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GEOMETRIC TRANSFORMATION ON CARVINGS OF TORAJA TONGKONAN HOUSES

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Abstract:
This research aims to examine the mathematical concepts in traditional Tongkonan houses' carving and provide information about the meaning of each carving in the Tongkonan house. The research method used is the qualitative research method. The results of the study are obtained by observation and interview. The results showed that it turns out, in some Toraja carvings, contain the concept of transformational geometry, namely reflection. The information also obtained that the carvings in the Tongkonan house are very loaded with meaning, especially about advice, prayer, or hope to all members of the Tongkonan.

Keywords: Transformation Geometry, Tongkonan Carving, Mathematical Concepts

GEOMETRI TRANFORMASI PADA UKIRAN-UKIRAN RUMAH TONGKONAN TORAJA

Abstrak:
Penelitian ini bertujuan untuk mengkaji konsep matematika yang terdapat pada ukiran rumah adat Tongkonan dan memberikan informasi tentang makna yang terkandung dari setiap ukiran yang ada pada rumah Tongkonan. Metode penelitian yang digunakan adalah metode penelitian kualitatif. Hasil penelitian diperoleh dengan cara observasi dan wawancara. Hasil yang diperoleh menunjukkan bahwa ternyata, dalam beberapa ukiran Toraja, mengandung konsep geometri transformasi, seperti refleksi. Serta informasi yang didapatkan pula bahwa ukiran-ukiran yang ada pada rumah Tongkonan itu sangat sarat dengan makna terutama tentang nasehat, doa atau harapan kepada seluruh anggota dari Tongkonan tersebut.

Kata Kunci: Geometri Transformasi, Ukiran Tongkonan, Konsep Matematika

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INTRODUCTION

Mathematics is one subject that is still very difficult to understand and feared by students today. This fear of mathematics is none other than because the object of mathematical study is unfamiliar to students and the abstract nature of mathematics itself.

Based on the results of the interviews with some students, it is difficult for them to learn mathematics because there are too many formulas and no context for them. While based on the results of interviews with mathematics teachers, the cause of students' difficulty understanding mathematics is due to a lack of understanding of the basic concepts of mathematics. Based on the research results, one of the students' mistakes in solving mathematical problems is due to concept errors (Lembang, 2018). In learning mathematics, one of the materials taught from elementary to the college level is geometry (Huda, 2018; Jelatu, Sariyasa, & Ardana, 2018). Geometry learning is expected to visualize the relationships and characteristics of geometric spaces (Susilawati, Suryadi, & Dahlan, 2017). Geometry learning involves concepts related to the student's context so that students have difficulty understanding various geometric concepts (Kusumah, Kustiawati, & Herman, 2020). The teacher revealed that specifically on transformational geometry material, students are very difficult to talk about translation, dilation, rotation, and reflection. In addition, teachers also admit that it is tough to explain the concepts of translation, dilation, rotation, and reflection. In research conducted by Kivkovich (2015), it was shown that the difficulties experienced by students in geometry were understanding the language of mathematics in geometry and relating it to their initial knowledge. Another cause of difficulty in learning geometry is that the mastery of concepts is weak, understanding is inadequate on mathematical skills, and students lack enthusiasm for the subject. In addition, previous research conducted by Retnawati, Arlinwibowo, and Sulistyaningsih (2017) explained that students have some misconceptions and lack of knowledge of concepts, difficulty understanding the information given in test items, and in applying geometric concepts. In mathematics learning, geometry is a material that is considered difficult (Evidiasari, Subanji, & Irawati, 2019). At the same time, geometry is essential for understanding other areas of mathematics and contributes to logical and deductive reasoning about objects and spatial relationships (Alqahtani & Powell, 2016).

