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Ethnomathematics In the Museum of Sasmitaloka Panglima Besar Jendral Sudirman Yogyakarta In Improving Students' Creative Thinking Ability

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ABSTRACT

Ethnomathematics as a medium in learning mathematics also aims to introduce and preserve culture or history in Indonesia. Creative thinking is a thinking process to connect concepts in mathematics with real objects it faces, so it takes perseverance, personal discipline, which involves mental activities such as observing, asking questions, analyzing, using new information and unusual ideas to synthesize, make connections. , relationships, connecting with each other to form new understandings or concepts intuitively. In this regard, the aim of this research is to improve students' creative thinking skills in learning mathematics, especially rectangular and triangular shapes by providing treatment in mathematics learning using the ethnomathematics of the Sasmitaloka Museum Panglima Besar Jenderal Sudirman. This research was conducted at SMP in Yogyakarta. This research is a quasi-experimental study with a sample of 30 students divided into 2 classes, namely the control class and the experimental class. Based on the results of the study, it was concluded that there was an increase in students' creative thinking skills on the material of rectangles and triangles with the ethnomathematics of the Sasmitaloka Museum Panglima Besar Jenderal Sudirman in class VIII students where the Asymp score. Sig is less than 0.05, so it can be concluded that ethnomathematics can improve students' creative thinking skills.

Keywords: ethnomathematics, creative thinking, Jendral Sudirman Museum

ABSTRAK

Etnomatematika sebagai media dalam pembelajaran matematika juga bertujuan untuk memperkenalkan dan melestarikan budaya atau sejarah yang ada di Indonesia. Berpikir kreatif adalah proses berpikir untuk menghubungkan konsep dalam matematika dengan objek nyata yang dihadapinya, sehingga dibutuhkan ketekunan, disiplin pribadi, yang melibatkan aktivitas mental seperti mengamati, mengajukan pertanyaan, menganalisis, menggunakan informasi baru dan ide-ide yang tidak biasa untuk mensintesis, membuat koneksi, hubungan, menghubungkan satu sama lain untuk membentuk pemahaman atau konsep baru secara intuitif. berkaitan dengan hal ini, maka bertujuan penelitian ini adalah untuk meningkatkan kemampuan berpikir kreatif siswa dalam pembelajaran matematika khususnya bentuk persegi panjang dan segitiga dengan memberikan perlakuan dalam pembelajaran matematika menggunakan etnomatematika Museum Sasmitaloka Panglima Besar Jenderal Sudirman. Penelitian ini dilakukan di SMP Piri 1 Yogyakarta. Penelitian ini merupakan penelitian eksperimen semu dengan jumlah sampel 30 siswa yang terbagi menjadi 2 kelas, yaitu kelas kontrol dan kelas eksperimen. Berdasarkan hasil penelitian disimpulkan bahwa terdapat peningkatan kemampuan berpikir kreatif siswa pada materi persegi panjang dan segitiga dengan etnomatematika Museum Sasmitaloka Panglima Besar

Jenderal Sudirman pada siswa kelas VIII dimana nilai Asymp. Sig (2-tailed) kurang dari 0,05, sehingga dapat disimpulkan bahwa etnomatematika dapat meningkatkan kemampuan berpikir kreatif siswa.

Kata kunci: Etnomatematika, Berpikir Kreatif Museum Jendral Sudirman

INTRODUCTION

Learning is a cultured process that produces changes that aim to educate the nation's life (fatkhurahman et al, 2021; Wahyudi et al, 2021; Putra et al, 2020; Bank, 2015; Barton, 1996). Mathematics is one of the subjects that has a fairly important role in terms of learning in students' thinking abilities, where one of them is logic which is the foundation in students' creative mathematical thinking concepts (Ayal et al, 2016; Hakim et al, 2019; Mulyaningsih & Ratu, 2018; Siswono, 2008). With this thinking foundation, students can construct a mindset that will affect the pattern of intelligence and creativity (Puente-Díaz & Cavazos-Arroyo, 2017). In creative thinking, a person will go through many stages of synthesizing ideas, as well as giving birth to new concepts that are far more perfect in planning the use of ideas and implementing these ideas so as to produce something new and more perfect (Siregar et al, 2020; Ibrahim & Widodo, 2020).

