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OBJECT AND ACTIVITY MATHEMATICS IN SASAK CULTURE PRODUCT

Al Kusaeri[1*]
[1] Universitas Islam Negeri Mataram, Nusa Tenggara Barat, Indonesia
alkusaeri@uinmataram.ac.id

Abstract

Ethnomathematics is an approach to mathematics learning that focuses on the mathematical practices found in certain cultural products. Therefore, this study aims to identify mathematical objects and activities found in Sasak cultural products. The research data were obtained through observation and a study of the 4th-grade elementary school mathematics curriculum. The results are as follows: First, the art tools (gendang beleq and rincik), handicrafts (ceraken, peraneq, and kre' sesek), traditional houses (bale terang, sangkep, and lumbung), and various motifs found in the royal houses in the Narmada and Mayure parks. Second, Mathematical objects that can be identified include flat shapes (squares, regular and irregular polygons, triangles, and circles), tiling, similarity, congruence, symmetrical plane shapes, and solid shapes (cubes and blocks). Third, mathematics learning activities include: observing and identifying mathematical objects, exploring patterns and relationships, classifying mathematical objects, and presenting work results.

Keywords: Mathematical objects and activities, Sasak cultural products, ethnomathematics

INTRODUCTION

The government has been continuously improving the implementation and quality of education. The proof is that educational policy improvements continue to be innovated to achieve the expected educational goals. These efforts have also been carried out and implemented in the National Education System. No. 20 of 2003 states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual, religious strength, self-control,

personality, noble morals, and the skills needed by themselves, society, the nation, and the state.

Educational innovations undertaken by various institutions can be seen as a movement toward genuine educational renewal. The impact of globalization, which has unwittingly eroded local cultural values and the identity of local communities, has awakened us to a better orientation for educational delivery. Education is not simply about imparting knowledge, but also about developing attitudes and values that align with the conditions and needs of the surrounding community.

Mathematics, as a field of knowledge that emphasizes thinking skills, is inherently linked to the abilities and factors that influence a person's mindset. Students studying mathematics sometimes struggle with communication skills and with connecting mathematics to real-life situations, which makes the learning experience feel less meaningful. Problem-based learning, linked to real-life issues, can improve students' mathematical problem-solving skills, communication skills, and connections.

Issues relevant to everyday life naturally encompass all aspects and activities occurring within society, including cultural activities. Therefore, learning linked to cultural aspects is believed to be effective in improving students' mathematical abilities and their ability to recall existing knowledge (retention). Culture, as part of life and a shaping force, contains complex educational values that can be used to improve the learning process, including in mathematics lessons.

Murphy & Hall (2008) explain that "values about social relationships influence people's responses to cognitive questions." This statement shows that a child will be influenced by the values that develop in social relationships when seeking answers to what is on their mind. Bishop (Ernest, 1991) emphasizes that:

Mathematics... is therefore conceived of as a cultural product, which has developed as a result of various activities. Counting.. Locating.. Measuring.. Designing. .Playing.. Explaining.. Mathematics as cultural knowledge derives from humans engaging in these six universal activities in a sustained and conscious manner.

Mathematics is seen as a cultural product that is developed through various activities, such as counting, placing, measuring, designing, playing, and explaining. Everyone engages in these activities, whether consciously or not,

on a daily basis. Furthermore, it can be said that mathematics is closely related to everyday life. These activities are common to everyone. Thus, mathematics, as cultural knowledge, is derived from these activities in a specific, conscious, and continuous manner (attitude).

According to Vygotsky: "in classroom life, the meaning of mathematical concepts and the validity of mathematical statements are socially accomplished" (Stefe, et al. 1996: 25). Understanding that mathematics is a part of social life and culture, mathematics teachers should consider cultural factors as they relate to students' experiences when developing mathematics teaching materials. However, given the complex nature of cultural elements within a society, this endeavor will be challenging. Therefore, innovation is needed to ensure effective mathematics learning.

Ethnomathematics is introduced as an approach to understanding and teaching mathematics to students. The concept of ethnomathematics emerged to complement existing approaches, such as realistic mathematics and constructivism. The concept of "ethno" itself can be understood as something at the grassroots level, not something at the level of ideas. Ethnomathematics is defined as "the mathematics which is practiced among identifiable cultural groups such as national-tribal societies, labor groups, children of certain age brackets and professional classes." (D'Ambrosio, 1985:44). Mathematics is what is practiced by cultural groups such as ethnic groups in a particular country, labor groups, children of certain age groups, and professional classes.

