

Ethno-mathematic Exploration of Historic Site Buildings Medan State Museum

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Abstract:

The Indonesian province of Medan is known for its unique culture, which includes architecture, linguistics, music, art, and traditional crafts. Each city has its own distinct identity, and Medan is one of them. The Negeri Medan Museum shares its history with us. This research focuses on introducing spatial structures through the contents of historical buildings, namely the State Museum in Medan. This research aims to describe flat shapes in mathematics learning. The research method used is ethnography, where researchers make observations through observation, documentation and literature studies related to the Medan State Museum. This type of research is qualitative which only describes how the contents of the Medan State Museum. Since mathematics requires facts to be precise, understandable, and reliable. From the results of the exploration, it can be concluded that the Medan State Museum is related to the mathematics of geometric shapes consisting of circles, tubes, cubes and rectangles.

Keywords: Building Space, Ethnomathematics, Medan State Museum

Introduction

Mathematics education is a science that must be studied by students because with mathematics students can solve problems related to everyday life. Sucherman (Zaenuri and Junaedi, 2020) defines mathematics as concepts related to the fields of algebra, calculus, and geometry. Mathematics also has a lot of material, one of which is geometric shapes. We can find this space building everywhere, including at the Medan State Museum. Mathematics can also be linked to culture. On the one hand, mathematics is formed from culture and mathematics is also used to advance culture. For example, through the traditional game of engklik students can learn mathematics about counting. Apart from that, students can identify the characteristics of square shapes in engklek images, and students can even learn about cube nets. This shows that mathematics comes from culture.

According to the Ministry of Education and Culture (2017), at the junior and senior high school levels, on the one hand, mathematics is part of culture, and on the



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other hand, mathematics is used to advance culture. As an illustration, through the traditional game of engklik students can learn mathematics about counting material. Apart from that, students can identify the characteristics of square shapes in engklek images, and students can even learn about cube nets. In the 2013 curriculum, revised 2017, mathematics subjects include geometry. Space shapes have boundaries and are three-dimensional geometric shapes (Lisnani et al., 2020). flat and curved sides are two categories of shapes.

The concept of spatial construction has been taught at all levels of education, from elementary school to high school. Even though spatial construction material is easier to convey through learning media, teachers face their own challenges in conveying this concept (Khalil et al., 2018). As a result, the geometric concept was displayed at the North Sumatra State Museum.

Ethnomathematics is part of a culture that is seen through learning mathematics. It is hoped that it can improve students' understanding of mathematics by combining mathematics learning with their cultural experiences (Kuntarto, 2017). Research on ethnomathematics in buildings has previously been carried out a lot, especially on museum objects. Some examples are the Ethnomathematics Exploration at the South Sumatra State Museum (Setiana, 2020) and the Yogyakarta Palace Museum (Lisnani et al., 2020), apart from other research.

The ethnomathematical values of the North Sumatra State Museum, however, have never been studied or researched. This study focuses on ethnomathematics concepts regarding structures and ornaments in North Sumatra state museums. This research mainly focuses on spatial building materials. This museum has many historical items from prehistoric to modern times.



Figure 1. State Museum Building Medan

This study aims to explain the types of spatial structures found in the historic building of the Medan State Museum that can be used to teach mathematics. By using

the ethnomathematics method, it is hoped that students will master the material well. This will result in students mastering their cognitive and affective abilities in mathematics. As a result, this research aims to learn more about the historical buildings at the Medan State Museum related to the concept of spatial planning. Additionally, these buildings can be used as tools to help students learn mathematics in the classroom, especially the concept of geometric shapes.

Research Methods

This research aims to understand the phenomena experienced by the subject through the application of an ethnographic approach, which is a type of descriptive qualitative research (Ahmadi & Rose, 2014). The results are presented in the form of images and words (Soendari, 2012). Non-transferable human instruments were used in this study (Peredaryenko, Margarita S., 2013). All field notes are additional tools. The Medan State Museum, North Sumatra is the research location. Initial observations were carried out in April 2024. This study focuses on the structure and ornamentation of the North Sumatra State Museum.

The process of viewing the entire collection of ornaments containing ethnomathematics at the North Sumatra State Museum during the first observation in April. A field notebook was created, and the informants' findings were documented. Furthermore, these results are used in the primary data collection method. To provide additional references, the author cites articles, journals, theses and other sources. As a result of the research, all data is transformed and displayed. Finally, conclude the ethnomathematics concept regarding spatial building materials at the North Sumatra State Museum.

Results and Discussions

The Medan State Museum was inaugurated on April 19 1982 by the Minister of Education and Culture DR. Daoed Joesoef. as a result of exploration carried out through observation and interviews. However, Ir. Soekarno, the first President of the Republic of Indonesia, placed a pair of Makara in 1954. The museum's first collection of makara came from the Sitopayan Monastery in North Padang Lawas Regency. Until now, the Medan State Museum, North Sumatra Province, is called the Arca Building because of these two collections.

From the results of the exploration of the contents of the Medan State Museum, several traditional houses and traditional musical instruments can be seen. If you look at these two shapes, there are circular, tube, cube and rectangular shapes which can be seen from the following picture.

