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Exploring the utilization of mathematical concepts in the traditional house of Desa Beleq Sembalun

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Abstract
Culture is a community's habits that have been passed down from generation to generation and become the identity of an area. One thing that bridges education and culture, especially mathematics education, is ethnomathematics. The aim of this research is to explore the mathematical concepts contained in the traditional houses of Desa Beleq. This research is a qualitative research. The research was carried out in Sembalun Bumbung Village, Sembalun District, East Lombok. The subject of this research includes the traditional chief as the key informant, along with the village head and the descendants of the owner of the traditional house, who serve as supporting informants. Research instruments include human instruments, observation guidelines, interview guidelines and documentation. Data analysis was carried out in three stages, namely data reduction, data display and conclusion drawing. The results of this research show that building elements such as roofs, stairs, doors, walls, ornaments and other building forms of Desa Beleq traditional houses contain mathematical concepts found in geometric materials such as 2D shapes, 3D shapes, and geometric transformation (reflection).

Keywords: exploration; ethnomathematics; traditional house of Desa Beleq

Abstrak
Budaya merupakan kebiasaan masyarakat yang terjadi secara turun temurun yang menjadi identitas dari suatu daerah. Salah satu yang menjembatani pendidikan dan budaya khususnya pendidikan matematika adalah etnomatematika. Tujuan penelitian ini adalah mengeksplorasi konsep-konsep matematika yang terdapat pada rumah adat Desa Beleq. Penelitian ini merupakan penelitian kualitatif. Penelitian dilaksanakan di Desa Sembalun Bumbung, Kecamatan Sembalun, Kabupaten Lombok Timur. Subjek penelitian ini yaitu ketua adat sebagai informan kunci, kepala desa dan keturunan pemilik rumah adat sebagai informan pendukung. Instrumen penelitian berupa human instrumen, pedoman observasi, pedoman wawancara dan dokumentasi. Analisis data dilakukan melalui tiga tahap yaitu reduksi data, display data dan penarikan kesimpulan. Hasil penelitian ini menunjukkan bahwa unsur-unsur bangunan seperti atap, tangga, pintu, dinding, ornamen dan bentuk bangunan lainnya dari rumah adat Desa Beleq memuat konsep-konsep matematika yang terdapat pada materi geometri seperti bangun datar, bangun ruang, dan transformasi geometri (refleksi).

Kata Kunci : eksplorasi; etnomatematika; rumah adat Desa Beleq

1. INTRODUCTION

Mathematics is one of the most important sciences and is often used by people to solve everyday problems. Its existence in the world is needed because there is no human activity or behavior in any aspect of life that is separated from mathematics. Even without realizing it, many human activities are part of mathematics (Young, 2017). The application of mathematics in ancient times can be seen from the ancient Egyptians in prehistoric times using the number of fingers on the hand, namely ten fingers in doing calculations (Pusfitasari et al., 2019). This calculation using fingers is what we use in our daily lives today. In addition, in prehistoric times a lelombo bone was also found in the Lelombo mountains of Swaziland, which is estimated to date back to 35,000 BC. This bone contains 29 different scratches on the baboon fibula bone, which explains and proves that women at that time had applied the habit of counting to remember their hai/nmcd cycle, which is 28 to 30 scratches (Utami et al., 2020).

This discovery proves that before technology existed, ancestors were able to use their minds to solve problems using simple tools, and this is the essence of mathematics. They may not realize that they can apply mathematical concepts, even at a simple level. It can be understood that, without realizing it, the local culture that has existed for a long time before people knew more about mathematics already had mathematical concepts in it (Afnenda et al., 2020). Mathematics and culture are two things that are closely related to each other. Many mathematical concepts are contributed by culture in human life. Mathematics was born, grew and developed from culture. Therefore, mathematics is a form of culture that is integrated into people's lives, whenever and wherever they are (Muhtadi et al., 2017). Therefore, the application of this mathematical concept has existed since ancient times.

