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Ethnomatematics Contain In Problem Based Learning to Improve Students Understanding about Geometry by Using Concept Of Cultural Buildings in Semarang

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Abstract

The purpose of this research was to analyze the model of Problem Based Learning based on ethnomatematics of cultural buildings in Semarang improving understanding of geometrical concepts of the fourth grade students' of SD Negeri Candi 01 Semarang. The type of research was quantitative with true-experimental design by using pretest-posttest control design models. The subjects' were 60 students of the fourth grade of elementary school that were divided proportially into a control group and an experimental group. The data collection technique used was essay test. The effectiveness was indicated from classical completeness with minimum completeness criteria (KKM), difference of average understanding of experimental and control class, improvement of understanding of geometry concept of experimental class. The results showed that (1) the understanding of the concept of geometry by using Problem Based Learning contained ethnomatematics of cultural building in Semarang has reached the classical completeness of 75%; (2) the average understanding about geometry concept of the experimental class with the learning model of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang is better than the average understanding of the concept of geometry with the learning of Problem Based learning in the control group; (3) there is a difference in the understanding of the concept of geometry before and after the learning through Problem Based Learning contained ethnomatematics of cultural buildings in Semarang. In conclusion, the use of the Problem Based Learning contained ethnomatematics of cultural buildings in Semarang is effective in improving students' understanding of geometrical concept.

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INTRODUCTION

The research result of Dzulfikar (2017), commonly found misconceptions in learning mathematics, particularly in concept of geometry, for example, is an understanding of the concept of square and rectangular. Students have misconceptions about perspective drawing and errors of students due to the habit of drawing a square and a rectangle in the normal position.

Research by Mathew (2016), shows that it is very important to position the students as a problem solver who is able to use mathematics to understand the problem in the the world growing fast. According to the research study of Hendriani, Masrukan, & Junaidi (2017), they revealed that solve the problem about daily life can improve students problem-solving abilities. Similar results were also described in the research of Saputro & Masrukan (2017), after the implementation of Problem Based Learning, students are able to attain mastery learning as well as to answer questions with the correct answer and also be able to write and communicate the answer.

The research results of Sinclair & Bruce (2015) show that the teaching of geometry in elementary school requires an emphasis on drafting, classificating, comparing and manipulating geometry objects. Arifin (2014), said that the implications of the properties of geometry can be easily found in the student's neighborhood. Based on observations and interviews with the fourth grade teacher of SD Negeri Candi 01 Semarang, the data of the midterms test result of the first semester in the academic years of 2017/2018, of the 27 students, there were 13 students (48%) who achieve the minimum completeness criteria (KKM), and 14 students (52%) who have not reached the KKM.

The minimum completeness criteria (KKM) of mathematics subject matter is 65. The classical completeness is set at 75% (Masrukan, 2017). It shows that the student learning outcomes was still low. Moreover, based on interviews with teachers and students, students' understanding of the concept was also low seen from the ability of students in answering the question based analysis which was still low, means that most of them cannot perfomed correct answer to the question succesfuly. Students were difficult to understand the problems that occur in the essay test and interpret it in the mathematical sentence.

Thus, in line with the facts found by Fuadiah in her study (2013), in accordance to the phases of Van Hiele, elementary school students, including in the sorting stage where students are able to sort and identify geometry. At this stage, the students have the ability in making inferences or deductive reasoning though but it is not fully developed so that they need a tangible objects to help them to construct their understanding.

The findings are also supported by Fiantika (2017) who explains that the experience is a supporting factor in solving the problem solving. Students are able to establish a definition of geometry by using analogical thinking in drafting a definition. Prabawati (2016) mentions that there are many craft products which can be utilized in the classroom learning, primarily as a learning resource or generate a model or ethnomatematics based learning method. One of them is the result of research by Febrian (2017), which informed that the learning activities contained ethnomatematics by using tenun cloth of Melayu, can trigger the students' reasoning ability in understanding geometry.

Based on several previous studies that have been conducted, found a research gap in the form of limitation in the previous studies. There were not any studies that found specifically examine the understanding of geometrical concepts of elementary school students through the learning of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang, particularly in elementary schools.

