Ethnomathematics Exploration of Carvings in Asei Community Houses as a Source of School Mathematics Learning

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Abstract
The Asei people are known for their distinctive local cultural heritage, particularly in the form of carvings that decorate their house walls. These carvings serve not only as symbols of cultural and social identity but also contain visual structures rich in mathematical concepts. This study aims to explore and describe the mathematical elements found in the carvings of houses in the Asei community, located in East Sentani District, Jayapura Regency, Papua, as well as to examine their potential as a source for school mathematics learning. This research employs a qualitative approach using ethnographic methods. Data were collected through direct observation, in-depth interviews with two informants knowledgeable about the meanings of the carvings, and visual documentation. The collected data were analyzed through a continuous interactive process of data reduction, data presentation, and conclusion drawing. The results reveal that the carvings on Asei houses encompass various mathematical elements, including reflection, symmetry, rotation, dilation, as well as geometric shapes such as circles, triangles, parallelograms, trapezoids, parallel lines, obtuse angles, and acute angles. These elements are found within seven main carving motifs, namely kino, heuw, iuwga, me khela-khela, fouw, khaley, and kheika.

Keywords: *Ethnomathematics, House Carvings, Asei Community, Mathematics Learning, Geometry*.

INTRODUCTION

Kampung Asei Besar is a cultural center in the East Sentani region (Kondoligit & Puhili, 2015). Kampung Asei Besar is located to the east of Sentani City with a distance of ± 9 km. The center of Kampung Asei Besar is on Asei Island or Pulau*Oh*e*y*which has an area of ± 21.6 km^{2}and is located in the middle of Lake Sentani. The people in this village still maintain their culture which is an attraction for tourists, both local and foreign tourists. One of the cultures owned by the Asei people is carving.

The carvings of the Asei people can be seen on the walls of the people's houses. Each house has 1 carving installed on the wall of the house. The carvings are painted on tree bark or plywood using a brush. Generally, the people use three types of colors in the carvings, namely red (*heysay*), black (*nokhomang*), and white (*beware*). The carvings are diverse, depicting life in their environment and the animals that live around them, such as birds and fish.

Similar to the carvings on the houses of the Asei people, carvings on houses are also found in the houses of the Toraja tribe, the houses of the Ampimoi Bay community and the Pamung Tawai traditional Lamin houses. Interestingly, Tandililing (2015) in his research in Toraja found mathematical concepts in the carvings of Toraja tribe houses that can be used in learning mathematics. Such as, the carvings of the pa'limbongan motif which contain geometric concepts in the form of the concept of symmetry and circle shapes. Similar to Ruamba et al., (2022) who found mathematical concepts such as rectangles, triangles, parallelograms, reflections and fractal shapes found in the wall carvings of the houses of the Ampimoi Bay community. In addition, Yahya & Haeiruddin (2023) also conducted research on the wall carvings of the Pamung Tawai traditional Lamin houses. In this study, it was found that in the wall carvings of the Pamung Tawai traditional Lamin houses there are geometric transformation concepts including translation, reflection, rotation and dilation.

The three studies show that mathematical elements can be explored from a culture, especially carvings. This indicates that the concept of mathematics lives in a culture owned by a community or tribe. A special term that describes the relationship between culture and mathematics is known as ethnomathematics.

Risdiyanti & Prahmana (2020) stated that ethnomathematics is a field that understands the thought process, various ideas, concepts,

methods, techniques and mathematical practices found in a cultural group. Sarwoedi et al. (2018) also define ethnomathematics as special methods used by certain cultural groups or communities in mathematical activities. The mathematical activities in question are activities that connect daily life experiences with mathematical concepts, and vice versa. This shows that the activities in a community group cannot be separated from the application of mathematical concepts in them, so ethnomathematics was created as a science used to understand how mathematics lives in culture. This is in line with research conducted by Tandililing (2015), Ruamba et al., (2022) and Yahya & Haeiruddin (2023) as mentioned above.

Ethnomathematics is a bridge between culture and mathematics (Setiani et al., 2023). Thus, the results of ethnomathematics research that have been found can be used as a source of school mathematics learning. For example, geometric transformations on the wall carvings of the Pamung Tawai traditional Lamin house can be used for geometric transformation material.

Ethnomathematics can help students more easily understand and comprehend concepts in mathematics learning related to everyday life (Nuraini et al., 2024). By using ethnomathematics in mathematics learning, it is hoped that students can feel a new nuance in learning by visiting the outside world and interacting with local cultures that are the objects of ethnomathematics (Filiestianto & Al-Jabar, 2022). The ethnomathematics object in question is a cultural object in a society that contains mathematical concepts. The object of ethnomathematics can be a carving that is a culture in a society such as carvings on the houses of the Asei people. By studying the ethnomathematics of carvings on the houses of the Asei people, a new source of learning will be obtained. The purpose of this study is to describe the mathematical concepts contained in the carvings on the houses of the Asei people that can be used in mathematics learning.