One of the subjects that can train students' thinking skills is mathematics (Widana et al, 2018). Mathematics lessons can help students to think mathematically, logically, analytically, critically, and creatively (samo & Kartasasmita, 2017; Maharani, 2014). These skills or abilities become something that is considered necessary for students to utilize and manage information during uncertain, competitive and ever-changing circumstances or situations (Morris & König, 2020). However, many students find it difficult to understand mathematics, so many students are reluctant to learn it. This makes the learning process less meaningful. So that the learning that occurs is only up to the teacher explaining and students listening and at least the learning experience that students get.

Basically, education and culture have a close relationship, where culture is the main basis for instilling character or affective values. In today's mathematics learning, it is rare to combine learning with culture. Ethnomathematics as the practice of mathematics within a cultural group that can be identified as the idea of studying mathematics (D'Ambrosio, 2001; Gerdes, 1994). The process of learning mathematics with ethnomathematics or learning by inserting cultural elements in mathematics learning can be used as an alternative as an incentive for students to be able to think creatively. So that in learning mathematics, students can bring out their creativity from the values obtained, including cultural elements that are inserted. Ethnomathematics has various ways of conceptualizing mathematics by taking into account the academic knowledge of mathematics obtained from various sectors of society and by considering the various modes in which mathematical practice can grow from different cultures (Ditasona, 2018). Not infrequently around us or something that is always side by side in our lives there must be an element of culture. In the area located in Yogyakarta, there is one element of culture or historic buildings. One of the cultural elements is the Sasmitaloka Museum, the Great Commander General Sudirman. From the museum, we will look for links with cultural elements that will be connected with mathematics learning which is then followed by students' creativity in finding mathematical values that are embedded in culture.

Creativity is a person's skill or ability to integrate information and generate new ideas or solutions that reflect fluency (Montag-Smit, & Maertz Jr, 2017). Creativity is the ability to produce and create something new (Hisrich, & Soltanifar, 2021). With creativity, someone can produce something. Learning mathematics will always demand an innovation. Innovation is an activity that produces a renewal (Coeman et al, 2015). With learning innovations in mathematics, students will be able to see the relationship between objects found around them and objects in mathematics. With creativity and innovation in learning, it will lead students to think logically, analytically, critically and creatively (Triana et al, 2020; Sumarni & Kadarwati, 2020). One of the subjects that can train students' thinking skills is mathematics (Pratama & retnawati, 2018). Mathematics lessons can help students to think mathematically, logically, analytically, critically, and creatively (Maharani, 2014; Ayal et al, 2016). These skills or abilities become something that is considered necessary for students to utilize and manage information during uncertain, competitive and ever-changing circumstances or situations. The problem is that many students find it difficult to understand mathematics, so there are students who are reluctant to learn it. Students who are reluctant to learn mathematics, then accept mathematics lessons are only seen as something that must be faced, not a need to be understood and understood. Thus making the learning process less meaningful.

Learning mathematics that is meaningful is learning mathematics that is able to connect the mathematical material being studied with the needs of students, and is able to connect something that is found to be constructed into a learning material (Simamora & Saragih, 2019). Constructivist view, in the learning process students build their own knowledge through the active involvement of students (Suhendi, 2018). This view explains that students construct knowledge from their own experiences, students learn by linking experiences or knowledge that already exists in their minds with new knowledge so that students build their knowledge through creative thinking processes so that they can more easily understand and learn an object.

Ethnomathematics is learning mathematics that grows and develops and is influenced by culture (Wahyudi et al, 2021; Putra et al, 2020; Gerdes 1994). Mathematics is part of culture, so learning mathematics is a process to recognize, understand, develop, and preserve culture. Learning mathematics based on culture is one way that it can be perceived that meaningful and contextual mathematics learning is closely related to the cultural community, where mathematics is learned and implemented in real life (Simamora & Saragh, 2019). With real experience it will generate motivation in learning. Someone with high motivation will produce high learning outcomes (Lin & Chen, 2017). The process of learning mathematics with ethnomathematics or learning by inserting cultural elements in mathematics learning can be used as an alternative as an incentive for students to be able to think creatively. So that in learning mathematics, students can bring out their creativity from the values obtained, including cultural elements that are inserted.

