradition, we can find related concepts such as "kai", "bata", "rese" and "lulu". The application of this parallelepiped concept in the construction of traditional houses does not only concern its size, but it also serves to ensure the stability of the structure of the house including its sacred objects as well as the small huts inside. This guarantees the quality, durability, accessibility, and use of the house for an indefinite period.

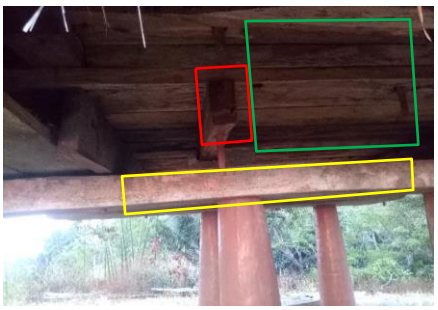

Figure 8: Kai (skin color), bata (red color) and rese with a green color

ii) Cylinder. The concept of silindro in the traditional house of Bui-lo is found in the four pillars of the traditional house. The concept of a cylinder is a geometric shape with a circular shape that exists in various sizes. In Bui-Lo, one can find wooden posts of different diameters placed in a circle. The concept of these posts placed in the ground with a large diameter and a small upper diameter, or in contact with the ground, is used to create holes that can be filled with soil and planted with plants. The objective is to strengthen the connection between the posts, the plants, the clothing, and the canes. On the other hand, it is necessary to prevent other animals such as mice from entering the inside of the posts to destroy sacred objects and the contents of the body.

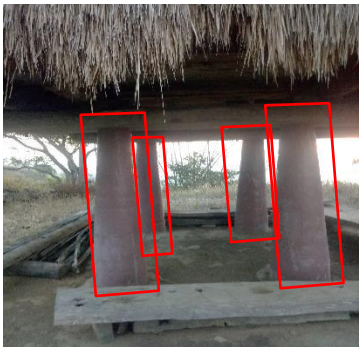

Figure 9: four pillars (4)

CONCLUSIONS

From the interpretation of the research results and discussion above, it is concluded that there is the existence of ethnomathematics activities in the Bui-Lo community and its connection with the concept of geometry from mathematics subject when being taught in school. These activities can be seen through the design and construction of traditional houses in Bui-Lo.

The concept of ethnomathematics is a belief or custom of a society, ethnic group, or community that relates mathematical concepts to their implementation for the necessity of daily life such as in the construction of their homes as a sacred

place or for cultural activities. This means that in the construction of traditional houses, these sacred places are not separated from the basic mathematical operations such as area, diameter, distance, object localization, flat figures (squares, isosceles triangles, and trapezoids), and solid figures such as parallelepipeds and cylinders.

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