Based on the above reason, therefore it is necessary to implement a learning model that provides a stimulus for students to enhance the students' understanding of the concept, which is the model of Problem Based Learning contained ethnomatematics of cultural buildings of Semarang. According to Arends (2007), Problem Based Learning is a form of learning that has

essence to presents a real problem situations found in the students' daily activities.

Sani (2014) argues that the Problem Based Learning presents a discussion of a problem before studying the concepts which is necessary for its completion so that the problem becomes the basis of learning. In addition, Huda (2013) states that Problem Based Learning is learning gained through the process towards understanding the resolution of a problem. In the implementation, Agraw (2017) argues that the Problem Based Learning is an instructional method in which the relevant issue was introduced in early learning and is used to provide context and motivation in learning.

The implementation of Problem Based Learning contained ethnomatematics is a learning activities which is combined with the material contained ethnomatematics. According to Martyanti (2018), ethnomatematics aims to study on how learners can understand, articulate, process, and finally use mathematical ideas, concepts, and those practices and are expected to be able to solve the problems associated with their daily activities.

Zaenuri (2018) states that the detailed observations on cultural buildings in Semarang showed various geometry, for example in the building of the Great Mosque of Central Java (Masjid Agung Jawa Tengah), Blenduk Church, Sam Poo Kong, Lawang Sewu, and Jiwa Sraya Building (Gedung Jiwa Sraya).

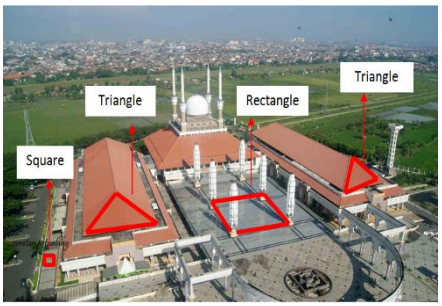


Figure 1. Geometry Found in The Building of The Great Mosque of Central Java

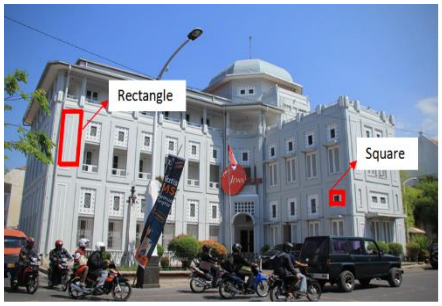


Figure 2. Geometry Found in The Building of The Jiwa Sraya

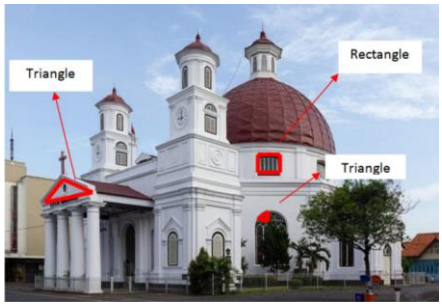


Figure 3. Geometry Found in The Building of The Lawang Sewu

Figure 4. Geometry Found Sam Poo Kong Temple Building

The learning of Problem Based Learning contained ethnomatematics of cultural buildings designed to introduce the concepts of geometry through observation and problem resolution to the images of cultural buildings with the following steps: (1) to orient students to the problem; (2) to organize the students to learn; (3) to investigation the problem by individual or group; (4) to develop and present work; and (5) to analyze and evaluate the process of solving to the problem by using images of cultural buildings in Semarang.

METHODS

This research is an experimental research. The design used was true-experimental design, The pretest-posttest control design.

Table 1. The Design of the Research

Class		Treatment	
Experiment	T1	Learning by using the Problem Based Learning contained ethnomatematics of cultural buildings in Semarang	T2
Control	T1	Learning by using the Problem Based Learning	T2

Information
T1: Test of understanding of the concept of geometry
T2: Test of understanding of the concept of geometry

The population in this research were the total of the fourth grade students of SD Negeri Candi 01, Candisari Semarang academic year 2017/ 2018, with the number of students were 60 students. Those 60 students were divided into 2 groups, 30 students taken for each group, 30 as control group, an 30 as experimental group. The data collection techniques was by using essay test. The data collection instruments used were a test conducted in pretest and posttest before and after the learning.

