

Transformation Geometry in Toraja Carving

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Abstract

Toraja carving (passura ') is the result of Toraja culture which is preserved and contains various values of life. In addition, Toraja carving is also rich in mathematical concepts, particularly geometric shapes. This study aims to identify the transformational geometry concepts found in Toraja carving. This research is qualitative research with an ethnographic approach and is conducted in 3 stages. Informants (data sources) in this study are people who understand the ins and outs of Toraja culture. The data in this study were obtained from data from interviews with informants, field notes made during the study, and documentation results in the form of photos of engraving and carving time. To obtain valid data, researchers used theoretical triangulation. The results of the study show that in the tongkonan and lumbung Toraja carvings there are concepts of transformation geometry, namely reflections both on the x-axis, y-axis, $y = x$, $y = -x$, and towards point 0 (0,0), translation, rotation, and dilation.

Keywords: Toraja Carving; Transformation Geometry; Toraja Culture

INTRODUCTION

According to Tandililing (2015) that Toraja carving is a typical carving art of the Toraja people in South Sulawesi which is made using very simple special measuring tools such as rulers from a bamboo blade, nails, and knives, and the carvings are made on wooden planks of the walls of traditional tongkonan houses and granaries. with various motives. The carving motifs are inspired by various things such as celestial bodies, plants, animals, and folklore. According to the traditions and culture that developed, especially in Toraja, each motif has meaning and is a manifestation of the relationship between humans and God, humans, and others, humans and nature, animals, and plants.

According to Hardiarti (2017) that mathematics and culture are something that cannot be avoided in everyday life because the culture is a complete and comprehensive unity, applies in society while mathematics is the knowledge that humans use in solving daily problems. But sometimes mathematics and culture are seen as something separate and unrelated. Mathematics is a cultural form, which means that it has been integrated into all aspects of people's lives. Furthermore, Pitriana Tandililing (2015) said that the use of mathematical concepts in culture by a certain group of people or certain ethnic groups is known as ethnomathematics. These mathematical ideas arise naturally, through the knowledge and views of certain tribes or groups of people or certain individuals without going through any formal education or training. This process stems from ancient societies who did not receive an education as it is today. The skills acquired are eventually passed down from generation to generation and ethnomathematics is a study of mathematics in society.

Toraja carving can be said that it is rich in mathematical concepts because in this carving there are many geometric concepts such as circle, square, rectangle, triangle, rhombus, symmetry, reflection, parallel lines, right angles, and so on. Mathematical ideas and mathematical concepts grow and have been used and developed by ancestors from time immemorial so that these ideas can easily be re-explored and then used for mathematics learning in schools. According to Huda (2018), the study of geometry is part of the educational curriculum taught from elementary to tertiary levels. Remme also said that the ideas in

geometry have been known since childhood and many around children, for example, the concept of points, lines, fields (Remme', V., Beatric, Ba'ru, Yusem, 2018). It will be very interesting to explore some of the geometric shapes found in Toraja carving to be associated with geometry because it will have an impact on these contributions to learning mathematics. Shirley (2001), ethnomatics is growing and develop in a community that conforms to local culture, can be used as a center for learning and teaching methods. After all, geometry is a part of mathematics that plays a large role in everyday life. As stated by Matang (2002) that the integration of culture into the formal mathematics curriculum is one way to overcome student learning difficulties. The formulation of the problem in this study is what transformational geometry concepts are found in Toraja carving?

RESEARCH METHODS

This type of research will be used as a type of qualitative research with an ethnographic approach. The instrument that will be used is the researcher as the main instrument whose role cannot be replaced, observation, interview, and documentation. The data obtained were analyzed using the data analysis model of Miles and Huberman with several stages, namely data reduction, data presentation, verification, and conclusion. In this study, an ethnographic approach was used to qualitatively analyze, explain, and describe the geometric transformation concepts contained in Toraja carvings through triangulation from various sources, namely documents and Toraja community figures. This research was conducted in 3 stages, namely (1) Identifying and Interviewing; identify and interview problems about the types of Toraja carvings. (2) Collecting Data; data were collected by interviewing informants about the forms of Toraja carving (3) Managing and analyzing data; perform data analysis from the results of observations and data interviews about the concept of transformation geometry in Toraja carving

