Mathematics Education Journals
Vol. 5 No. 1 February 2021

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Concept of Geometry in Penataran Temple

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Abstract

This study aims to describe the results of exploring the shapes in Penataran Temple, cultural relics accompanied by geometric concepts. This research uses explorative-descriptive research because it is suitable for uncovering mathematical cases related to Ethnomathematics. The data analysis technique used in this research is qualitative. In this study, an ethnographic approach was used, accompanied by interviews, collecting documentation, or analyzing literature about Penataran Temple as data collection techniques. This study concludes that the relationship between culture and building structure in Penataran Temple has always been attached to the concept of geometry in the material. Wake up flat and build space. In these buildings, the forms are applied in mathematical objects such as in flat plane geometry and space shapes. As in this study results, there are several structures, namely cuboid and right triangular prism and plane shape, in an isosceles triangle.

Keywords: Geometric Concept; Penataran Temple

INTRODUCTION

Mathematics in the academic world prioritizes cognitive, studying quantity, shape, structure, and size. Mathematics is better known as a topic of conversation in school to college. It is known as something related to numbers and calculations; even when we see an object must have imagined geometric shapes in mathematics. Managing Mathematics learning so that it is easy to understand and at the same time fun is still a challenge. In various aspects of life in society, mathematics education has a significant role, such as counting the number of objects, comparisons, sorting the number of things, etc. However, most people do not know the use of mathematical concepts in their activities, daily habits, and cultures around us, which are associated with benefits. One of the approaches offered as an alternative is culture-based mathematics learning, known as Ethnomathematics. Therefore, utilizing culture in learning Mathematics is a possible option, and in Indonesia, Ethnomathematics is not something new.

Indonesia has a wide variety of cultures. Each tribe or group has a unique and unique culture. The integration of culture in mathematics is contextual and realistic, which is realized due to human activity. Since our ancestors, there have been many cultural products, namely artistic creativity that contains mathematics, such as carvings on stone, wood, and traditional buildings containing three-dimensional geometric shapes (Kucuk, 2013). The temple is one of Indonesia's

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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cultural heritage known throughout the world. Many tourists visit, admiring the beauty of its various artistic forms, which now only remains to remember its history. Only a few of them know that these temples have mathematical elements and are fascinating to study. And one of these temples will be explored further for research in this article. Precisely the temple is categorized as the most magnificent and the most extensive in East Java, namely Palah Temple or better known to the public as Penataran Temple (Mashuri, 2014). One of the temples with Hindu Siwaitis style is located in Penataran Village, Kec. Nglegok, Kab. Blitar. It is located on the southwest slope of Mount Kelud and northern Blitar with an altitude of 450 m above sea level.

This Penataran temple complex contains a cluster of several buildings stretching along the northwest-southeast axis. On the opposite side of the Eastside, there is a river that originates on Mount Kelud. The Penataran temple area is arranged using a linear pattern with other heritage buildings located in the main temple. This linear arrangement pattern is somewhat irregular, which eventually makes the Penataran temple distinctive. The ethnomathematics study of the Penataran Temple is expected to get to know Palah Temple's culture, which has many reliefs, statues, and other forms of Hindu-style buildings. This study aims to describe the results of exploring the conditions in Penataran Temple, which are cultural relics accompanied by their mathematical concepts.

RESEARCH METHOD

Researchers' research in this article is descriptive-exploratory research with an ethnographic approach because it is suitable for uncovering mathematical cases related to Ethnomathematics. The data analysis technique used in this research is qualitative. Retrieval of data in this study is employing exploration, documentation, and interviews conducted in the Penataran temple area, according to the study's aim to explore the concept of geometry on components and artists in buildings in the area of Penataran Temple, Kab. Blitar. The role of the researcher in the method used is as a critical instrument or research instrument. An ethnographic approach is accompanied by interviews, collecting documentation, or analyzing literature about Penataran Temple as a data collection technique. The talk was aimed at verifying the validity of the data from the researcher's interpretation. Resource persons / cultural observers who were interviewed were also conducted as complementary data in this study. Analyzing literature documents involved activities such as cursory examination and interpretation. The data analysis technique in this article uses taxonomic analysis. The taxonomic analysis is carried out to analyze the buildings' shape in the Upgrading complex and its associated mathematical concepts.

