Analysis of Students' Mathematical Comprehension Ability Against Mathematics Teaching Materials with Constructivism Through Mobile Learning System

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ABSTRACT

This objective of this study was to analyze the achievement of each indicator of students' mathematical comprehension of mathematics teaching materials with constructivism approach through mobile learning system. This research was qualitative descriptive research that described the ability of students' mathematical comprehension analysis. The subject of the research was the students of Bung Hatta University Mathematics Education Major which took the academic year of 2016/2017 which consisted of 25 students. Data collection methods used students' mathematical comprehension skills after using instructional materials with constructivism approach through mobile learning system. Based on the results of the research it can be concluded that the achievement of the mathematical comprehension ability to the indicator of classifying objects according to certain properties shown by the questions 2 and 5 are 55% and 67%. The indicator of the students' ability to use, utilize, and select a particular procedure or operation which is indicated by question 1 is 87.5%. And the indicator of ability to apply concept or algorithm in problem-solving shown on questions 3 and 4 are 92% and 90%.

Keywords : Mathematical Comprehension, Constructivism, Mobile Learning System

INTRODUCTION

The use of teaching materials can make learning more meaningful. Teaching materials can help students so they are no longer fixated on the explanation of lecturers. Students freely explore their own knowledge and develop the knowledge they have. This can improve students' reasoning ability because students are accustomed to facing a variety of problems.

According to Muchlis (2006), many students only memorize the material in math lessons, but can not apply it in everyday life. As a result of this condition, students' mathematical comprehension of concepts in math lessons is very low. According to Mertayasa (2012), this is because the learning tools used so far have not been able to help students in rediscovering mathematical concepts, and less optimal use of the textbook as a supporting material in the teaching and learning process (Fitria, 2013). In learning activities, teacher usually explain the

concept informatively, give examples of problems, and provide practice questions (Herman, 2007).

The approach that can be used to support students to construct their own knowledge is the constructivism approach. According to Ovelyn (2013) in constructivism approach knowledge can not be transferred from teacher to students, but students have to build their own knowledge so that learning becomes meaningful.

Along with technological developments, the learning process of mathematics needs to be carried out creatively and innovatively by utilizing emerging technologies. To that end, the use of mathematical learning materials based on constructivism approach can be done by using multimedia, so that learning math become more meaningful (Esra & Berna, 2010). One of the multimedia trends is a new trend in the e-learning is known as the mobile learning system.

The process of mathematical comprehension is in line with what Piaget had developed (Lely, 2017), which is about a student's process of learning through experience. The process of mathematical comprehension in a teaching and learning activity can be described as follows: Capturing the learned ideas through observations. Observable things can be sourced from what is done by themselves or from what is shown by others.

Many factors that cause low ability and lack of comprehension of students, one of the causes is one of the learning strategies implemented by teachers is still traditional, the students are still treated as learning objects and teachers are more dominant role in learning by providing concepts or procedures, so that in this learning strategy, it is only one-way communication occurs. Students are rarely given the opportunity to discover and construct mathematical concepts or knowledge formally, so problem-solving, reasoning and communication are considered to be little importance (Vera, 2014).

Therefore, the effort to increase students' comprehension of mathematical material becomes a joint responsibility, especially lecturers as the subject of education that plays an important role in realizing the success of a teaching.

Mathematical comprehension is the goal of a mathematical learning process, which means an ability to understand concepts, distinguish between separate concepts, and the ability to perform meaningful calculations on situations or wider issues. So that the ability of mathematical comprehension is a strength that must be considered and treated functionally in the process and objectives of learning mathematics (Lely, 2017).

Comprehension is the second cognitive level in Bloom's taxonomy that describes mastery using the relevant rules without relating them to other ideas and their implications (Dian, 2013). The level of comprehension is equivalent to the level of instrumental comprehension (Sumarmo, 2012) that can memorize the formula and follow the sequence of process and algorithms.

There are three kinds of comprehension: translation, interpretation, and extrapolation (Cita, 2014). Comprehension of translation (ability to translate) is the ability to understand an idea expressed in another way from a previously known origin statement. Comprehension of interpretation (ability to interpret) is the ability to understand materials or ideas recorded, altered, or arranged in other forms or ways, for example in the form of graphs, tables, diagrams, drawings, and so forth. While the comprehension of extrapolation is the ability to forecast trends that exist according to certain data by expressing consequences and implications that are in line with the conditions described (Vera, 2014).