RESULTS AND DISCUSSIONS

Toraja carving is one of the Toraja cultures that has continued to experience development. Based on information from informants. Toraja Carving (passura ') originally consisted of 4 carvings, commonly called garonto'na passura' and to date has grown to more than one hundred carvings (Tangirerung, 2017). In this research, 60 types of carvings will be studied, namely Paqbarre allo, paqdoti siloang II, paqsekong kandaure, paqsekong anak, paqsekong dibungai, paqsekong salah, paqlimbongan, paqlamban lalan, paqbombo uai, paqsalaqbiq, paqsalaqbiq ditoqmokki, paqsalaqbiq dibungai, paqreqpo sangbua, paqsempa, paqssedan, paqbarraqbarraq, paqsiborongan, paqlalan manuk, paqkapuq baka, paqsulan sangbua, paqdadu, paqtangkiq pattung II, paqpollo songkang, paqaraq denaq, paqkollong bungkanq, paqpollo gayang, paqmanik-manik, paqbokoq komba kaluq, paqpapan kandaure, paqdon bolu, paqdon bolu sangbua, paqbua tinaq, paqdon lambiri, paqdonlambiri ditepo, paqlolo paku, paqdaun paria, paqbungka kaliki, paqbulu londong, paqtedong, paqtanduk reqpe, paqtalinga, paqtedong tumuru, paqkatik, paqkasik, paqsissik bale, paqdoti siloang I, paqerong, paqsepuq tarongkong, paqkadang pao, paqulu karua, paqulu gayang, paqtangke lumuq, paqtukku pare, paqkangkung, paqbatang lau, paqbaranaq II, paqbungkanq tasik, paqbulintong sitebaq, paqmanuk londong, paqsekong sala, paqdon lambiri ditepo, paqaraq dena, paqlamban lalan, paqlalan manuk, paqkollong buqkuq, paqtangkiq patting I, paqbaranaq I, paqlolo tabang, paqsulan sangbua, tekkenan busa dan paqkosik (Sande, 1989).

1. Reflection in Toraja Carving

a. Reflection in the x-axis

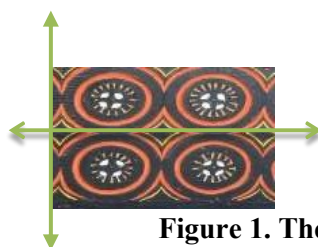


Figure 1. The result of reflection paqbarre allo to the x-axis

Based on Figure 1, the concept of transformation geometry contained in the paqbarre allo carving is a reflection of the x-axis, besides that, it is also found in the paqtangke lumuq carving.

b. Reflection in y-axis

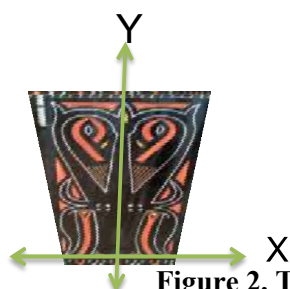


Figure 2. The result of reflection paqtedong to the y-axis

Based on Figure 2, the concept of transformation geometry contained in paqtedong carving is a reflection of the y-axis, besides that, it is also found in the paqbulu londong, paqtanduk reqpe, paqmanuk londong, dan paqsempa carving.

c. Reflection of the carving in the Line $y = x$



Figure 3. The result of reflection paqsekong kandaure to the Line $y = x$

Based on Figure 3, the concept of transformation geometry contained in paqsekong kandaure carving is a reflection on the line $y = x$, besides that, it is also found in the paqtakku pare carving

d. Reflection of the carving in the Line $y = -x$

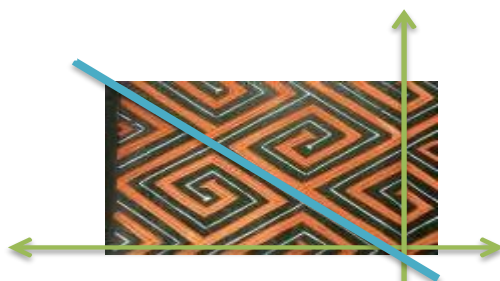
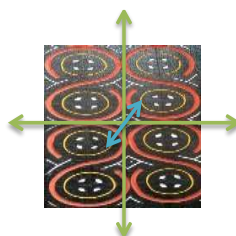