RESULTS AND DISCUSSION

The Normality and Homogeneity of Research Data

Tabel 2. Normality Data Test

Prerequisites Test	Group	Score	Sig	Conclusion
Normality test	Experiment	0.928	0.05	Normal
	Control	0.704		

Based on Table 2, the .sig value of the Kolmogorov-Smirnov test was 0.928 for experiment class and 0,704 for control class. Since the .sig value was greater than 0.05, then both data of both group learning interest is considered in the category of normal (Slameto, 2014).

Base on Table 3, we got 0.270 of the sig. value at based on mean. Since the sig. value on based on mean greater than 0.05, then both data of test result is a homogeneous data (Slameto, 2014).

Tabel 3. Homogeneity Data Test Result

	Levene statistic	df_1	df_2	Sig
Based on mean	1.242	1	58	.270
Based on median	1.305	1	58	.258
Based on median and with adjusted df	1.305	1	57.5	.258
Based on trimmed mean	1.275	1	58	.263

Classical Completeness

The results showed that the value of understanding of the concept of geometry in both classes can be seen in Table 4 below.

Table 4. The Results of the Concept Test

Class	N	Average	Max	Min	Completeness (%)
E	30	78	100	52	83
K	30	60	94	50	17

Information
E : Experimental Class
K : Control Class

The test results of the understanding the concept of geometry in the experimental class seen on Table 4, the percentage of students who completed the learning were 83% and those who cannot completed the learning were 17%, for more detail can be seen in Figure 5 below:

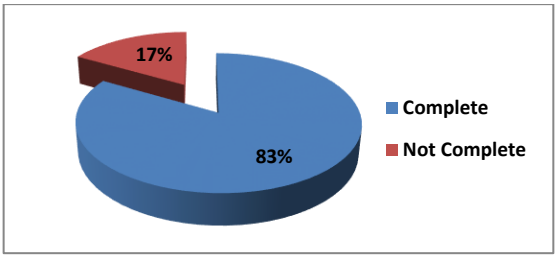


Figure 5. The Completeness of the Understanding of Concept in Experimental Class

The test results of understanding of the concept of geometry in control class seen on Table 3, the percentage of students who pass the learning was 60% and 40% of them could not completed the test, for more detail can be seen in Figure 6 below.

Based on the identification of students' work results, most students who did not reach the KKM, had difficulties in counting operations. Most of them have been able to determine the circumferential formula and area, but have not

been able to complete the multiplication or mix count.

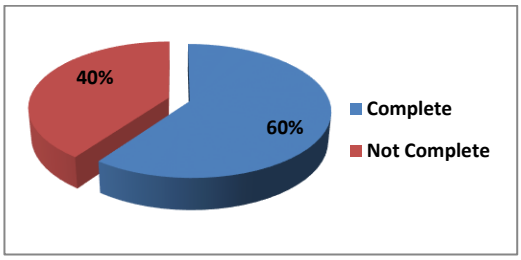


Figure 6. The Completeness of The Understanding of Concept in Control Class

The results of the analysis of the experimental class on classical completeness test showed z_{value} = 0.26. H_0 is rejected if = $z_{value} \geq z_{(0,5-\alpha)}$. Z_{value} of the standard normal distribution list is $z_{(0,45)}$ = 0.174, so that 0.26 > 0.174, therefore, H_1 is accepted. It means that the learning of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang has achieved a 75% classical completeness.

The Average Different Test of Experimental and Control Class

The test of average difference was done by using independent sample t-test with statistical significance test α= 5%, the test sample tables independent column sig. (2-tailed) was 0.000 < 0.05, means that H_1 is accepted. It means that the average understanding of geometrical concepts by using the learning of Problem Based Learning contained ethnomatematics of cultural buildings of Semarang in the experimental class is better than the average understanding of geometrical concepts in control class that used the learning of Problem Based Learning.

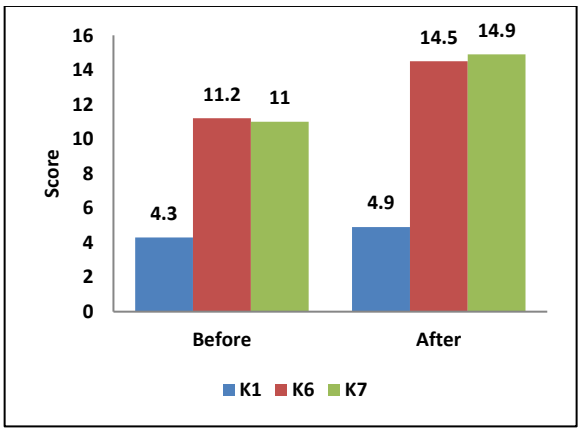
The Improvement of the Understanding Concept

Based on Table 5, before the implementation of the learning of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang, the classical completeness only reached to 52%, after the implementation of the learning of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang, the classical completeness increased to 83%.

