



The Mathematical Values of the Ploasan Temple

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Abstract. This study aims to: (1) explore the historical and cultural values found in Ploasan Lor Temple, (2) explore geometric concepts in mathematics for junior high schools related to Ploasan Lor Temple.

This research was conducted at Candi Ploasan, and a public junior high school in Tepus, Gunungkidul, Yogyakarta from March to May 2022. This research was descriptive qualitative research with an ethnographic approach. The participants in this study were a cultural practitioner from Ploasan Temple and a junior high school mathematics teacher. This study employed observation, documentation, and interviews for data collection. Spradley ethnographic model was used to analyze the data.

The results of the study concluded that (1) Ploasan Temple was a temple built around the 8th century to the 10th century AD. Ploasan Temple is believed to be one of the temples built by two different religious beliefs. Therefore, this temple not only has a Buddhist pattern but also has Hindu nuances. Ploasan Temple is divided into two complects, namely Ploasan Lor (North) Temple and Ploasan Kidul (Nouth) Temple. Ploasan Temple is also known as the Twin Temple. In the north side, there are several buildings including the main temple, ancillary temples, perwara stupas, mandhapas, mandhapa perwara stupas, fences, kori agung gates, and dwarapala statues. (2) The mathematical values found in the Ploasan Lor temple complex are two-dimensional and triangular shapes, Pythagorean theorems and Pythagorean triples and the congruence between two-dimensional shapes, flat geometric shapes, and curved geometric shapes.

Keywords: Ethnomathematics · Culture · Ploasan Temple · Mathematics Learning

1 Introduction

Mathematics is a part of culture, applied and used for innovative analysis. The mathematical paradigm as thinking skills and tools to develop a superior culture. Mathematics tends to use linear thinking related to theorems. However, when it is integrated with culture, the thinking becomes flexible. For example, think about the forms of architectural beauty. The structure of the building is mathematically thought out but the ornamentation uses aesthetics. This flexibility arises when thinking about building structures not only from the aspect of form (three-dimensional geometry), but also having to consider the sense of beauty of the form.

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Mathematics and culture are two things that are closely related. The relationship between mathematics and culture can be linked in specific settings using ethnomathematics (Albanese & Perales, 2015). Meanwhile, the goal of ethnomathematics is to understand the relationship between mathematics and culture, so that students and the general public can understand mathematics and become easier to understand (Abdullah, 2017). In other words, the study of ethnomathematics is very important in studying cultural anthropology (ethnography), mathematical modeling and mathematics itself. In line with this, D'Ambrosio (1985) states that the purpose of the existence of ethnomathematics is to recognize that there are different ways of doing mathematics taking into account the knowledge of academic mathematics developed by different sectors of society as well as taking into account the different modes in which different cultures discuss their practice of mathematics (how to group, count, measure, design buildings or tools, play and so on). The intersection of the components of mathematics, mathematical modeling and ethnography is called ethnomathematics.

The scope of ethnomathematics includes mathematical ideas, thoughts and practices developed in culture. The existence of ethnomathematics aims to help students learn, understand, and apply the mathematical concepts. It is expected to be able to improve students in understanding the concepts of learning mathematics related to daily basis. Ethnomathematics is an approach used to explain the relationship between culture, the environment and science (Putri, 2017: 23).

Ethnomathematics is a link between mathematics and culture. One of the characteristics of ethnomathematics is to connect the concept of mathematics with cultural values in learning at school. Indonesia is a nation that has cultural diversity and many historical heritages. The concept of ethnomathematics makes mathematics easier for students to understand through contextual-based learning by being connected to historical heritage objects such as temples.

However, the process of learning mathematics has not fully utilized cultural values as a source of learning. The mathematical values contained in culture can be used for approaches in studying mathematical concepts and also become a form of passing on culture from the current generation to the next generation. Therefore, in this particular research we would like to get into a deep understanding of the mathematical concept in one of Indonesia's greatest historical temples.

The temple is one of the most popular historical relics in Indonesia. In Indonesia there are 24 temples, one of which is the Plaosan temple. Plaosan Temple is located on Jalan Manisrenggo, Plaosan, Bugisan Village, Prambanan District, Klaten Regency, Central Java Province. Plaosan Temple is estimated to have been built in the 9th century by King Rakai Pikatan and Sri Kahuluan during the Ancient Mataram Kingdom. Plaosan Temple is a Buddhist temple that was built as a sign of King Rakai Pikatan's love for his wife Sri Kahuluan.

Plaosan Temple consists of two temple complexes, namely Plaosan Lor Temple and Plaosan Kidul Temple. The entire Plaosan temple complex has 116 perwara stupas and 50 perwara temples. Plaosan Temple itself can be associated with the concept of geometry. The geometric concept of the Plaosan temple can be seen in the Plaosan Lor temple complex in the temple building. This shows that the Plaosan Lor temple has

various geometric shapes in it. In addition, there are still many historical values that can be learned at the Plaosan temple.