Figure 4. The result of reflection Paqsekong kandaure to the Line $y = -x$

Based on Figure 4, the concept of transformation geometry contained in paqsekong kandaure carving is a reflection on the line $y = -x$, besides that, it is also found in the paqtakku pare carving

e. Reflection to point O (0,0)



Based on Figure 5, the concept of transformation geometry contained in *paqtangkiq pattung* II carving is a reflection to point $(0,0)$, besides that, it is also found in the *paqbaranaq* II, dan *paqkapuq baka* carving

2. Tanslation in Toraja carving

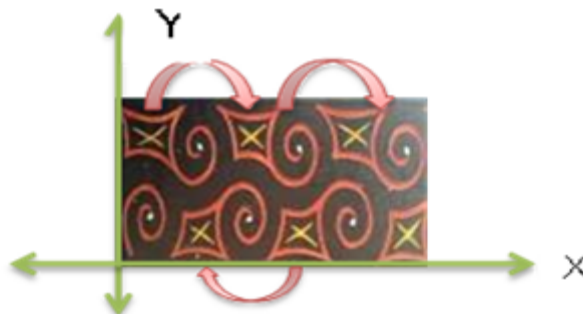


Figure 6. The result of translation in *paqtakku pare* carving

Based on Figure 6, the concept of transformation geometry contained in *paqtakku pare* carving is translation, besides that, it is also found in the *paqbaranaq* II, dan *paqkapuq baka* carving *paqbarre allo*, *paqssedan* dan *paqbaranaq* II.

3. Rotation in Toraja carving

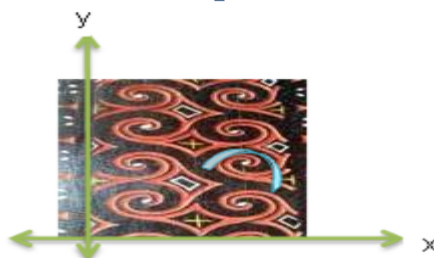


Figure 7. The result of translation in *paqtangke lumuq* carving

Based on Figure 7, the concept of transformation geometry contained in *paqtangke lumuq* carving is rotation, besides that, it is also found in *Paqssedan*.

4. Dilatation in Toraja Carving

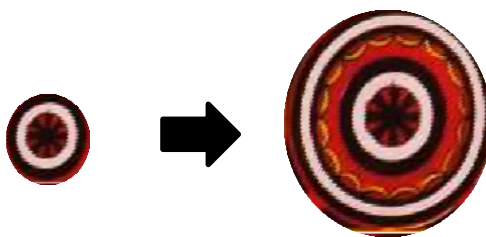


Figure 8. The result of Dilatation in *Neqlimbongan* carving

Based on Figure 8, the concept of transformation geometry contained in *neqlimbongan* carving is dilatation, besides that, it is also found in *Paqbarre allo*, *neq limbongan* dan *paqreqpo sangbua*. Based on the above research, the geometry of transformation in Toraja carving is:

Table Transformation Geometry in Toraja Carving

NO	Transformation Geometry	Toraja Carving
1	Reflections	Paqbarre allo, paqtangke lumuq, paqtedong, paqbulu londong, paqtanduk reqpe, paqmanuk londong, paqsempa, paqsekong kandaure, paqtakku pare, paqtangki patting II, paqbaranaq II, dan paqkapuq baka.
2	Translation	Paqtakku pare, paqbarre allo, paqsedan dan paqbaranaq II
3	Rotation	Paqsedan dan paqtangke lumuq
4	Dilation.	Paqbarre allo, neq limbongan dan paqreqpo sangbua.