Yogyakarta has historical buildings that can generate motivation to learn mathematics. One of the cultural elements is the Sasmitaloka Museum, the Great Commander General Sudirman. From the museum, it is possible to find links to cultural elements that will be linked to learning mathematics, which is then followed by students' creativity in finding mathematical values that are embedded in culture. This is because the culture contained in the Panglima Besar Jendral Sudirman museum is

buildings and all forms that can be compared with shapes in mathematics. With ethnomathematics, it will build students' creativity in learning mathematics, so that it will help students in improving students' creative thinking skills.

Through this article, it is hoped that cultural and historical places, especially in the Sasmitaloka Museum, Panglima Besar Jenderal Sudirman, Yogyakarta, can be used in the learning process of mathematics on quadrangle and triangle material. It is also hoped that this can be used as a learning resource to increase knowledge and motivation to learn, as well as be used to measure students' creative thinking abilities. By using the ethnomathematics of the Sasmitaloka Museum, the Great Commander General Sudirman, is there an increase in students' creative thinking skills in the material of rectangles and triangles.

METHOD

This research was conducted at SMP Piri in Yogyakarta which consisted of two classes, as the control class and the experimental class. The variables in this study were the ability to think creatively using an ethnomathematical approach and without an ethnomathematical approach.

This research is a type of quasi-experimental research. Quasi-experimental research was chosen because the researcher wanted to apply an action or treatment. The action in the research is treatment with an ethnomathematical approach, to increase the efficiency and effectiveness of the work so that the results become more optimal (Mulyatiningsih, 2014). The design used in this study is a classical experimental design. The classical experimental design has four data groups (O), namely the pre-test data for the treatment group (O1) and the control data group (O3) and the post-test data for the treatment group (O2) and the control group (O4).

There are two treatments in the study, namely using an ethnomathematical approach and without an ethnomathematical approach. The data collection technique used a test technique, namely to collect data on creative thinking skills pre-test and post-test. The data obtained were then collected and analyzed to determine an increase in students' creative thinking skills after using the ethnomathematics of the Sasmitaloka Museum Panglima Besar Jenderal Sudirman. The data analysis technique used the paired sample t-test where previously the prerequisite tests were carried out, namely the initial ability difference test, normality test and homogeneity test of test results, post-test and pre-test differences (improvement). The test of increasing students' creative thinking skills in learning mathematics by using the average difference test from the difference between the post-test and pre-test and the paired sample t-test. The next stage is to interpret students during the learning process. The last stage is processing data and analyzing research results. Data analysis was conducted to determine whether the ethnomathematical approach could improve the creative thinking process.

RESULT AND DISCUSSION

The Sasmitaloka Museum of the Great Commander General Sudirman, Yogyakarta, is one of the historical museums used to commemorate heroes, especially the Great Commander General Sudirman. This museum is located on Jl. Bintaran Wetan No. 3, Gunungketur, Pakualaman,

Yogyakarta City. In Javanese, Sasmitaloka means a place to remember and reminisce (Rahardjo, 2019). The museum, which is under the management of the Indonesian Army, was indeed established with the aim of commemorating the services and dedication of General Sudirman. The collections owned by the Sasmitaloka Museum include buste statues of General Sudirman, a collection of weapons and various award certificates, equipment and uniforms that are used daily while on duty, including replicas of signs used during the Guerrilla war.

Figure 1. The Sasmitaloka Museum, the Great Commander General Sudirman, Yogyakarta

Mathematics applied by groups of workers/farmers, children from certain classes of society, professional classes, and so on (Gerdes, 1994). Ethnomathematics includes mathematical ideas, thoughts and practices developed by all cultures (Barton, 1996). Ethnomathematics at the Sasmitaloka Museum Panglima Sudirman Yogyakarta in which there are historical heritage objects, from which these objects can be taken in shape which will be used as mathematics learning in rectangular and triangular building materials as an alternative in improving students' creative thinking skills.

