TEACHER'S PERCEPTION OF THE CONCEPT OF FLAT AND SPATIAL SHAPES IN THE JABUNG TEMPLE BUILDING

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ABSTRACT

As we go about our daily lives, both mathematics and culture play important roles that cannot be ignored. For this reason, educators must incorporate ethnomathematics learning by using their everyday knowledge of mathematics. This study aimed to investigate the concept of flat and spatial shapes within the Jabung temple structure in elementary schools, while also exploring teachers' perceptions of ethnomathematics. The research used is qualitative research using an ethnographic approach. The research was conducted in Jabung village, Paiton sub-district, Probolinggo district, which is located in East Java. Various methods were used, including interviews, observation, and documentation. The results showed that the Jabung temple structure contains flat and spatial geometric concepts, such as rectangles, squares, triangles, hexagons, circles, beams, cubes, and tubes. The hope is that by implementing ethnomathematics learning, students will better understand mathematical concepts by relating them to tangible and realistic examples. Teachers perceive ethnomathematics learning as an interesting and concrete way to teach flat and spatial shapes, while also allowing students to learn about the history of the Cabung Temple.

Keywords: flat shape, spatial construct, ethnomathematics, perception.

1. Introduction

Education and culture are two things that are interrelated in everyday life, including mathematics learning (Dewi et al., 2023). Both cannot be avoided because culture is a complete and comprehensive unity in a society (Amirah & Budiarto, 2022). Meanwhile, education is a basic need for every individual in society. Something that bridges mathematics with culture is known as ethnomathematics (Wahyuni et al., 2013). Cultural elements in learning must remain as a form of protection for ancestral culture so that it does not become extinct. So even though times have developed rapidly, the cultural heritage of our ancestors will not disappear. Therefore, it is important for teachers to link mathematics learning with the surrounding local culture (Nursyeli & Puspitasari, 2021).

Mathematics is a branch of science that has an important role in the development of science and technology. Both as a tool in applications in other fields of science and in the development of mathematics (Prabowo & Darmawan, 2022). Istiqomah & Nurulhaq (2021) & Khairunisa & Basuki (2021) stated that some students consider mathematics to be an abstract subject, where other students have difficulty understanding the material. The learning process in schools often uses the lecture method, causing students to become bored in class (Akase, 2021). Adim et al. (2020) revealed that students receive material passively, which causes students to get bored and bored because most of the time is spent doing assignments, listening to teachers lecture, and doing exercises. This learning causes students to be less able to absorb the material well due to a lack of interaction and thought processes. Activities in class are very monotonous. They are given mathematical formulas on the blackboard and students understand mathematical formulas without knowing where they come from. Thus, on average students have difficulty solving the

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mathematical problems they face (Delyana, 2015).

Overcoming students' difficulties in being passive in learning and difficulty in understanding mathematical concepts can be overcome with various ways of learning. One of them is by implementing ethnomathematics learning, apart from studying mathematics, we also study culture. Mathematical concepts that are interrelated with local culture are known to provide useful functions (Mahendra, 2017). Students can know and understand the concept of flat structures and concrete spatial structures by going directly into the field to see the temple building. Ethnomathematics also functions as a bridge for students to study mathematics while getting to know cultural knowledge. Ethnomathematics is useful for transferring knowledge from school to situations outside of school or vice versa. Ethnomathematics also aims to discover how students understand, express and use mathematical concepts to solve mathematical problems related to everyday life (Nursyeli & Puspitasari, 2021).

There are many objects around that can be used as material for learning mathematics by linking local culture, namely the Jabung temple. Jabung temple can be used as a learning resource object that creates excitement and interesting, culture-based mathematics learning. This learning can help teachers explain mathematical concepts to students more easily. Ethnomathematics can also be stated as a bridge for researchers in several scientific fields such as anthropology, history, culture and mathematics. One of the implementations of ethnomathematics learning is linking the concepts of flat shapes and spatial shapes with artifacts from the Jabung temple, Probolinggo, East Java. Through this approach, it becomes easier for students to learn mathematics because the media is around them. Ethnomathematics learning is used to understand how mathematics is adapted from a culture. Studying ethnomathematics is expected to broaden students' knowledge of local wisdom and create a generation that will never forget their culture. Ethnomathematics in the Jabung temple building can help teachers improve innovative and creative learning. The discussion is useful for additional learning resources that can make learning more enjoyable for students (Sarwoedi et al., 2018).