For this reason, a solution is needed for students and teachers so that students can explore mathematical concepts, especially in transformational geometry materials. One solution is culture-based mathematical learning. Culture is an important thing in education, so that it can be a source of learning, including in learning mathematics (D'Ambrosio & Rosa, 2017; Rosa & Orey, 2011). The practice of mathematics in cultural groups is Ethnomathematics (D'Ambrosio, 1989). Ethnomathematics studies the relationship between mathematics and culture (Albanese & Palacios, 2015). Learning mathematics with cultural contextual (ethnomathematics) can affect students' interest and learning achievement (Budiharso & Tarman, 2020; Mauluah & Marsigit, 2019; Utami, Ponoharjo, & Aulia, 2019). Ethnomathematics plays a role in creating (Blanco-Alvarez & Oliveras, 2016) and encouraging an atmosphere to achieve educational goals and even become effective learning (Balamurugan, 2015). Ethnomathematics shifts mathematics from formal education (schools and universities) and applies it in various cultures and daily activities (Abdullah, 2017). It refers to broad ideas ranging from numerical and mathematical systems to multicultural mathematics education. The purpose of ethnomathematics is to contribute to cultural understanding and mathematical understanding, but primarily to appreciate the relationship between the two. Mathematics and culture cannot be avoided in everyday life. Culture is a unified whole and comprehensive, mathematics is knowledge that is used to solve problems in everyday life (Hardianti, 2017). Toraja is an area rich in culture, such as the traditional Toraja house that is Tongkonan. The most dominating cultural elements of this house are unique and interesting carvings. Toraja carving art is made using very simple special tools such as rulers from bamboo blades, nails, knives, and carvings made on wooden boards from the walls of traditional Tongkonan houses and barns with various motifs (Tandiling, 2015). Each motif in the carving of the traditional Tongkonan house has its own meaning. From the traditional house Tongkonan actually contains mathematical concepts. If we look closely at the carvings on the traditional Tongkonan house, all of them have mathematical concepts, one of which is geometry transformation. From the traditional house Tongkonan contains mathematical concepts. Carvings in the Tongkonan house have a type of geometry transformation (Remme' & Ba'ru, 2020). In this Tongkonan Toraja house we find type of geometry transformation, namely reflection.

The results also showed that students were more enthusiastic when taught using Toraja carvings (Lembang, La'biran, & Kristanto, 2019). This research is expected to examine the mathematical concepts contained in the carving of traditional Tongkonan houses. Teaching materials can be obtained that can accommodate home-based learning of Tongkonan custom and find out how to apply teaching materials in mathematical learning.

METHODS

The research method used is qualitative research. The qualitative approach in this research consisted of three stages. These three stages are connected to maintain the data quality obtained. The first stage is to identify and interview the initial subject of the researcher, namely people who understand the intricacies of carvings on Toraja Tongkonan houses, in this case, are indigenous figures. The second stage is to collect convinced data through surveys and further interviews with related sources regarding the meaning of the carvings of Toraja traditional Tongkonan houses. The third stage is to manage and analyze data sets and conduct publications obtained from survey results and interviews in connection with the meaning of the traditional Tongkonan Toraja house.

The three stages are described as follows.

1. Identify and Interview

Identify and interview problems by finding information on the geometric transformations types contained in the traditional Tongkonan Toraja house.

2. Collect Data

Collecting interview survey data is done by looking and digging for information about the types of geometric translation contained in the carvings of traditional Tongkonan Toraja houses. The interview was conducted to find out the meaning contained in the carvings of traditional Tongkonan Toraja houses. Interviews are conducted with indigenous figures and related sources.

3. Managing and Analyzing Data

Data analysis was carried out from interview results and data collection on types of geometry transformation, meaning contained in Toraja traditional houses, and the preparation of teaching materials about Tongkonan traditional houses related to transformation geometry.

RESULTS AND DISCUSSION

Concept of Reflection/Mirroring on Toraja Carvings.

1. Type of Carving *Paqbarre Allo*

The word *paqbarre allo* consists of 2 words: *barre* and *allo*; *barre* means roundabout, and *allo* means sun. So *paqbarre allo* is a carving that resembles a circle of the sun with its radiance. This type of carving is found in barrels and barns. The meaning of the carving *paqbarre allo* is a symbol of greatness and pride for the Toraja people. It was noticed, the carving *of paqbarre allo* is included in the reflection/mirroring of line *x*, line *y*, and against point 0 (0,0). However, researchers focused the *paqbarre allo* on the *x* line, as shown in figure 1.