RESULTS AND DISCUSSION

The data from the documentation, observation, and architectural exploration of the Penataran Temple shows that the Penataran Temple area has several

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ISSN : 2579-5260 (Online)
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geometric forms of plane geometry and space shapes. The following are some of the buildings in the Penataran Temple area.

1. Bale Agung

In its original form, this Bale Agung building has supporting poles in every corner and has a roof used to use leaves. While the pillars are made of wood, the foundation uses stone, so it is clear that the still-intact part is a strong and not brittle foundation. As can be seen in Gam bar 1, the building has length, width, and height.

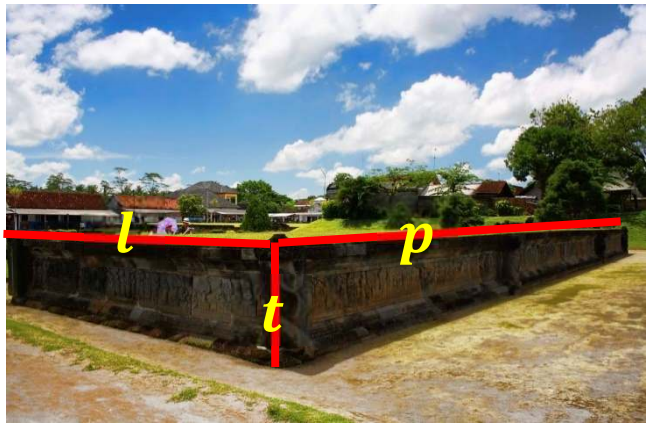

Figure 1. Bale Agung

And if it is implemented into the concept of waking up space (Kriegeskorte, N., & Kievit, 2013), the building is a glimpse of shaped beams that have the formula. However, if observed further, in some blankets on the structure's side, there are stories relief that juts into (Figure 2). Several studies discuss Hindu Buddhist heritage temples' architectural design forming reserves with hallways, as shown in Figure 2 (Aditya Bayu Perdana & Rahadhian P. Herwindo, 2020) if exploring the Amber 2 that juts outgained 3 part geometry waking up space in part.

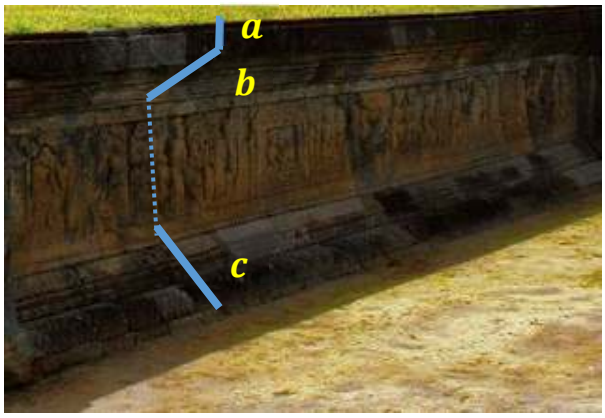

Figure 2. Exploration of geometric shapes

ISSN : 2579-5724
ISSN : 2579-5260 (Online)
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Furthermore, if explored a section on building bale grand this, in part forming geometric beam (Figure 3. Cuboid). While the features are equally created wake rung prism triangular bracket

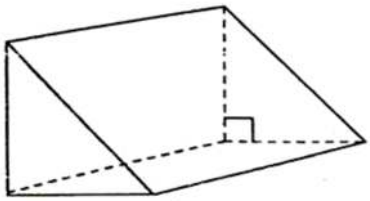

Figure 4. Right triangular prism

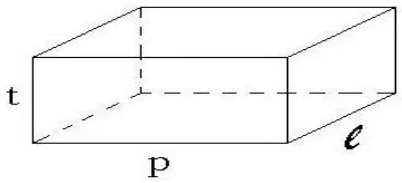

Figure 3. Cuboid

Architecture juts out also contained in the design of the patio. The same thing in the Pendopo Teras building, the shape is almost the same as the Bale Agung. The difference is only in terms of the terrace pavilion size, which is smaller than the Bale Agung.