METHOD

This research is ethnographic research. Ethnography is research that allows researchers to explore and research a culture and society (Nixon & Odoyo, 2020). In this study, the object of study is the carvings on the houses of the Asei community in Kampung Asei Besar, East Sentani District, Jayapura Regency, Papua Province. There are two types of instruments used in this study, namely the main instrument and the supporting instrument. The main instrument is the researcher himself, while the supporting instruments are in the form of interview guidelines, observation and documentation. Data collection was carried out through observation, interviews and documentation. Interviews were conducted with two informants. The informants used were informants who met the criteria, namely people who knew and understood the meaning of the carvings on the houses in Kampung Asei Besar. To check the validity of the data, the researcher conducted an extension of observations, increased perseverance in research and triangulation of sources. After obtaining data from informants, data analysis was carried out. Data analysis was carried out through the process of data reduction, data presentation and drawing conclusions (Abdussamad, 2015).

RESULTS AND DISCUSSION

Kampung Asei Besar is a cultural village in East Sentani District. There are various cultures that live in the community in this village. Culture-The culture is still maintained until now. One of the cultures owned by the Asei community is carving.

There are many carvings that can be found in Kampung Asei Besar, one of which is the carvings on the people's houses. These carvings are used as an identification mark or identity of the homeowner. Each house in Kampung Asei Besar is only allowed to put one carving on the wall of its house. The carving is placed in front of the house so that it can be seen and recognized by people who pass by the people's house in Asei. The types of carvings on houses found in Kampung Asei Besar are kino, heuw, iuwga, me khela-khela, fouw, khaley and kheika.

Based on the results of the data analysis, the following is a discussion of the findings of the mathematical concepts that are found in

carvings on the houses of the Asei community which can be used in mathematics learning.

1. Reflection
   Reflection is a transformation that moves points on a shape by using the properties of the object and its reflection in a flat mirror. The carvings on the houses of the Asei people that have the concept of reflection are carvings *bad* And *I played-played*. The concept of reflection in these carvings is reflection on the axis-andor reflection on the line$x = h$. The concept of reflection on the carvings can be seen in Picture 1 and Picture 2.

Figure 1. Reflection on kino carving

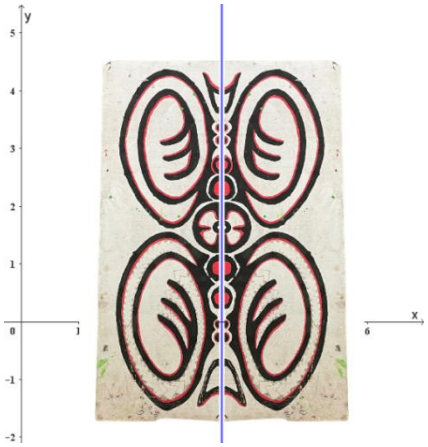


Figure 2. Reflection on me khela-khela carving

2. Symmetry
   Symmetry means that a plane produces an identical shape when the object is moved, such as flipped or rotated. If a plane can be folded into two equal parts, then it can be said that the plane has line symmetry. The line that divides the plane is called the axis of symmetry. Line symmetry is closely related to reflection. Thus, the carvings on the houses of the Asei people that have line symmetry are carvings that also have elements of reflection, namely carvings bad and *played-played*.
3. Rotation
   Rotation is a transformation that rotates points on a shape with a certain angle and direction to a fixed point (center of rotation). The size of the angle of the object's shadow to the starting point is called the angle of rotation. Carvings on the Asei community's houses that have rotation elements are bad carvings. The concept of rotation found in engraving *bad* is a rotation with a center point$(a, b)$and the rotation angle is$180°$. The rotation of the carving can be seen in Figure 3.

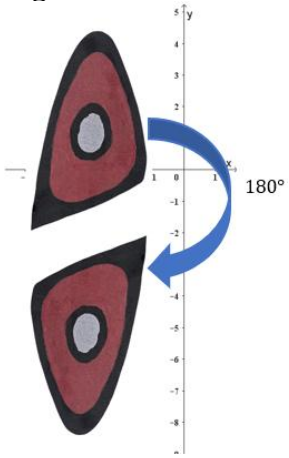


Figure 3. Rotation on kino carving

4. Dilation
   Dilation (multiplication) is a transformation that changes the size of a shape either by enlarging or reducing it, but does not change the shape of the shape. The carvings on the houses of the Asei people that have elements of dilation are carvings *played-played*, *fou*, *Khaley* and *kheika*. The concept of dilation in these carvings is dilation with a center(a, b). The dilation in the carving can be seen in Figure 4, Figure 5, Figure 6 and Figure 7.