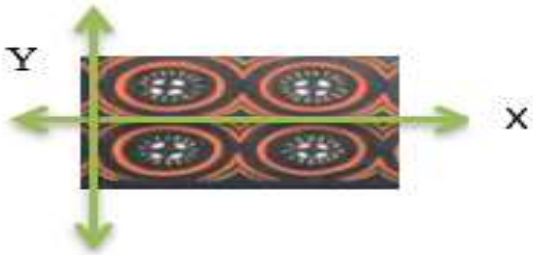

Figure 1. *Paqbarre Allo*

2. Type of Carving *Paqtedong*

Figure 2 is a type of *paqtedong* carving. This carving resembles the face of a buffalo. In general, buffalo functions as mating gold, a transaction tool in the buying and selling for Toraja people, as a sacrifice of offerings to gods and ancestors. The meaning of *paqtedong* carving for the Toraja community symbolizes welfare for the Toraja people and symbolizes prosperity and life. When carefully observed, the carving of *paqtedong* is included in the reflection/mirroring of the *y* line.

Figure 2. *Paqtedong*

3. Type of Carving *Paqtakku Pare*

Figure 3 is a type of carving *paqtakku pare*. The word *paqtakku pare* consists of 2 words: *takku* and *pare*; *takku* means submission, and *pare* means rice. Rice plants are the main plant in Toraja and are considered noble because, according to the parents, the ancestors of rice were originally humans. This carving resembles a submissive rice fruit. The meaning of carving *paqtakku pare* for the people of Toraja is that in this life, keep humbling yourself in an association like rice that the more it contains, the more it bends. If carefully observed, the carving of *paqtakku pare* is included in the reflection/mirroring of the line $y = x$.

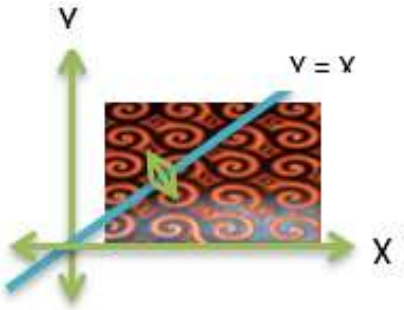

Figure 3. *Paqtakku Pare*

4. Type of Carving *paqsekong kandaure*

Figure 4 is a type of carving *paqsekong kandaure*. The word *paqsekong kandaure* consists of two words, namely *sekong,* and *kandaure*. *Sekong* means twist, and *kandaure* means the shape of the elbow line. The meaning of the carving of *paqsekong kandaure* is a derivative or posterity that may always live in happiness like light. If carefully observed, the carving of *paqsekong kandaure* is included in the reflection/mirroring of the line $y = -x$.

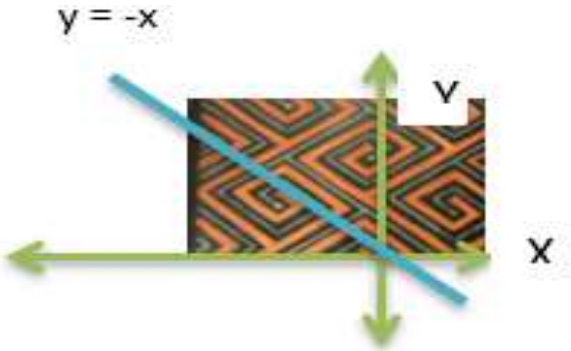

Figure 4. *Paqsekong Kandaure*

CONCLUSION

The carving of *paqbarre allo*, *paqtedong*, *paqtakku pare*, and *paqsekong kandaure* contains the concept of reflection to a mirror on the coordinate axis that is mirroring against point 0 (0.0), including the x line; y line; line $y = x$; and line $y = -x$. The information also obtained that the carvings in the Tongkonan house are very loaded with meaning, especially about advice, prayer, or hope to all members of the Tongkonan.

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