This is in accordance with the opinion of the Department for Education and Employment (Haylock & Fiona, 2007) which states that "Mathematics is important in everyday life, many forms of employment". This means that mathematics has a very important role in everyday life and in various fields, one of which is science. In line with that, in (Juliarta et al., 2020) the National Research Council (NRC) of the United States stated: "Mathematics is the key to opportunity." Mathematics is the key to opportunities for success. Bishop said that mathematics essentially grows from skills or activities in the cultural environment, so that a person's mathematics is influenced by their cultural background (Pixten in Hartoyo, 2013). According to (Hartoyo, 2013), ethnomathematics is a complex and dynamic representation that describes the cultural influence of the use of mathematics in its applications. One example of the application of ethnomathematics is a traditional house. Traditional houses are one of the highest forms of culture in a society. Furthermore, if studied more deeply, the very complex architecture and structure of traditional houses can be used as teaching material in the field of education for students (Pratami et al., 2018).

The Desa Beleq is a house that has existed since Mount Samalas erupted in 1257 and is the forerunner of the Sembalun community, East Lombok Regency, West Nusa Tenggara (Astari, 2018). The location is flanked by two hills at the foot of Mount Rinjani which has a height of 3,726 meters above sea level (MDPL), Pergasingan and Selong. The Desa Beleq Traditional House is a building made of wood on poles, walls with woven bamboo, a foundation made from a mixture of clay and cow dung, a roof made of palm fiber which functions as a residence. Judging from the building structure of the Desa Beleq Traditional House with its unique shape and building pattern, it gives its own meaning about how people in ancient times produced a masterpiece in the form of a traditional house that was full of mathematical concepts. Even though it is known that at that time there was no technology as developed as it is today. Mathematical concepts have unwittingly been applied and become activities in the lives of ancient people.

Research on the Desa Beleq that has been carried out recently focuses more on the role of stakeholders in tourism and the development of tourism at Desa Beleq, Sembalun. Additionally, previous studies have also delved into the architectural models of Desa Beleq. Research that focuses on the study of mathematical concepts has not been studied much, especially from a mathematical perspective. Therefore, this writing aims to reveal how mathematical concepts are used in the traditional house of Beleq Sembalun Lawang Village.

2. RESEARCH METHODS

This research follows a qualitative approach. Qualitative methods involve research procedures that generate descriptive data in the form of written or spoken words derived from observed behavior or input from individuals. In qualitative research, the instrument utilized is a human entity, specifically the researcher themselves (Sugiyono, 2013). This qualitative research uses descriptive research, namely a type of research that systematically describes a situation, problem, phenomenon, service, and/or important information about human or organizational living conditions (Kumar, 2018).

Data sources in this research are divided into two, namely primary data and secondary data. Primary data was obtained directly from the results of interviews conducted with informants and observations with key informants and supporting informants. Secondary data was obtained from textbooks, news and articles in relevant research journals.

Data collection techniques are methods used to obtain the data or information needed in a study. Data collection is carried out to obtain data that is relevant and accurate and can be used appropriately. In this research, Data collection techniques used include observation, interviews, documentation and literature review. The data collection technique through observation in this research is observing related to Traditional house in Desa Beleq. Furthermore, in the interview technique, the researcher uses a

structured interview technique, namely the researcher uses an interview guide that contains specific questions to be asked and only contains the important points of the problem. Researchers use documentation techniques as a technique for collecting data so that the data collected is more accurate. The documentation used in this research includes photos, voice recordings and field notes. Researchers also conducted a literature review of relevant literature.

Data analysis is a process of making choices, discarding, eliminating, sorting and classifying data according to expectations. Data analysis in this research uses three activity streams: data reduction, data display, and conclusion drawing/verification. In the reduction stage, the researcher focuses on the data needed according to the interview guide. Next, at the display stage, the researcher describes the results of the recordings that have been made with key informants and supporting informants in the form of a short description to make it easier for the researcher to understand what happened, planning further activities referring to the results of the short description that has been made. Finally, in the verification stage, the researcher draws initial conclusions from the results of interviews with key informants, but the data is still not valid, so the researcher digs into the data in more depth through supporting informants to obtain credible results (Miles & Huberman, 2009).

