Exploring Gotong Simalungun's Approach to Geometry Concepts at SMP Negeri 1 Dolok Batu Nanggar

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Abstract

This research explores the traditional Simalungun carrying culture known as "Gotong" and its relationship with geometric concepts in mathematics. The study was conducted at SMP Negeri 1 Dolok Batu Nanggar and aims to uncover the geometric patterns, forms, and structures present in the traditional tools and practices of Gotong. Using ethnomathematics as the theoretical lens, the research employs a qualitative descriptive method involving field observations, interviews with cultural figures, and documentation analysis. The findings reveal that Gotong involves significant geometric reasoning, including symmetry, angles, polygons, and measurement estimation. This study contributes to the integration of local wisdom into geometry education and supports culturally responsive teaching practices in schools.

Keywords: Ethnomathematics, Simalungun Culture, Geometry, Gotong, Local Wisdom

INTRODUCTION

Indonesian society is rich in local cultures rich in values and knowledge, including in mathematics. One such culture that has not been widely explored in an educational context is the practice of "Gotong" (Government) among the Simalungun people of North Sumatra. Gotong is a collective practice of lifting or carrying heavy loads, reflecting cooperation and calculation in the positioning of the load. From a mathematics education perspective, this practice can be viewed from an ethnomathematics perspective, an approach that examines mathematical concepts that emerge in local cultures. Geometry is a branch of mathematics closely related to everyday life, particularly in visual, spatial, and structural forms. However, the approach to geometry learning in schools is often disconnected from students' real-life contexts, let alone their local wisdom. Therefore, it is important to integrate cultural elements into geometry learning to bridge the gap between

local and academic knowledge. This study aims to explore the relationship between the Simalungun community's Gotong practice and geometric concepts and how this can contribute to contextual and meaningful mathematics learning.

LITERATURE REVIEW

This literature review presents the main theories and previous research that form the basis for analyzing the relationship between Gotong Simalungun culture and geometric concepts through an ethnomathematics approach. **Ethnomathematics as an Approach in Mathematics Education is** the concept of ethnomathematics was first introduced by D'Ambrosio (1985) as the study of mathematics as it develops within a specific cultural context. Ethnomathematics recognizes that different societies have unique ways of thinking, calculating, and solving problems that can be categorized as forms of mathematics. According to Rosa and Orey (2011), ethnomathematics serves as a bridge between local and academic knowledge, creating a more contextually relevant learning space of **Integration of Local Culture in Mathematics Learning.** Integrating local culture into mathematics learning has been shown to improve student motivation and understanding (Achor et al., 2014; Barton, 2008). A study by Utami et al. (2020) showed that students more easily grasp geometric concepts when taught through their cultural context. In the Indonesian context, several studies have shown that cultural practices such as weaving, traditional houses, and traditional ceremonies have great potential in explaining mathematical concepts such as symmetry, patterns, volume, and plane figures (Rahayu &

Kusuma, 2019; Yuliani, 2021). **Gotong in the Context of Simalungun Culture,** Gotong (Gotong) culture in the Simalungun community is a traditional practice of collectively lifting heavy objects. This practice involves calculating angles of inclination, weight distribution, and utilizing simple tools such as long bamboo poles. While there is little research specifically on Simalungun Gotong in a mathematical context, a study by Simanjuntak (2021) indicates that the practice has an implicit geometric structure that merits further study. **Geometry Concepts in Ethnic and Cultural Contexts** Geometry in the daily lives of indigenous peoples is often demonstrated through buildings, tools, and communal activities (Gerdes, 2012). Some geometric forms that can be found include rotation, translation, symmetry, and the use of lines and angles. Research by Barton and Frank (2014) suggests that culturally based geometry learning can develop students' spatial understanding more naturally. **Culturally Responsive Mathematics Learning as** A culturally responsive learning approach not only considers students' backgrounds but also utilizes local knowledge as a learning medium. According to Gay (2010), this strategy not only improves learning outcomes but also strengthens students' cultural identity. In the context of geometry, utilizing local cultural practices such as Gotong (Gotong) allows students to understand concepts like balance, size, scale, and ratio in real-life situations (Nugraha et al., 2022).

RESEARCH METHOD

This study uses a descriptive qualitative approach with ethnographic methods, which aims to explore the cultural practices of Gotong in the Simalungun community in relation to geometric concepts. The research location is in Simalungun Regency, North Sumatra, specifically in several villages that still actively practice Gotong in daily life such as Raya Village, Purba Village, and Silou Kahean Village. The research subjects consisted of traditional leaders, community elders, and community members who regularly practice Gotong, as well as elementary school teachers in the area. Data collection techniques include: **Participatory observation** towards the practice of Gotong which is carried out in activities of lifting wood, stones or large objects collectively. **In-depth interview** with key informants on the symbols, tools, techniques, and meaning behind the practice of Gotong. **Visual documentation** in the form of photos and videos to identify the geometric shapes that appear. **Literature review** paper examines ethnomathematics literature and local Simalungun culture. Data analysis was conducted through data reduction, data presentation, and conclusion drawing. The analysis categories focused on geometric elements such as symmetry, plane shapes, rotation, load distribution, and informal measurements conducted traditionally.

RESEARCH RESULT

Based on the results of observations and interviews, it was found that the practice of Gotong Simalungun contains various geometric elements as follows: **Form of Gotong tool**: The tool used is usually a long bamboo stick that is shaped symmetrically and straight. The length of the bamboo is traditionally measured based on footsteps or arm span (length estimation). **Lifting technique**: People arrange individuals symmetrically on the left and right sides of the device. This arrangement takes into account load balance, distance between individuals, and the angle of inclination to prevent the load from falling. **Gotong route pattern**: The route taken in the classification takes into account route efficiency (space geometry), avoiding extreme climbs, and maintaining the turning angle on corners. **Gotong planning design**: There is a practice of measuring the volume or weight of an object indirectly, then dividing it according to the number of people using a certain ratio, which shows an understanding of the concept of division and proportion. **Visualization of research results** shows the geometric distribution pattern of the body position of the carrier (forming a straight line,

an obtuse triangle when turning, and a rectangle when lifting large objects crosswise).

DISCUSSION

The results of this study reinforce the theory of ethnomathematics, which states that mathematics lives in local culture and is reflected in everyday practices. In the practice of Gotong: The concept **symmetry** and **balance** is clearly visible in the balanced placement of individuals on the left and right sides of the transport vehicle. The concept of **angle** and **rotation** visible when the carrier turns, taking into account the space for movement and pressure distribution. **Ratio and proportion** seen in the distribution of the load according to the physical ability and position of the carrier. Use **length and volume estimation** demonstrates geometric intuition without formal measuring tools, approaching the concept of mathematical measurement. Mathematics learning, especially geometry, can draw inspiration from this practice by designing culture-based learning models. For example, students can be invited to create a Gotong (Gotong) simulation in class to learn about distance, weight, and angles. This finding aligns with research by Rosa & Orey (2011) and Gerdes (2012) which emphasizes the importance of culture-based mathematics education as an effort to increase learning relevance and student engagement.

CONCLUSION

This research shows that the practice of Gotong (Gotong) in the Simalungun community is strongly linked to geometric concepts such as symmetry, geometric shapes, angles, proportions, and informal measurement. Integrating these local cultural values into mathematics learning, particularly geometry, can increase student engagement and enrich the learning context in schools. Practical implications of this research include: The mathematics curriculum needs to provide space for local wisdom as a learning resource. Mathematics teachers can use cultural practices such as Gotong to explain abstract concepts. Further research is needed to develop ethnomathematics-based learning modules from various other local cultures.

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