Tabel 5. The Results of Understanding Concept Test

Condition	N	Average	Max	Min	Completeness (%)
Before	30	68	75	50	52
After	30	78	100	52	83

The test results of each indicator of understanding the concept of learning using Problem Based Learning contained ethnomatematics building culture in Semarang increased, more clearly found in the bar chart below.



Information
K1 : restates a concept
K6 : using, utilizing and selecting procedures
K7 : applying concepts in problem solving

Figure 7. Score Understanding of Geometry Concept in Experiment Class

Test results of the average difference by using paired sample t-test with a significant value α= 5% in column sig. (2-tailed) obtained a score of 0.001 < 0.05, means that H_1 is accepted. Therefore, it can be concluded that there is a different of understanding of the concept of geometry before and after the learning.

The learning of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang is effective in improving the understanding of the concept, which includes the ability to restate a concept, use and take advantage of as well as choose specific

procedures and apply the concept in problem solving.

Setiyadi (2018) states that the Problem Based Learning model nuanced ethnomatematics by using traditional games are effective in improving students' problem-solving abilities. Problem-solving skills by using the model of Problem Based Learning with ethnomatematics nuances of traditional games was better than the average of problem-solving skills using a model of expository. In addition, Nugraha (2018) expressed the traditional game-based learning effect on the students' social skills and train their collaboration skills. Based on the observations in this study, learning using ethnomatematics about the building of culture in Semarang City increases the curious, learning motivation and helps students find the concept of geometry by identifying geometry objects in the picture.

Dole (2017) states that, Problem Based Learning provides opportunities for students to organize learning process autonomously. Learning becomes more meaningful activities and they have pride in solving problems through perseverance and opportunity for creative thinking.

Problem Based Learning contained ethnomatematics gives students ability to express the concept. Worksheet experiments class using ethnomatematics contain images of cultural building of Semarang. Based on the observation, the learning activities of Problem Based Learning based on ethnomatematics cultural buildings in Semarang has attract the interest of students and they can identify the properties of geometry in a more tangible way. Then use it to choose the procedure to solve the problems of mathematics. Based on the investigation geometry contained on images of cultural buildings in Semarang, student worksheets that contains questions to be solved in groups.

Fouze (2018) stated that students' math learning difficulty, from lack of meaning, logic, reality and an inability to analyze and organize complex mathematical concepts. Integration of values and cultural elements of the student's daily life, such as folk tales are needed by students.

Figure 7. The Learning of Problem Based Learning Contained Ethnomatematics of Cultural Building in Semarang

Figure 8. Students Present The Results of Discussion

Ula (2018) stated that the problem solving process helps students to improve understanding of concepts and learning outcomes. Based on the results of Problem Based Learning teaching and learning of the control group, students still need the help of the teacher in providing a stimulus to explore students' knowledge.

Teachers require learning activities sourced from the surrounding environment, so that students can explore the knowledge to improving understanding the concept of geometry. Understanding the concept of geometry, can be authorized for students to complete resolve issues related to the circumference and geometric area such as square, rectangular and triangle.

The results of this research different from the reasearch conducted by Setiyadi (2018), however, there is a similarity which is using ethnomatematics. The results of his study only describes how students can complete a math problem using a Problem Based Learning with the nuanced of ethnomatematics of traditional games. In this present research, students are not only able to solve the problems of mathematics,

but they were also able to identify the type of the existing geometry on cultural buildings, so that they are able to determine the type of procedure used to solve the mathematical problems.

CONCLUSION

Based on the results and discussion, it can be concluded that the learning through the model of Problem Based Learning contained ethnomatematics of cultural buildings in Semarang is effective in improving students' understanding of geometrical concepts. This is demonstrated through: reached by the students classical completeness. The average understanding of the geometry concept experiment class is better than control class, and there is a difference in the understanding of the geometry concept before and after learning.

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