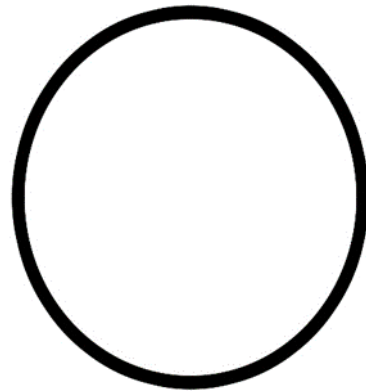


Figure 2. Tools Gong music

If seen tool Gong music Already suitable with traits circle , that is :

1. Own distance between end line And point known center as fingers or r
2. Own symmetry turn And fold the ones that don't finite
3. Own amount degrees 360 degree circle
4. Own One focus .
5. Has a dividing diameter circle become two the same side .
6. Own point arc circle And point center fingers
7. Has no diameter changed .

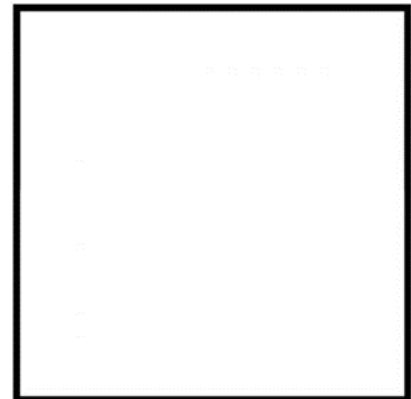


Figure 3. House traditional batak Toba

Draft get up room furthermore can found on building House traditional batak toba , roof from building the shaped facet four , bias a We Look from side from picture the . House This usually have 1.75 meters high , tall the door is 1.5 meters and width 80 cm.

Every facet four own four parallel sides And long . Every facet four own two line transverse , or diagonal, which is truncated become two part become two axis symmetry same fold length . Every facet four Also own four corner the same angle magnitude , namely 90 degrees .

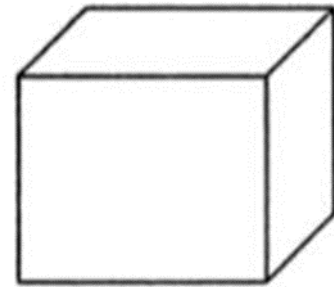


Figure 4. Basket webbing

Furthermore on basket shaped weave cube . From the picture on Already in accordance with characteristic features cube that is :

1. Has 12 ribs of the same length.
2. Has 6 square sides.
3. Has 8 corner points.
4. It has 12 side diagonals or plane diagonals.
5. Has 4 diagonal spaces.
6. Has 6 diagonal fields.
7. Has 3 pairs of parallel planes that are the same and congruent.

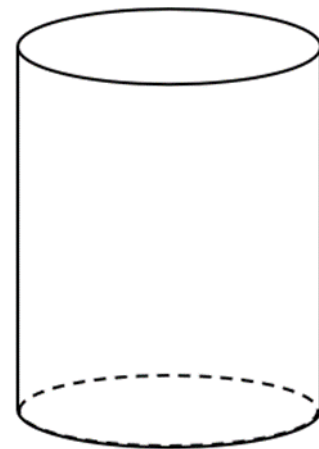


Figure 5. Drum

Draft get up room furthermore can found on Drum . From the picture the Already in accordance with characteristic features tube that is :

1. It has three sides: a base, a circular lid, and a rectangular cover
2. Has no corner points
3. The type of tube with an open lid is shown in figure 5
4. As a reference for an illustration of a tube with a closed base and an open top
5. The formula used to calculate the volume and surface area of a tube room building is as follows:

$$V = \pi r^2$$

$$\begin{aligned} \text{The surface area of the tube} &= (2 \times \text{luas alas}) + (K. \text{ alas} \times t) \\ &= (2 \times \pi r^2) + (2\pi r \times t) \\ &= 2\pi r(r + t) \end{aligned}$$

From the results exploration above so can concluded that the Medan State Museum is related with mathematics get up flat consisting of from like circle , cylinder , cube , and rectangle four . Draft get up flat found Can made source Study mathematics student . On draft get up flat can be applied on class VIII junior high school students like that Also For draft get up room can implemented at the junior high school level . Results study This can made material in learning mathematics for students can observe direct existing forms on life real student.

Conclusions and Suggestions

The ability of class VIII students at Delitua Private High School to solve problems using Pythagorean theorem material can be categorized according to the key indicators achieved. The highest score percentage was 98.04% for the problem understanding indicator, while the lowest percentage was 33.34% for the blessing indicator. Overall, the average percentage score was 69.51%, which is high. This means that the ability of class VIII students at Delitua Private High School is considered very competent in solving mathematics using Pythagorean theorem material. Students' ability to solve Pythagorean mathematical problems is very good; they are also able to process the Pythagorean formula to get good and correct results that are in accordance with the indicators they have. Students' understanding of Pythagoras is also deep enough so that the results of students' work can be assessed as good by researchers. And students' responses to statements in the mathematics problem solving test were effective, because all statements were answered positively by $\geq 90\%$ of students.

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