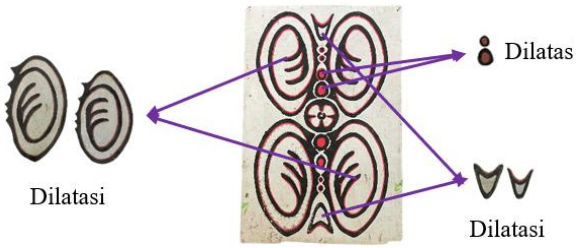


Figure 4. Dilatation on me khela-khela carving

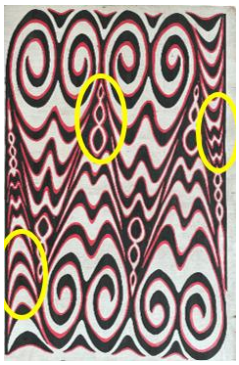


Figure 5. Dilation in the fouw carving


Figure 6. Dilation in the Khaley carving


Figure 7. Dilation in the kheika carving

5. Circle
A circle is a set of all points that lie on a plane and are equidistant from a particular point in the plane. The particular point is called the center of the circle (*P*). While the distance of a point on the plane from the center point is called the radius (*r*). The carvings on the houses of the Asei people that have circular elements are carvings bad, *heuw* and *Khaley*. The circle on the carvings can be seen in Picture 8, Picture 9 and Picture 10.

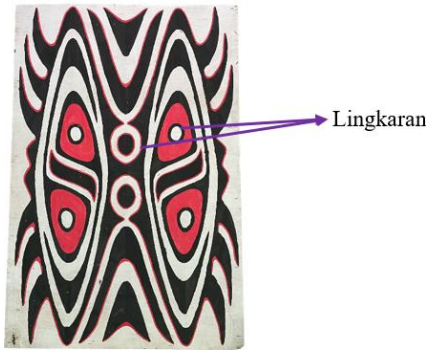


Figure 8. Circle on kino carving

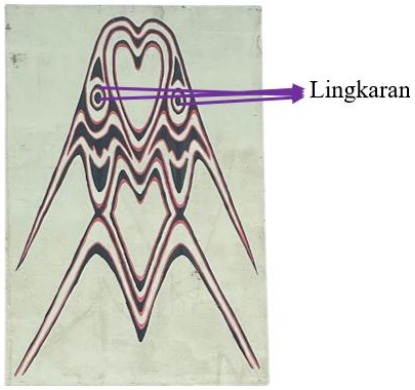
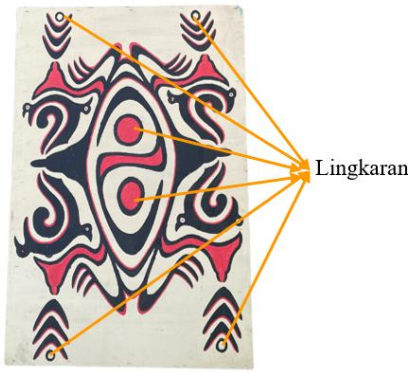


Figure 9. Circle on the heuw carving



Picture 10. The circle on the khaley carving

6. Triangle
A triangle is a flat shape formed by three intersecting line segments. The carvings on the Asei community's houses that have circular elements are century carvings. The triangle in the carving can be seen in Figure 11.

Figure 11. Triangle in the iuwga carving

7. Parallelogram
   A parallelogram is a quadrilateral that has 2 pairs of parallel opposite sides. The carvings on the Asei community's houses that have parallelogram elements are carvings century. The parallelogram in the carving can be seen in Figure 12.

Figure 12. Parallelogram in the iuwga carving

8. Trapezoid
   A trapezoid is a quadrilateral that has exactly one pair of opposite and parallel sides. The carvings on the Asei people's houses that have trapezoid elements are carvings from centuries ago. The trapezoid in the carving can be seen in Figure 13.

Figure 13. Trapezoid in the iuwga carving

9. Parallel lines
   Two lines that lie on one plane and do not have a common point are called parallel lines. The carvings on the houses of the Asei community that have parallel line elements are carvings. *Century*. The parallel lines on the engraving can be seen in Picture 14.

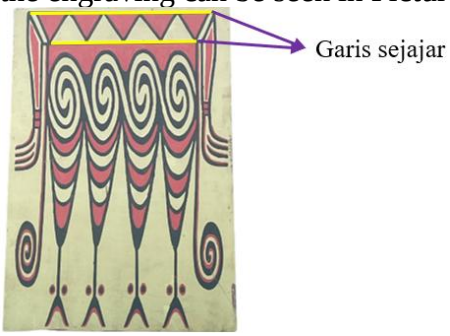


Figure 14. Parallel lines on the iuwga carving

10. Corner
    An angle is a combination of two rays whose starting points coincide. The carvings on the Asei community's houses that have angular elements are carvings heuw. There are two types of angles on engraving *heuw*, namely obtuse angles and acute angles.
    An obtuse angle is a large angle between the angles 90° And 180°. Obtuse angle on engraving *heuw* can be seen in Figure 15.

Picture 15. Obtuse angle on heuw carving

An acute angle is an angle whose angle is between0° And 90°. Acute angles on the carving how can be seen in Figure 16.

Figure 16. Acute angle on the heuw carving

CONCLUSION

Based on the results and discussion, it can be concluded that there are mathematical concepts in the carvings on the houses of the Asei people. Concepts Mathematics contained in carvings on the houses of the Asei people which can be used in mathematics learning namely reflection, symmetry, rotation, dilation, circle, triangle, parallelogram, trapezoid, parallel lines, obtuse angles and acute angles.

SUGGESTION

The researcher suggests that further research be conducted to explore ethnomathematics in other cultural aspects possessed by the Asei community and other communities around Kampung Asei Besar.

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