Concrete objects around students can serve as learning resources, helping them become more familiar with the information teachers or students want to convey about the subject matter. This includes elements of local culture, as they are very close to students' daily lives.

Using an ethnomathematics approach, which relates mathematics to students' everyday cultural experiences, has been shown to improve their retention of statistical material compared to conventional methods. This success is attributed to making learning more relevant and familiar to students (Kurumeh, Onah, & Mohammed, 2012).

Based on the results of research conducted by (Tandiling, 2013) there is a relationship between cultural practices and mathematical concepts, including calculating operations (counting, measuring, determining locations, making designs, and games), as well as other potential for carrying out the

mathematics learning process. This is obtained from various forms of culture, such as oral literary traditions, daily life activities, and cultural arts artifacts.

Various studies that use cultural products in teaching mathematics have shown positive results, such as the use of African drumming and the rhythm of African songs to explain algebra material, supported by teachers' sufficient knowledge of the musical instrument's pitch rules (Sharp & Steven, 2007). Similarly, the use of Zulu culture, specifically Beadwork and Basketry, has been successfully used as a medium to develop mathematical knowledge while disseminating Zulu cultural values to students (Chahine & Kinuthia, 2013).

Cultural elements from each region include culture. The Sasak have systems and values that can be developed into guides and learning resources for organizing the teaching and learning process, while cultural products provide concrete objects for use in mathematics learning. To facilitate the implementation of culture-based learning, information is needed about real objects and mathematical activities contained in certain regional cultural products. Therefore, this study was conducted to provide information on implementing culture-based mathematics learning, namely "Ethnomathematics in Sasak Culture".

METHOD

This study uses a qualitative approach to assess the suitability of real objects and activities for mathematics. The study examined the schools found in the Sasak cultural products. The research was conducted in Lombok, West Nusa Tenggara, from September to December 2016. The study was conducted by observing and searching for documents at historical sites related to the Sasak people.

This research was conducted by identifying Sasak cultural products in the form of art tools, crafts, traditional house designs, and artifacts found in Narmada and Mayure Parks. The results of the cultural product identification were then analyzed using the school mathematics curriculum to identify tangible objects and mathematical activities that can be performed using various Sasak cultural products.

The required data consists of real objects and student learning activities that can be conducted through the Sasak cultural products. These data were collected using observation guidelines, document analysis, and literature review. The data obtained were then classified by the mathematical forms they

represent and translated into activities aligned with the school mathematics curriculum.

RESEARCH RESULTS AND DISCUSSION

The research results obtained in identifying Sasak cultural products to find real objects and school mathematics activities based on the mathematics curriculum are as follows:

Mathematical Objects

The Sasak cultural products collected through this research can be used to observe various square and geometric shapes, tiling, and similarity. Therefore, student learning activities that can be carried out using Sasak cultural products are as follows:

1) Various Square Shapes (Regular and Irregular)

A shape consisting of a number of sides is called a polygon. Polygons are plane shapes bounded by several sides and are divided into two types: regular polygons and irregular polygons. A regular polygon is a polygon whose sides are of equal length and whose angles are of equal measure, such as an equilateral triangle, a square, a regular pentagon, and so on. An irregular polygon is a polygon whose sides are of unequal length and whose angles are of unequal measure.

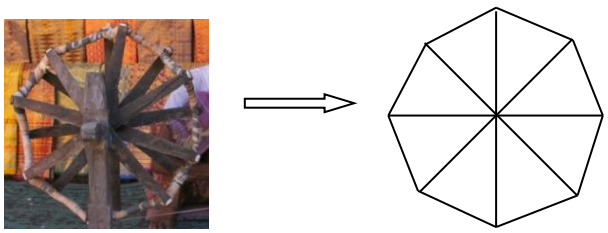

Figure 1. Identifying regular polygons

Prane' is a thread-spinning tool that, in student learning activities, can be illustrated as an octagonal shape and is included in regular polygons because each side has the same length and angle.

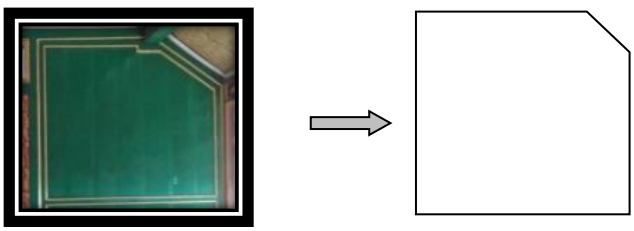

Figure 2. Identifying irregular polygons

The wall section of the king's resting place in Narmada Park is pentagonal, an irregular polygon.