Toraja carvings have a regular shape, therefore Toraja carving is very rich in geometric concepts. In addition to the concept of flat shapes, Toraja carving also contains the concept of transformation geometry. The concepts of transformation geometry in toraja carving are reflection, translation, rotation, and dilation. The most common concept of transformation geometry found in Toraja carving is reflection/mirroring. Mirroring or reflection is a type of transformation which is the process of reflecting every point of a straight line or to a certain line or in other words, reflection is a transformation that moves each point to a line that acts as the mirror axis. Mirroring uses the reflection property of a flat mirror, namely the image distance to the mirror is equal to the object's distance to the mirror, the image and object are the same height and the image is upright.

Almost all Toraja carvings contain the concept of transformational geometry. This is because Toraja carvings have regularity in terms of their shape or motif. If you pay attention to the Toraja carving motifs there is always a repetition in the form with the same distance. This results in almost all Toraja carvings there is the concept of transformation geometry.

CONCLUSIONS AND SUGGESTIONS

Based on the research that has been done, it is concluded that the types of carvings included in the reflection of the x-axis are paqbarre allo and paqtangke lumuq. Reflections on the y-axis are paqtedong, paqbulu londong, paqtanduk reqpe, paqmanuk londong, and paqsempa. The reflection on the line $y = x$ is paqsekong kandaure dan paqtakku pare. The reflection on the line $y = -x$ is paqsekong kandaure. And the reflection towards point 0 (0,0) is paqtangkiq patting II, paqbaranaq II, and paqkapuq baka. The types of carvings included in the translation are paqtakku pare, paqbarre allo paqssedan, and paqbaranaq II. The types of engraving that are included in the rotation with a center o (0,0) as far as a are paqssedan and paqtangke lumuq. And the types of carvings included in the dilation are paqbarre allo, neqlimbongan dan paqreqpo sangbua. The results of this discovery can be used by the teacher to be used as a learning medium in instilling the concept of geometric transformation to students.

Toraja carving is very rich in geometric concepts, therefore the authors suggest that further researchers be able to limit the problems in the geometrical field to be studied so that the discussion is deeper.

REFERENCES

- Hardiarti, Syiviyani. 2017. *Etnomatematika: Aplikasi Bangun Datar Segiempat pada Candi Muaro Jambi*. volume(8): nomor 2.
- Huda, Tohud, Nuk. 2018. *Etnomatematika pada Bentuk Jajanan Pasar di Daerah Istimewah Yogyakarta*. jurnal nasional pendidikan matematika. volume(2): nomor 2.
- Matang, Rex. (2002). The Role Of Ethnomathematics In Msthenatics Education In Papua New Guinea: Implications For Mathematics Curriculum. *Directions: Journal of Educational Studies* vol 24 (1) June 2002.

- Pradanti, Paskalia. (2016). Geometri Transformasi Dalam Motif Batik Kawung Yogyakarta. Prosiding Seminar Nasional Matematika dan Terapannya 2016 p-ISSN : 2550-0384; e-ISSN : 2550-0392
- Remme', V., Beatric, Ba'ru, Yusem. (2018). Analisis Kesalahan Mahasiswa dalam Menyelesaikan Soal Geometri Berdasarkan Newman's Error Analysis Ditinjau Dari Gaya Kognitif Pada Mahasiswa Semester IV UKI Toraja. Prosiding Seminar Nasional Kepariwisata Berbasis Riset
- Sande, S, J. 1989. TORAJA IN CARVING'S. Ujung Pandang.
- Shirley, L. (2001). Ethnomathematics as a fundamental of instructional methodology. ZDM, 33(3), 85-87.
- Tangirerung, R., Johana. (2017). Berteologi Melalui Simbol-simbol Upaya Mengungkap Makna Injil Dalam Ukiran Toraja. Bandung: BPK Gunung Mulia. ISBN 6022314135, 9786022314134
- Tandililing, Pitriana. 2015. Etnomatematika Toraja (Eksplorasi Geometri Budaya Toraja). jurnal ilmiah matematika dan pembelajarannya. volume. (1): nomor 1.
- Yanti, Dwi. Haji, Saleh. (2019). Studi Tentang Konsep-Konsep Transformasi Geometri Pada Kain Besurek Bengkulu. JNPM (Jurnal Nasional Pendidikan Matematika) Volume 3, No. 2, September 2019