THE ABILITY OF STUDENTS' CONCEPTUAL UNDERSTANDING IN COMPLETING STORY PROBLEMS ON MATHEMATICS

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Abstract
This study aims to describe the ability of students to understand concepts in solving story problems. The research subjects were 28 grade VII students of SMP Negeri 8 Merauke. Data collection techniques were carried out in tests of students' abilities in understanding concepts and unstructured interviews. The test used to measure the concepts is in the form of description questions and 4 questions with integer operation material on the story problem. From the data analysis, it was concluded that the students' ability at high ability could master the 6 indicators of concept understanding, students in the moderate category mastered 5 indicators of concept understanding, students in the low category mastered 4 indicators of conceptual understanding. It can be concluded that the students' concept understanding ability is in the medium category.

Keywords: *mathematical concept ability, Mathematics, word story*

INTRODUCTION

Understanding the material concept is a basic ingredient for someone to solve problems (NCTM, 2000). The purpose of teaching and learning Mathematics in secondary schools is to understand mathematical concepts, describe the relationship between concepts and apply the concepts or algorithms in solving problems flexibly (MoE, 2015; Siregar, 2019). The ability of a person to understand mathematical ideas as a whole and functionally is called conceptual understanding (Kilpatrick et al., 2005).

In fact, the result of 2015 TIMSS (Trends in International Mathematics and Science Study), Indonesia is ranked 44th out of 49 countries with an average Indonesian score of 397 and an average international score of 500. Indonesia's achievement is based on the ability

where low proficiency is 54%, medium ability is 15% and high ability is 6 % (Hadi & Novaliyosi, 2019). Based on the results of some interviews with Mathematics teachers, it was concluded that the students' ability in Mathematics was low and the data on national examination scored in 2017 for Mathematics at SMP Negeri 8 Merauke achieved a mean of 31.80.

The author suspects that students' low abilities in Math are due to teacher-centered learning where students are rarely involved in solving math problems. The conventional approach taken by the teacher is not bad but fails to develop higher-order thinking skills (Siregar, 2019). One of them is problem solving skill and most teachers pay less attention in making teaching materials (Rismawati & Hutagaol, 2018). The problem is how to improve students' conceptual understanding skills so that they can easily solve story problems (Bardach & Klassen, 2020; Gasco, Villarroel & Zuazagoitia, 2014).

Conceptual understanding indicators (Minarni et al., 2016) where students are able to understand concepts if 1) use images to help solve problems, 2) provide examples, 3) classify examples into a concept, 4) are able to apply mathematical equations between concepts and procedures, 5) understand and use appropriate patterns to solve problems, 6) apply similarities or differences to solve problems, 7) explain the solution.

The abilities above will be useful for students in solving problems related to their daily lives (Azis, 2019). The development of

Mathematics lessons currently emphasizes the application of concepts that connect students' daily lives to Mathematics (Mayasari et al., 2019). The applied subject matter is expected to be able to apply real situations with the aim of students being able to relate everyday problems to Mathematics so that students' understanding skills can increase (Aminah & Ayu Kurniawati, 2018). The application of students' conceptual understanding skills can be done in story problems (Pradani, 2019). Through the application of everyday problems with story questions related to Mathematics (Bernard & Senjayawati, 2019). This will make students understand more about the teaching material (Agustina et al., 2019).

In fact, the learning that occurs in the field still uses questions that are contextual. Where after the teacher has finished presenting the subject matter, the teacher gives questions directly to students without connecting daily life with Mathematics (Rismawati & Hutagaol, 2018). In solving the questions, students rush to record every concept of the material presented without understanding what they are recording (Wahyuddin, 2017).

Even students are less able to understand the concepts on their notes when they are given practice questions (Al-Mutawah et al., 2019). If this continues, students will be trained to be spoiled students and have a negative impact on learning outcomes (Al-Mutawah et al., 2019).

Thus through understanding the concept, it can help students to understand what is meant, be able to find ways to express the concept, and

be able to explore possibilities related to problem solving (Hakim & Ramlah, 2019; Fajar et al., 2019; Aminah and Ayu Kurniawati, 2018) learning is being carried out at this time with the pattern of providing material, explanation of examples and exercises, students only record each concept without understanding it.

This will affect student learning outcomes. So it is necessary to update the learning process that is designed so that students can understand the concept. Previous research (Agustina et al., 2019) stated that students' understanding in solving story problems at the high school level was categorized as sufficient. The story questions given are routine questions taken from printed books. The ability to understand low concepts is low by giving math problems in the form of story problems (Aminah & Ayu Kurniawati, 2018).

There is an increased lack of teachers in understanding story problems related to everyday life (Simamora, Saragih & Hasratuddin, 2018; Diana, Suryadi & Dahlan, 2020). In this study, the author raised a topic on experiencing the story problems and encouraging students to visualize the stories. Therefore, the study focuses on students' conceptual understanding skill in solving story problems.