Based on what has been explained, this research aims to determine the concept of flat and

spatial structures in the Jabung temple building. Apart from that, to explore teachers' perceptions of ethnomathematics learning. The research activity is to explore and identify flat and spatial shapes throughout the Jabung temple building. The results of identifying geometric concepts are expected to show the relationship between flat shapes and spatial shapes with the Jabung temple.

2. Research Methods

This research is qualitative research using an ethnographic approach. The research was conducted at Jabung Temple which is located in Jabung village, Paiton subdistrict, Probolinggo district, East Java. The research subjects in this study were teachers at elementary schools and custodians of Jabung temple. The method used in this research was obtained from interviews, observation and documentation. The research instruments used were observation guidelines and interview guidelines.

3. Results and Discussion

Jabung Temple is a red brick building and some others are made of andesite rock. The temple faces west, on the west side jutting forward is the former structure of the stairs entering the temple. Jabung Temple stands on a plot of land measuring 35 meters × 40 meters. The results of an interview with the temple caretaker showed that the Jabung temple has a Buddhist style, a legacy from the Majapahit Kingdom from Saka 1276 or 1354 AD. Jabung temple was built by King Hayam Wuruk. The reliefs of the Cabung temple have motifs of lotus flowers, people, houses, and there is a relief of Sri Tanjung which depicts a woman riding on the back of a fish in the southeastern part of the temple.

The function of Jabung temple at that time was as a place to store the ashes of the wife of Bhre Gundal, a member of the Majapahit royal family. Apart from that, Jabung temple is a building for the three gods in Buddhist belief or as a place of worship for Mahayana Buddhists. Until 2021, Jabung Temple was used for the celebration of the Tri-Holy Vesak Day by the Buddhayana assembly. Jabung Temple is very interesting, consisting of the shelf, legs, body and roof, the body has a round shape (octagonal cylinder) standing on top of the foot of the three-story, square-shaped temple.

Jabung temple has several flat shapes and spatial shapes that can be presented in discussing

mathematical concepts. The concept of a flat structure in Jabung temple is found in the reliefs and several shapes in the temple. In every part of the temple building there is a flat building concept. This concept was obtained from the shapes in the temple building and the reliefs on the surface of the temple. Types of flat shapes found in temple buildings include: rectangular shape. The rectangular shape can be seen from the Jabung temple door. The temple door is at the top of the temple roof which is like a rectangular window.
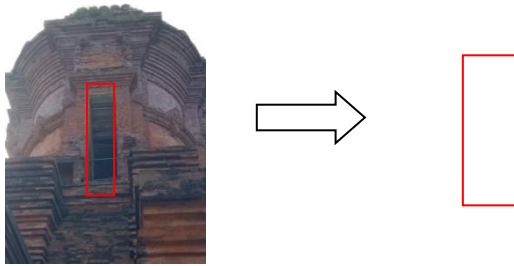
Figure 1. The Jabung Temple door is rectangular in shape

In Figure 1, it can be seen that the arrangement of the bricks in the temple is in the form of a flat, rectangular shape because it has four sides and each facing side is the same length. So this part of the temple can be called a rectangle. Apart from rectangular parts of the temple there are also square ones.
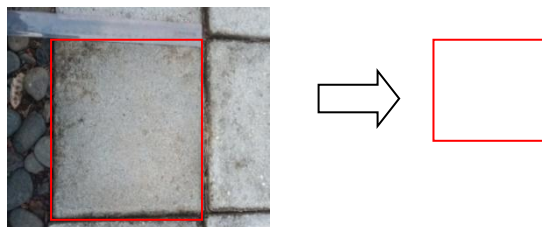

Figure 2. The road to the temple is square

In figure 2, the shape is square. It can be seen that around the road to the temple there are white bricks which have a square shape and have each side the same length. So the temple road (white brick) is square in shape. Apart from the rectangular and square concepts, flat triangular shapes were also found on the lower edge of the temple. At the edge of the temple there are rather small bricks in the shape of a triangle.