The data validity test carried out in this research was first conducted, using reference materials in the form of interviews and field notes. Next, the researcher held discussions with the research team to unite the same perceptions, so that the resulting research was credible. Apart from that, researchers also used triangulation techniques as a way of checking the degree of confidence in the results obtained in the field. Triangulation techniques are used by researchers to compare interview results obtained from each source or informant to check the truth of the information obtained, and researchers also check degrees through triangulation techniques with methods, namely by checking research results with different data collection techniques, namely interviews, observations, documentation so that the degree of confidence in the data can be valid.

3. RESULTS AND DISCUSSION

3.1 History

Sembalun is one of the oldest blood of the 13 oldest villages on the island of Lombok. The word Sembalun actually comes from ancient Javanese which consists of two syllables, namely the word "SEMBAH" which means to worship/surrender oneself and "ULUN" which means leader. At the end of the 14th century, when Mount Samalas or currently better known as Mount Rinjani erupted, leaders in the area ordered all residents to leave Sembalun to avoid the very powerful flow of hot lava.

After evacuating for so many years "down under", there are several people who propose to return to the area where they used to live. Of the large population, only seven families dared to look for the place where their ancestors once lived. After a very steep and dangerous journey, they finally arrived at a spacious place, so they thought about building a place to live there. It was in this place that they tried to organize their lives as they were and build a village which is now known as Desa Beleq. The seven heads of the family are called the second Sembalun generation which will then become the forerunners of the next Sembalun descendants.

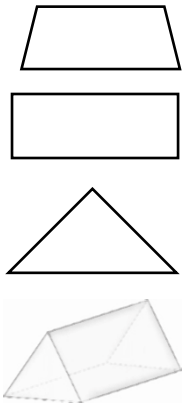
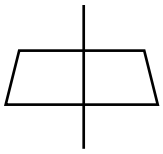
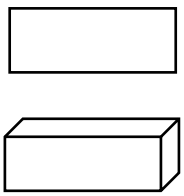
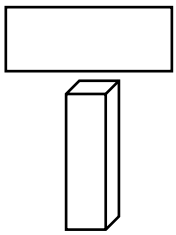
1. Philosophical Meaning
   The traditional house of Desa Beleq is currently being maintained and continues to be cared for. The number of buildings in the traditional house of Desa Beleq is 7 houses, no more. This is because according to the beliefs of the Sembalun people, if more than 7 are built, disaster will usually come. The roof of the traditional house in Desa Beleq is shaped like a rectangular prism and covers almost the entire building to protect the family inside the house from extreme weather which usually occurs every year in the Sembalun area. The door is made short which is intended so that when guests come they can bow and show their politeness to the host. If the guest shows politeness, then the owner of the house will also honor the guest.

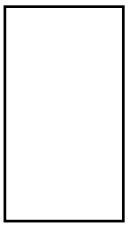
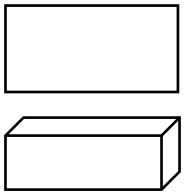
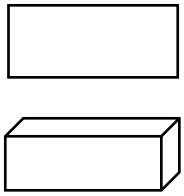
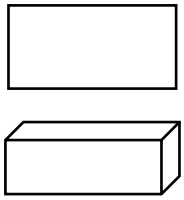
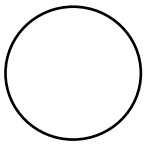
   The number of stairs in the traditional house of Desa Beleq is only 7, which is a symbol of human birth and death. In ancient times, when a new baby was born, it was not allowed to be taken out of the house before 7 days because according to the beliefs of the Sembalun people, if the baby was taken out, then when the baby got older his vision would become less clear or nearsighted. Babies who are seven days old will then be placed in meda'au. Meda'au is a series of ceremonies in the tradition of giving children names.