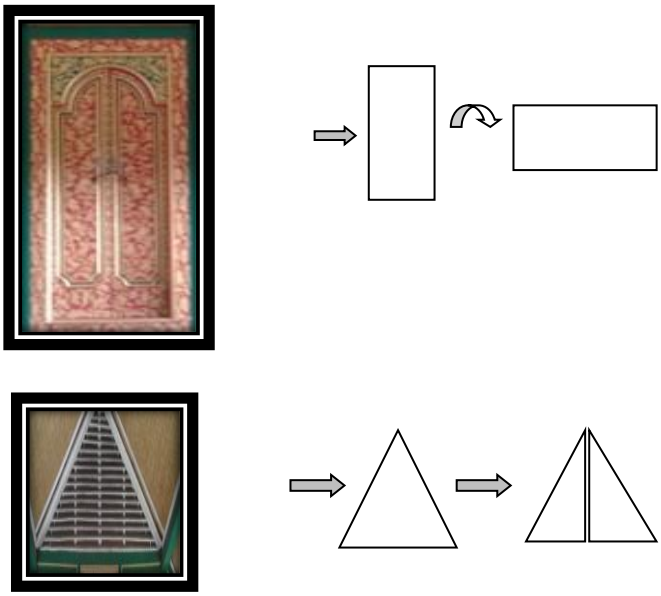

Figure 3. Identifying rectangles and triangles

Student activities observing the shape of the door and its top at the king's resting place in Narmada Park yielded rectangular and triangular flat shapes.

Student activities in observing Sasak cultural products and finding various square shapes can serve as a medium for understanding the concept of squares, regular and irregular polygons, recognizing and understanding the properties of flat shapes, and determining the perimeter and area of flat shapes.

2) Symmetrical, Similar and Tiling Plane Shapes

A symmetrical shape is a shape that can be folded (divided) into two parts that are exactly the same in both shape and size. An asymmetrical shape is one that is not symmetrical. The fold line that determines a symmetrical object is called the line of symmetry or axis of symmetry. The line or axis of symmetry is needed to determine whether flat shapes that look the same in shape and size, when folded together, will have their outer sides meet exactly.

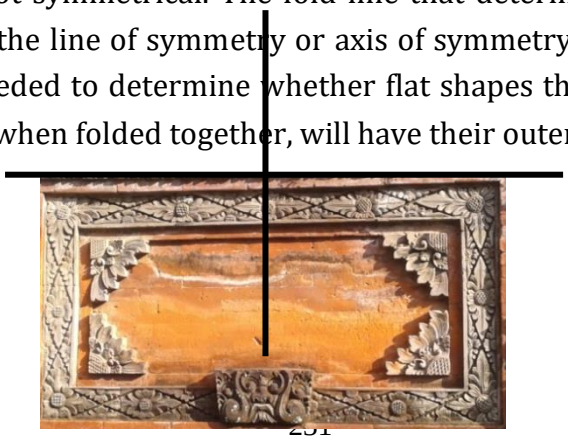

Figure 4. Illustration of a symmetrical flat shape

The illustration above shows that one of the motifs in the Sasak cultural heritage building consists of two parts of the same shape and size, which, if divided in the middle of the image, would meet at the outer edges if folded into two halves along its symmetrical axis. So, the motif above is a symmetrical plane shape. A plane shape is said to be symmetrical if it has at least one line or axis of symmetry. By observing the various forms of artifacts found in Sasak cultural products, students can be asked to identify symmetrical shapes as follows.

Figure 5. Identifying symmetrical and similar plane shapes

The image above illustrates symmetrical, similar flat shapes found in Narmada Park, such as the window leaf and an abstracted gate. Each displays a flat shape with one axis of symmetry. Observing these, students can explore symmetrical flat shapes in architectural and Sasak cultural products, as shown in the following image.

The fabric motif above can serve as a medium for developing students' understanding of similar flat shapes.

Figure 6. Identifying tiling shapes

The picture of the entrance to Narmada Park and the cloth motif above can be used to carry out student activities in observing tiling using flat shapes.

Mathematics Learning Activities

Learning activities are essential actions students engage in during mathematics instruction. Experts identify these as visual, verbal, auditory, writing, drawing, motor, mental, or emotional activities, often occurring together due to the complex nature of learning mathematics.