Figure 5. Terrace pavilion

2. Candra Sengkala Temple / Temple of Annual Figures / Brawijaya Temple / Ganesha Temple

The temple is a spot prime for the visitors to immortalize in photos or enjoy the history. The temple is also included buildings that have symmetrical the same on each of its sides. Its simple shape and is a characteristic typical of the patterned Hindu temple is interesting to associate the symmetric wake flat. As seen in Figure 6, one of the parts of the temple is that the front, if applied into line coordinates of the axes X and Y, obtained the concept of reflection or reflection on waking flat (Ledi et al., 2020). Axis X is drawn right to be in the middle of the section ahead of the building is so has the object right and left are the same. Here are the properties of reflection woke up flat this.

The large size of each object on the mirror has properties that together with its shadow. The position of the item with the opposite shadow

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Figure 6. Candra Sengkala Temple

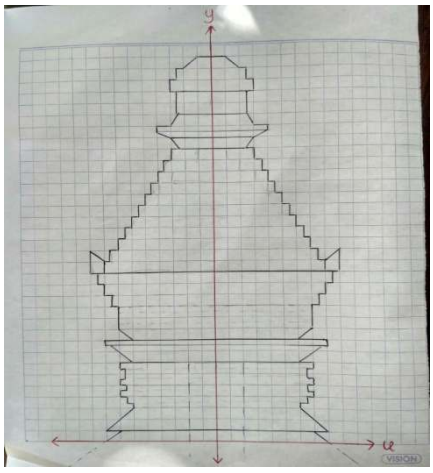

Figure 7. The application becomes a

Furthermore, if the observed side next to the right and left of the stairs towards the door entrance is carved, tumpal were decorated with flowers with a wet outer in the shape of a triangle at the foot (Figure 8). Tumpal, according to KBBI Online (Fatya Permata Anbiya, 2014), is a motif by painting three dashes are lined up (on gloves and so on). It can be concluded tumpal is one of the types of ornamental geometric types that shaped wake flat triangular rows and varied either single or face (Figure 9). A variety of decorative it can be found in Java's culture in the Hindu era, which

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ISSN : 2579-5260 (Online)
http://ejournal.umm.ac.id/index.php/MEJ

Figure 8. Tumpal motif

Figure 9. Temple Pintu

became part of the ornate buildings and statues. Garnish tumpal very much found in object-be n da ethnography of tribal peoples in appears logical as the carving homes, boats, and others.

3. Naga Temple

In building Dragon Temple is fleeting like shape block, too, but the building is over many carvings that stand out so that the cover forms the base of the building called Dragon Temple because the building is wrapped around the dragon and propped figures dressed highway. Once in exploring again, in Figure 10, the shape of the building at the box colored red are almost equally well with the building bale grand and pavilion terrace with a difference of her in terms of size.

Figure 10. Naga Temple

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ISSN : 2579-5260 (Online)
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CONCLUSION

Based on the exposure results of the description and discussion above in gain, the linkages between society's culture and fabric have been since first attached to mathematics elements. On the site, some of the Temple Penataran have connections with mathematics concepts, such as the material geometry field of flat and woke up the room. So it can be concluded that the era of first when build buildings that less is more has to know the object of mathematics and apply to the forms of the buildings are. At the same time, it showed the materials mathematics were obtained from exploration above attributed in life every day as a form apperception in learning because the temple has a geometric model. By because it is, I hope researchers subsequently could be explored the heritage of culture is and can be used as a source of research further regarding the use of learning mathematics in school

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