The focus of research in this study is to explore the mathematical values contained in the Plaosan Lor Temple artifacts. This is done by selecting, revealing, classifying, and interpreting the meaning of mathematics in Candi Plaosan related to geometry in junior high school. This research sought to answer this following research questions: (1) What are the history and cultural values of Plaosan Lor Temple? (2) What are the mathematical values found in Plaosan Lor Temple for Junior High School Geometry?

2 Methodology

This study uses a naturalistic paradigm that comes from phenomenology with an ethnographic approach. (Sugiyono 2019:17) qualitative research methods are also called naturalistic research methods because the research is carried out in natural conditions (natural settings). Naturalistic research is also known as the ethnographic method, because at first this method was more widely used for research in the field of cultural anthropology.

This naturalistic paradigm is carried out by direct observation of the Plaosan temple. The data obtained were processed in detail and systematically and then interpreted in mathematical form. This research study emphasizes the implementation of Plaosan temple ethnomathematics in mathematics learning.

Reinforcing data for naturalistic research is carried out by means of observation, interviews, and documentation. Observations were carried out directly at the Plaosan temple complex, and were strengthened by interviews with cultural experts at the Plaosan temple. Documentation is also used as a reinforcement for naturalistic research by examining various data related to research. The presentation of the data is carried out qualitatively by describing the research findings in depth in a descriptive way.



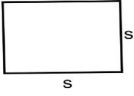

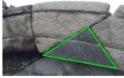

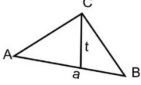


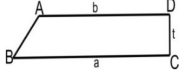

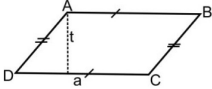
Data collection was carried out on March 20, 2022 to May 20, 2022. The observation process was carried out directly at the Plaosan temple on March 15, 2022. During the observation process the researchers carried out activities such as observing, taking notes, and taking photos related to the Plaosan temple.



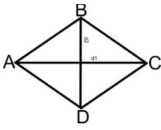




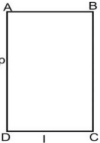
The interview process was carried out with three resource persons, namely officers from the Central Java Cultural Heritage Preservation Center, and also a teacher in junior high school mathematics. The place for the interview with the Central Java Cultural Heritage Preservation Center was held at the Plaosan Temple Site Office in April 2022. The place for the interview with the 8th grade math teacher was held at a junior high school in Tepus on April 2022.

3 Research Subject

The subjects in this study were officers of the Central Java Cultural Heritage Preservation Center, and also a junior high school mathematics teacher.

Findings and Discussion

No	ARTEFAK	BURNER		
		Enaktif	Ikonik	Simbolik
1.	Plaosan Lor Temple Building Main Temple Stairs. 	There are several quadrilaterals, including squares, triangles, trapezoids, parallelograms	Square Shape 	 A square is a quadrilateral whose four sides are the same length and all four angles are 90° .
	Main Temple Stairs 	On the steps of the main temple and the Kori Agung gate, there is a sharp triangle, respectively	Triangle Shape  	 Flat triangles have various types, one of which as in the picture above is an acute triangle. An acute triangle is a triangle in which each angle is less than 90° .
	Great Kori Gate 		Trapezoid Shape elbows 	 A right trapezoid is a quadrilateral that has 2 parallel sides and one of the angles forms a right angle.
			Parallelogram 	 A parallelogram or often called a parallelogram is a two-dimensional flat shape that has 4 edges. Each opposite edge is the same length and each opposite angle is the same.

No	ARTEFAK	BURNER		
		Enaktif	Ikonik	Simbolik
	<p>Rhombus Relief</p> 	<p>There is a flat rhombus in the relief sculpture on the side.</p>	<p>Rhombus Shape</p> 	 <p>A rhombus is a two-dimensional flat shape in which all four sides are the same length and the angles are the same size. In addition, a rhombus also has two diagonals that are perpendicular to each other.</p>
	<p>Gapura Kori Agung</p>  <p>Candi perwara</p> 	<p>There are several flat shapes in the Gapura Kori Agung building and the perwara stupa, one of which is rectangular.</p>	<p>Rectangle Shape</p>  	 <p>A rectangle is a two-dimensional flat shape that has two opposite sides that are parallel and of the same length. All of the angles are the same size and form a right angle.</p>

4 Conclusion

The mathematical values found in the Ploasan Lor temple complex are flat and triangular shapes, Pythagorean theorem and Pythagorean triples, congruence and congruence between flat shapes, flat side spaces, and curved side spaces.

5 Implication

This research is expected theoretically to enrich findings in the field of education, especially in learning mathematics through the implementation of the Ploasan temple ethnomathematics in learning mathematics as an alternative to learning mathematics. The practical benefits from this research are to provide alternative choices of mathematics learning models. At the same time, it can preserve historical heritage, namely the Ploasan

Temple. Forstering teacher insight about learning mathematics. By the implementation of Plaosan temple ethnomathematics in learning mathematics as an alternative learning mathematics, students will be more familiar with historical heritage in learning mathematics as well as preserving the historical heritage of the Plaosan temple. They's also able to find out the relationship between Plaosan temples with math lessons.

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