Applying the Sasak cultural products to mathematics education, students can engage in mathematics learning activities such as:

1) Observing Mathematical Objects

Observation activities are important for students as a first step in gathering information from concrete objects available in their surroundings. Sasak cultural products, as part of the objects found in the students' surroundings, can be used as objects of observation. The process of observing Sasak cultural products is carried out to discover various forms of real mathematical objects.

Students observed Sasak cultural products, including art instruments (gendang beleq, rincik), crafts (kereng sesek, paranaek, caraken), traditional houses (lumbung, balai terang), and motifs, at the king's house in Narmada Park and Mayure.

2) Identification of Mathematical Objects

Students' observations of Sasak cultural products reveal distinct flat shapes (polygons, squares, triangles, circles) and spatial forms (cubes, cuboids). These mathematical objects are identified by precisely redrawing the patterns found in Sasak cultural products.

The process of identifying various forms of real mathematical objects in Sasak cultural products is carried out in groups. Each group is directed by the teacher to find as many flat or spatial shapes as possible and draw them on the provided paper. In carrying out learning activities, each group assigns different tasks to its members, so that the process of identifying real mathematical objects found in Sasak cultural products can run more effectively. The division of tasks includes observing the Sasak cultural product

documents available in the Student Book and redrawing various flat and spatial shapes found in them.

3) Pattern and Relationship Search

Pattern tracing is the process of identifying the properties of real mathematical objects. This identification is conducted based on their shape, number of sides, and angles. This process aims to identify the characteristics of real mathematical objects, making it easier to group them.

The exploration of patterns and relationships of flat or spatial shapes carried out by students using Sasak cultural products, namely: exploring the properties of flat shapes (squares, rectangles, and triangles), is carried out by calculating the number of sides, measuring the length of the sides, and measuring the size of the angles of the identified flat shapes. Next, students identify the pattern of flat shapes found in Sasak cultural products, which are symmetrical or similar, and the shapes of the cube and the cuboid with their nets.

4) Classification of Mathematical Objects

Real-world object classification groups mathematical objects based on patterns. This helps students understand concepts. All members join the activity and share their opinions to reach the correct classification. Building on this collaborative effort, students apply their classification skills to culturally relevant materials.

Based on real mathematical objects found in Sasak cultural products, students group flat shapes, including regular and irregular squares, and spatial shapes, as well as nets of cubes and cuboids, and explore similarity and symmetry.

5) Math Problem Solving

Problem-solving is a learning activity in which students use their prior knowledge to solve problems. The problem-solving process uses mathematical objects found in Sasak cultural products, which are then transformed into mathematical forms, a process known as mathematization. This activity is intended to improve students' problem-solving skills and knowledge of their surroundings.

Problem-solving activities using Sasak cultural products involve tasks such as tracing characteristics and grouping flat shapes (including regular and irregular polygons), identifying the properties of both flat and spatial shapes, calculating the area and perimeter of flat shapes, determining the area of

squares, rectangles, and triangles, recognizing symmetrical flat shapes, and constructing net patterns for cubes and cuboids. These activities are intentionally designed to connect mathematical concepts with concrete examples drawn from the Sasak culture, ensuring a cohesive learning experience.

The existence of regional cultures in a country cannot be ignored in society, as each regional culture plays a very important role in shaping social life. The cultural values and products that are close to and embedded in Indonesian society are an extraordinary strength and should be well utilized as a basis for developing various aspects of life, including education and learning. Cultures, like other regional cultures, also have cultural products that can serve as a basis for learning mathematics.

Conclusion and Suggestions

The conclusion of the research on ethnomathematics in the Sasak culture that has been conducted is that, first, Sasak cultural products that can be collected to find real objects and mathematical activities are art tools (Gendang Beleq and Rincik), craft products (Kereng Sesek, Paranek, and Caraken), traditional house forms (Lumbung and Balai Terang), and artifacts found in Mayure and Narmada Parks. Second, Real Mathematical Objects that can be identified are flat shapes (squares, regular and irregular polygons, triangles, and circles), tiling, similarity, congruence, symmetrical plane shapes, and solid shapesBuilding (cubes and blocks). Third, the mathematics learning activities carried out by students in participating in the Sasak culture-based mathematics learning process are observing, identifying, finding patterns and relationships, and classifying real mathematical objects, as well as presenting work results on real mathematical objects found in Sasak cultural products, and solving problems contained in the Student Book and LKS.

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