According to Killpatrick and Findell (Lely, 2017) suggested that indicators of mathematical comprehension are: 1) Ability to reiterate concepts that have been studied, 2) The ability to classify objects based on whether or not fulfilled the requirements that form the concept, 3) Ability to apply algorithms, 4) Ability to provide examples of learned concepts, 5) Ability to present concepts in various forms of mathematical representation, 6) Ability to relate various internal and external concepts of mathematics, and 7) Ability to develop necessary and sufficient conditions of a concept.

In general, indicators of mathematical comprehension include: recognizing, comprehension, and applying mathematical concepts, procedures, principles, and ideas. In this research, indicator of mathematical comprehension used was the indicators of comprehension according to Jihad and Haris (2010) that are as follows:

1) The ability to classify objects according to certain traits
2) Ability to use, utilize, and select certain procedures or operations
3) Ability to apply concept or problem-solving algorithm.

The ability of mathematical comprehension is very important, because, in addition to being one of the goals of learning mathematics, the ability of comprehension can also help students to not only memorize the formula, but can understand the meaning in learning mathematics (Pitaloka, 2013).

RESEARCH METHODS

This research was a qualitative descriptive study. The subject of the research was the students of Bung Hatta University Mathematics Education Major who took the Geometry Course in the even semester of 2016/2017 consisted of 25 students.

The test used in this study was the problems of mathematical comprehension consisted of 5 essay questions. The problems are the indicators of mathematical comprehension, that are as follows: the ability to use, utilize, and select a particular procedure or operation. Ability to apply concept or problem-solving algorithms, and Ability to classify objects according to certain properties.

RESULTS AND DISCUSSION

1. Research Results

From the research results, it was obtained the test data of mathematical comprehension ability, namely:

Table 1 The achievement of each mathematical comprehension ability problems

Indicators of Mathematical Comprehension Ability	Observed Aspects	Problems Number	Average Score	Maximum Score	Achievement (%)
The ability to use, utilize, and select a particular procedure or operation	Students can select procedures and can use them in problem-solving	1	17,2	20	87,5
Ability to apply concept or problem-solving algorithms	- Students can apply the surface area of solid figure concept	3	18,2	20	91
	- Students can apply the volume of solid figure concept	4	18	20	90
Ability to classify objects	- Students can classify solid	2	11	20	55

according to certain properties	figure to determine the volume of solid figure - Students can classify solid figure to determine the area of solid figure	5	13,4	20	67

From table 1 it can be seen that the highest mathematical comprehension of students is on the second indicator that the students have been able to apply the concept or problem-solving algorithm related to the area and the volume of solid figure.

2. Research Discussion

Based on the results of data analysis contained in table 5 can be shown that the ability of students to classify objects according to certain properties shown about 2 and 5 are 55% and 67% respectively. This shows that overall, the average of these indicators has not reached 70%. While the ability of students to use, utilize, and select a particular procedure or operation, and the ability to apply concepts or algorithms in problem-solving shown in numbers 1, 3 and 4 are 87.5%, 92%, and 90% respectively. This means that almost all students can understand the concept of surface area and volume of solid figure, and can utilize the concept in solving math problems.

The result of data analysis in Table 1 shows that students' ability in presenting mathematical statement orally, written, through drawing and diagram, and ability to perform mathematical manipulation shown on numbers 1, 2, and 5 are 58%, 36%, and 48%. This shows that overall, the average of these indicators has not reached 70%. While the ability of students to draw conclusions, compile evidence, provide reviews, or evidence against some solutions shown by questions 3 and 4 are 80% and 72%. This means that there are many students who can provide the right solution for a problem related to the area and volume of the solid figure, so that students can also draw conclusions from the solution they find.

CONCLUSION

Based on the results and discussion, it can be concluded that the achievement of the mathematical comprehension ability to the indicator of classifying objects according to certain properties shown by the questions 2 and 5 are 55% and 67%. The indicator of the students' ability to use, utilize, and select a particular procedure or operation which is indicated by question 1 is 87.5%. And the indicator of ability to apply concept or algorithm in problem-solving shown on questions 3 and 4 are 92% and 90%

Based on the conclusion above, the researchers recommend:

1. In classroom learning, there should be interaction because class interaction is the right way to explore students' comprehension to be more developed.
2. The development of the reasoning process in the students can not only be pursued through the application of relevant strategies or learning models but also the enrichment of teaching materials that can develop students' thinking skills.

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