Measurement of creative thinking skills needs to be done to find out the description of students' creative thinking skills so that teachers can design methods, strategies, and learning models that can improve creative thinking skills (Purwati & Alberida, 2022). Creative thinking skills is relationship between creativity and problem solving and problem posing generally uses 3 main components in "The Torrance Test of Creative Thinking (TTCT)" namely fluency, flexibility, and novelty (Siswono, 2008; Krisdiana et al, 2019). There are 3 indicators of creative thinking according to Silver in (Mulyaningsih & Ratu, 2018), as can be seen in Table 1.

Table 1. Indicators of Creative Thinking Ability

Student of skill	Creative Thinking Component
Students can solve problems with various solutions and answers	Fluency
Students can solve problems in one way, then in another way. Students discuss various methods of solving.	Flexibility
Students check answers with several methods of completion or answers, then make other different ones.	Novelty

Creative thinking abilities also have different levels, the characteristics of learning mathematics in each student show a degree or level called Creative Thinking skills level (TKBK) which is stated by Siswono (2008), as can be seen in Table 2.

Table 2. Creative Thinking skills Level

Creative Thinking Ability Level	Characteristics of Creative Thinking Ability
TKBK 4 (Very Creative)	Students in solving and posing problems have met novelty, flexibility, and fluency
TKBK 3 (Creative)	Students in solving problems are able to bring up novelty and flexibility without fluency or able to show novelty and fluency but without flexibility
TKBK 2 (Creative Enough)	Students are able to come up with novelty but are not flexible or fluent, or show flexibility and fluency without novelty in solving problems
TKBK 1 (Less Creative)	Students in solving problems are only able to bring up indicators of flexibility or fluency
TKBK 0 (Not Creative)	Students cannot propose or provide solutions that meet novelty, flexibility and fluency in solving problems

Based on the exploration results, the Sasmitaloka Museum Panglima Besar Jenderal Sudirman has ethnomathematical objects that can be used in the mathematics learning process in improving students' creative thinking skills. From the triangular shape of the Juki weapon in Fig. 2, we get a triangular shape. The triangle has three sides, three angles, and the sum of the three angles is 180°.

Figure 2. Japanese-made Juki weapons which were looted in Kido Butai Purwokerto and used by TKR against the allies in Ambarawa City in December 1945

In addition to finding triangular shapes, other shapes can also be found from the building plan of the Sasmitaloka Museum, Panglima Besar Jenderal Sudirman, Yogyakarta in Figure 3, namely the rectangular and triangular shapes contained in combined flat shapes. From the red composite figure, we can find various rectangles and triangles by separating each part. The shapes that can be found are triangles, rectangles, and trapezoids. Many ethnomathematical objects are found in the Sasmitaloka Museum of the Great Commander General Sudirman. So, it can be used as an activity in learning mathematics.

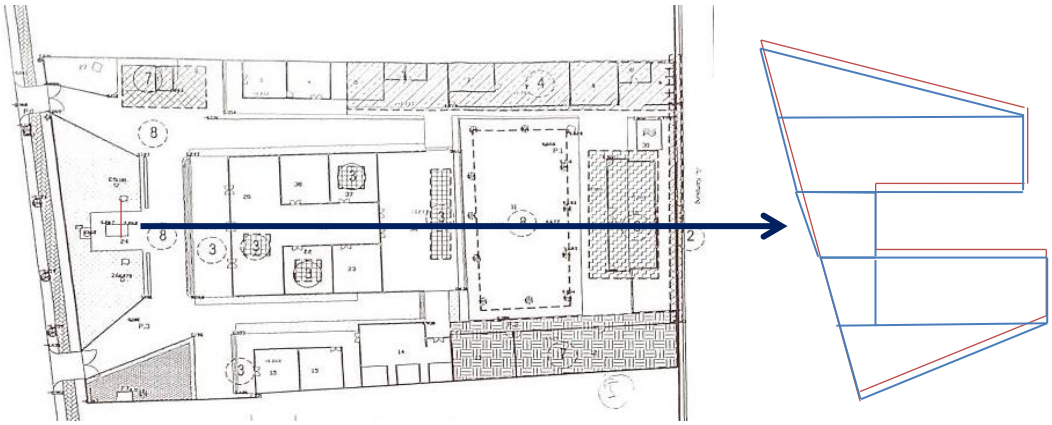


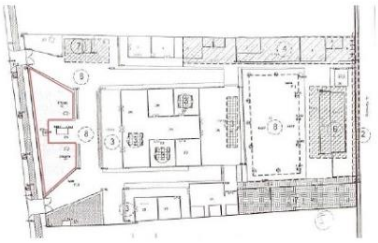
Figure 3. The floor plan of the Sasmitaloka Museum, the Great Commander General Sudirman, Yogyakarta