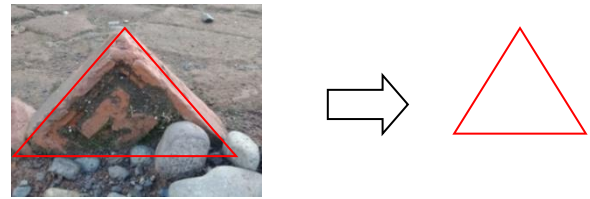**Figure 3.** Stones at the edge of the temple

Figure 4. Triangular shape

Figure 3 shows several other parts below the edge of the temple and in figure 4 is a picture depicting a triangle at close range. The lower edge of the temple is triangular because it has three sides and each side is the same length, so in the picture the shape is a triangle. Around the road to the temple there are red bricks in the shape of a hexagon.
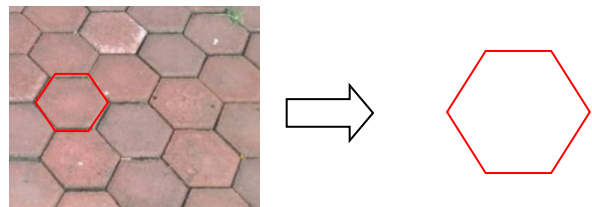

Figure 5. The road to the temple is hexagon shaped

Not only are there white bricks, but there are also red bricks. The red bricks are hexagon shaped. Figure 5 is in the shape of a hexagon because it has six sides and six corner points. On the left and right edges of the temple body, there are a collection of circular bricks.
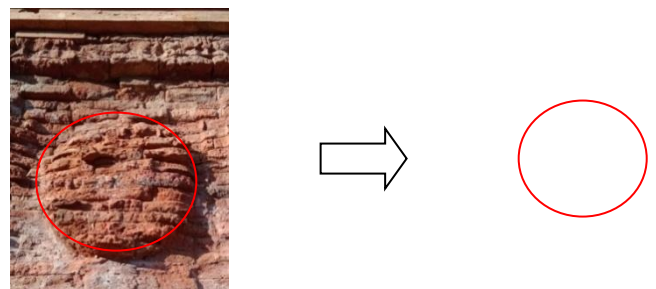

Figure 6. Collection of bricks at the edge of the temple body in a circular shape

In picture 6 the collection of bricks is circular because the dots/lines are circular. Furthermore, the mathematical concept of building space can be seen in the Jabung temple. The spatial concept of Jabung temple is obtained from the overall shape of the building in several parts of the temple. The types of spatial structures found in temple buildings include: blocks, which

can be seen from the collection of bricks in the temple building, the bricks are shaped like blocks.
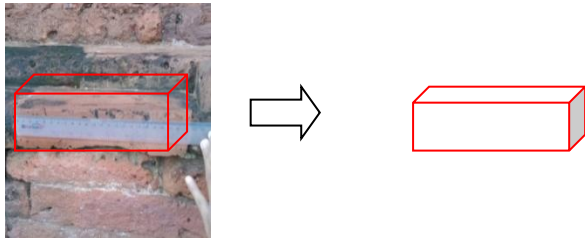

Figure 7. Collection of bricks in a block-shaped temple building

From Figure 7, there is a collection of temple bricks in the form of blocks because the bricks have three dimensions formed by three pairs of squares or rectangles, with two pairs of them being different sizes. By measuring the bricks, students can find out that the shape of the room is in the form of a block whose sides consist of rectangles.
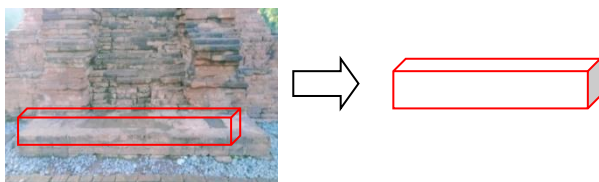