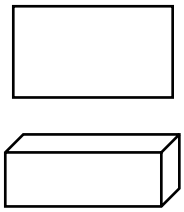
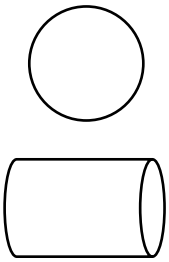
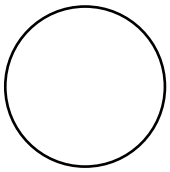
2. Mathematical Concepts in the Traditional House of Desa Beleq
   Based on the results of interviews conducted with the head of the Desa Beleq traditional house in Sembalun Lawang Village, East Lombok Regency, ~~Its~~ the traditional house of Desa Beleq location flanked by two hills at the foot of Mount Rinjani which has a height of 3,726 meters above sea level (Mdpl) means that the Desa Beleq traditional house has beautiful views. The traditional house of Desa Beleq itself has 7 residential buildings occupied by 7 heads of families to start a new life on their ancestral land which has been abandoned for hundreds of years due to the eruption of Mount Samalas (Mount Rinjani) in 1257. The traditional house of Desa Beleq is made of straw or leaf thatch with woven bamboo walls, and the floor is made of clay which is high above ground level. Apart from having cultural elements, the traditional houses of Desa Beleq also have mathematical concepts applied. The mathematical concepts used in Desa Beleq traditional houses can be seen in the shape of the building, calculations of room size, area and distance between

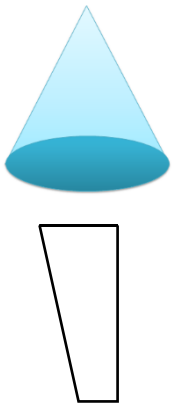
foundations and windows and so on. Below, we will present the ethnomathematics of the traditional house of Desa Beleq.

Tabel 1. Mathematical Concepts in Traditional House Buildings and Ornaments

Parts of Desa Beleq	Building Forms and Ornaments	Math Concepts	Description
Buildings			
The roof of a traditional house	 		The roof shape applies trapezoidal, triangular and rectangular flat shapes to form a triangular prism.
The roof of a traditional house			At the front of the traditional house building applies the concept of geometric transformation, namely reflection.
Traditional House Entrance Stairs			The shape of the stairs applies rectangular flat shapes to form a block.
Building Support Poles			Rectangular building support poles that form a beam.

Lawang (Traditional House Door)			The shape of the lawang itself uses the concept of flat shapes, namely rectangles
Bale Dalem			Bale dalem is the bed of the girls and is shaped like a block composed of several rectangles.
Wooden Cross			Wooden crossbars are used for hanging spices and are shaped like blocks made up of several rectangles.
Bong			The bong table serves to place a drinking water container, in the form of a flat-sided space, which is a solid half-sphere.
Timpoan Atas			The shape of the top timpoan atas applies a rectangular flat shape to form a block shape.
Ornament			
Reong			Seen from above, the reong is shaped like a circle.

Saok			Saok serves as a place to put clothes and applies a rectangular flat shape, thus forming a block space.
Incense Holder			The incense holder applies a hemispherical shape to its top and bottom.
Gendang			The drum applies the flat shape of a circle to form the shape of a tube.
Meriuk Stone			The Meriuk stone resembles a solid spherical structure.
Rinceq			Rinceq applies the flat shape of a circle.

Ceretan			Ceretan apply the shapes of spatial figures, namely cones and tubes.

4. CONCLUSIONS

Based on the results and discussion presented previously, it can be concluded that the mathematical concepts found in the traditional houses of Desa Beleq include rectangles, triangles, trapezoids, circles, triangular prisms, blocks, tubes, cones, half spheres, and solid spheres, and the concept of geometric transformation (reflection) is found in the shape of the front building.

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