Activities carried out include: finding geometric shapes on ethnomathematical objects. can create examples of other composite shapes from the shapes that have been found previously. The example in Figure 4 shows that ethnomathematical learning shows creative thinking on the material of rectangles and triangles related to angles. Figure 5 shows ethnomathematical learning in improving creative thinking skills on rectangular and triangular materials.

Gambar 1. Atap Museum Sasmitaloka Panglima Besar Jenderal Sudirman

Figure 4. Mathematics Learning Activities Museum Roof Sketch

Figure 4 is mathematics learning activities at the Sasmitaloka Museum, the Commander in Chief General Sudirman, Yogyakarta on the Material of Quadrilaterals and Triangles Related to Angles. Figure 5 is mathematics learning activities at the Sasmitaloka Museum, the Commander in Chief, General Sudirman, Yogyakarta, on the Material of Quadrilaterals and Triangles Related to Circumference and Area.



Gambar 2. Denah Museum Sasmitaloka
Panglima Besar Jenderal Sudirman

Perhatikan denah di atas, terlihat pada gambar dengan garis berwarna merah memiliki suatu ukuran, maka tentukan:

a. Terdiri dari gabungan bangun datar apa saja gambar dengan garis berwarna merah di atas? Buatlah gambar bangun datar yang menyusunnya!
b. Jika keliling bangun datar di atas adalah 72, gambarlah bangun datar gabungan yang lain serta tuliskan ukurannya yang memiliki keliling yang sama dengan bangun datar di atas!

Figure 5. Mathematics Learning Activities Museum Floor Plan

Based on the data collected, and the research findings have been registered, then analyzed to determine the improvement of students' creative thinking skills with the ethnomathematics of the Sasmitaloka Museum Panglima Besar Jenderal Sudirman Yogyakarta in class VIII subjects at SMP Piri 1 Yogyakarta. Where is described from the post-test results obtained as in Table 3.

Table 2. result of post test

Source of Variation	Experiment Class	Control Class
amount	1255,52	561,05
N	16	14
$\overline{X}$	78,47	40,07
Variance (S2)	188,57	230,09
Standard Deviation (S)	13,73	15,16

Based on the post-test results of students' mathematical creative thinking skills, it shows that the average creative thinking ability of experimental class students is higher than the control class, and has increased from before being treated to after being treated in both the experimental class and control class. The hypothesis test uses a non-parametric test, namely the Wilcoxon test because based on the results of statistical calculations, the pre-test and post-test data are not normally distributed. The Wilcoxon test is used as an alternative to the paired sample t-test if the research data is not normally distributed. Based on the output of the hypothesis test, it is known that the Asymp.Sig (2-tailed) value is 0.000. Because the value of 0.000 is smaller than 0.05 (0.000, 0.05), it can be concluded that "The hypothesis is accepted". This means that there is a difference between the results of students' creative thinking abilities for the pre-test and post-test in the ethnomathematics of the Sasmitaloka Museum, Panglima Besar Jenderal Sudirman.

CONCLUSION

The Sasmitaloka Museum of the Great Commander General Sudirman in it contains objects with cultural and historical elements that cannot be separated from rectangular and triangular

shapes. So that from these objects there are applications of rectangular and triangular material in mathematics learning, such as square shapes, rectangles, trapezoids, rhombuses, Use the "Insert Citation" button to add citations to this document.

kite and triangle. The shape of the object or something related to the museum can be used as a source of learning mathematics for students. In addition, students also gain cultural and historical insight, as well as increase students' knowledge about the existence of mathematics in one of the places that has cultural and historical elements, namely the Sasmitaloka Panglima Besar Yogyakarta Museum, can find out the categories of students at the Creative Thinking Ability Level (TKBK) based on the results creative thinking ability test, improve students' creative thinking skills and motivate and facilitate students in solving problems in learning mathematics.

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