Figure 9. Edge corner of a cube-shaped temple

Figure 9 is found in a corner of the edge of the temple where there are bricks. When viewed from under the bricks, they have the shape of a cube. Because it has three dimensions which are limited by six congruent side planes in the form of a square. By looking at spatial structures concretely, students can understand the difference between blocks and cubes by looking at the parts of the temple and those before them. The structure of space that can be studied from the temple is a tube, which can be seen from the body of the temple.
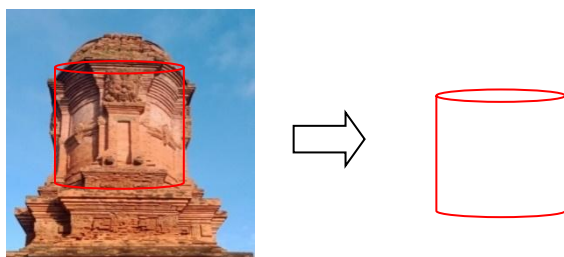

Figure 10. Tubular temple body

The body of the temple is tubular (cylindrical) because it has three dimensions formed by two parallel identical circles and a rectangle surrounding the two circles. Students can see and understand that the body of the temple is shaped like a tube.

Based on the research results obtained from the concept of flat shapes and space at Jabung Temple, it can be linked to several learning outcomes in phase A. Students can recognize various flat shapes and space shapes, and can arrange and decompose flat shapes. The teacher can present images 1-6 as examples of flat shapes, while images 7-10 as examples of spatial shapes. Students can carefully observe the shape of each shape, so that they do not find difficulty in naming the flat shapes and spatial shapes that have been presented. Students can also differentiate flat shapes and space shapes according to shape and properties.

The following will explain the perception of one of the MIS teachers, Ihyaulislam Gunggungan Lor, Pakuniran sub-district, Probolinggo district regarding ethnomathematics learning. The results of the interview stated that the findings of the Jabung Temple concept when applied in mathematics learning were very interesting. Learning will become more meaningful and enjoyable when students are invited directly to Jabung Temple. Learning mathematics that is linked to culture will certainly interest students because this has never been implemented before. There is ethnomathematics learning at Jabung temple, the teacher applies innovative learning. This is useful so that students do not get bored or fed up if learning mathematics is always in the classroom without understanding anything concrete. Learning in a new atmosphere can increase enthusiasm for learning so that it has an impact on good learning outcomes.

Ethnomathematics learning provides a visualization of the structures in the temple. Apart from that, it makes students aware that the elements of history and mathematics learning are interconnected. Changing students' paradigm that history lessons are only found in social studies. Fostering a sense of concern for maintaining and preserving temples. In classroom practice, students experience difficulty in identifying and mentioning the characteristics of flat shapes and spatial shapes. The application of ethnomathematics learning can help students understand these two concepts through the Jabung temple.

Studying the concept of flat building and building space using the Jabung temple is considered appropriate and can be used as a

reference for students in grades IV and V of elementary school. Students can explain the name of the shape and its characteristics. The easiest shapes for students to recognize in Jabung temple are square and rectangular. Students describe if the shape is a square then it is a square, while the shape of a box but is longer is a rectangle. The easiest way to build space is cubes and blocks. However, some students still confuse these two names. The most difficult shape for students is a hexagon shape. Students are always mistaken because they think that hexagons are exactly the same as pentagons.

The existence of Jabung Temple not only contains material about culture and history, but material about learning mathematics is also found there. This is supported by the opinion of Saputro et al. (2020) which states that students need to create interesting and meaningful learning. Fadillah et al. (2019) stated that learning mathematics using a cultural approach has been proven to improve students' mathematical abilities. So several concepts of flat shapes and space such as squares, rectangles, triangles, hexagons, circles, blocks, cubes and tubes found in Jabung Temple can be used as alternatives for teaching mathematics at school. So, through the Jabung Temple building structure approach, it is hoped that it will be easier for students to understand the concepts of flat shapes and space. Mathematics based on ethnomathematics has proven to be effective in students' mathematical problem solving and critical thinking skills.

4. Conclusions

Based on data analysis and observation activities carried out, it can be concluded that there is a flat and spatial concept in Jabung temple. The concepts of flat shapes in question are rectangles, squares, triangles, hexagons and circles. Meanwhile, the shapes in space include blocks, cubes and tubes. These structures can be seen in the Jabung temple structure with the naked eye without using special tools. The discovery of the concept of flat shapes and space shapes in the Jabung temple can be used as an alternative culture-based mathematics learning object. The teacher's perception is that learning with ethnomathematics makes learning more meaningful and enjoyable.

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