METHODS

This research is a descriptive analysis with a qualitative approach. This study will analyze phenomena, events, social activities, beliefs, attitudes, and perceptions, about a person or a group (Fajar et al., 2019). This study will discuss the phenomena experienced by research subjects in a holistic manner and describe them through words and language in a scientific context and utilize various scientific methods (Moleong, 2004). The subjects in this study are the seventh grade students of SMP Negeri 8 Merauke with 28 students consisting of 16 boys and 12 girls.

This research went through some stages; preliminaries, compiling a test of the ability to understand mathematical concepts, validating instruments with colleagues, collecting data, analyzing data and drawing conclusions (Pradani, 2019). In the introduction stage, the researcher found that students faced problems when implementing learning in the seventh grade class of SMP Negeri 8 Merauke, and it was clearly depicted that the students' conceptual understanding was still very low. Based on this result, the researcher conducted research with 9 students as subjects who were divided into the high, medium and low categories.

The instrument used was a test of the ability to understand mathematical concepts, assessment rubrics, and test results of interviews with 9 research subjects. In qualitative research, research acts as a planner, data collector, analyst, interpreter and reports on the results of the research (Aminah & Ayu Kurniawati, 2018). It is the same as stated (Moleong, 2004) that the researcher acts as the main instrument. The researcher compiled a concepttual understanding problems consisting of 4 descriptive questions related to integers. The questions given are in the form of problems that students often face in their daily lives. Researchers compile an assessment rubric that is developed in accordance with the indicators of understanding

mathematical concepts. Researchers also conducted interviews with 9 research subjects consisting of 3 high abilities, 3 medium abilities and 3 low abilities.

The data analysis technique used is data reduction by analyzing data qualitatively by reducing data, presenting data and drawing conclusions.

RESULTS AND DISCUSSION

Based on the results of data analysis on the test results, it was found that the subjects' conceptual understanding ability was still low. The following is the data on the results of the students' answers.
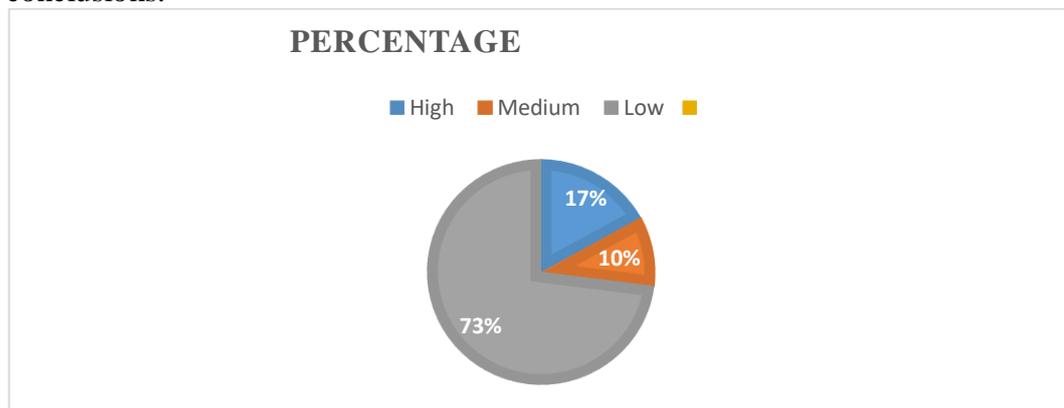
Figure 1. Percentage of Students' Conceptual Understanding

From Figure 1, the results show that students who are in the high category are 17%, 10% in the medium category and 73% in the low category. This shows that there are still many students who do not understand the concept of integer operations

The low ability of understanding concepts can be seen from the 4 questions given, many students have not been able to solve the problem so that their understanding of mathematical concepts is still low. The results of data collection obtained the fact that for question number 1 (There was a flood incident in the Merauke area, an activist named Pak Didin helped flood victims for 15 days. 2 boxes of instant noodles were divided between each head of the family, there were 120 families who were victims of the flood. How many box of instant noodles that have been shared by Mr. Didin?) The researcher wants to measure the ability to understand the concept of expressing concepts and classify certain objects according to the concept (Jannah et al., 2014).

Table 1. Description of Student's Completion of Problem Number 1.

Description of Student's Completion	Subject
Applying wrong concept or procedure in the process.	S1, S3, S6, S7, S8, S9, S10, S11, S13, S14, S16, S17, S18, S19, S20, S21, S22, S26, S27, S28

Shows aspects of mathematical understanding that correspond to the problem but solves it wrongly.	S5, S12, S15, S23
Shows aspects of mathematical understanding that correspond to problems and complete operations but leads to wrong answers.	S24
Shows aspects of mathematical understanding that corresponds to the problem and complete operations but leads to the correct answer.	S2, S25

Of the total students who can answer, only 10 students were able to classify certain objects accordingly to the concept. This is in line with Ayu's opinion (Fajar et al., 2019) that the students' conceptual ability to classify certain objects is very low. The result of the student's work can be seen in Figure 2.
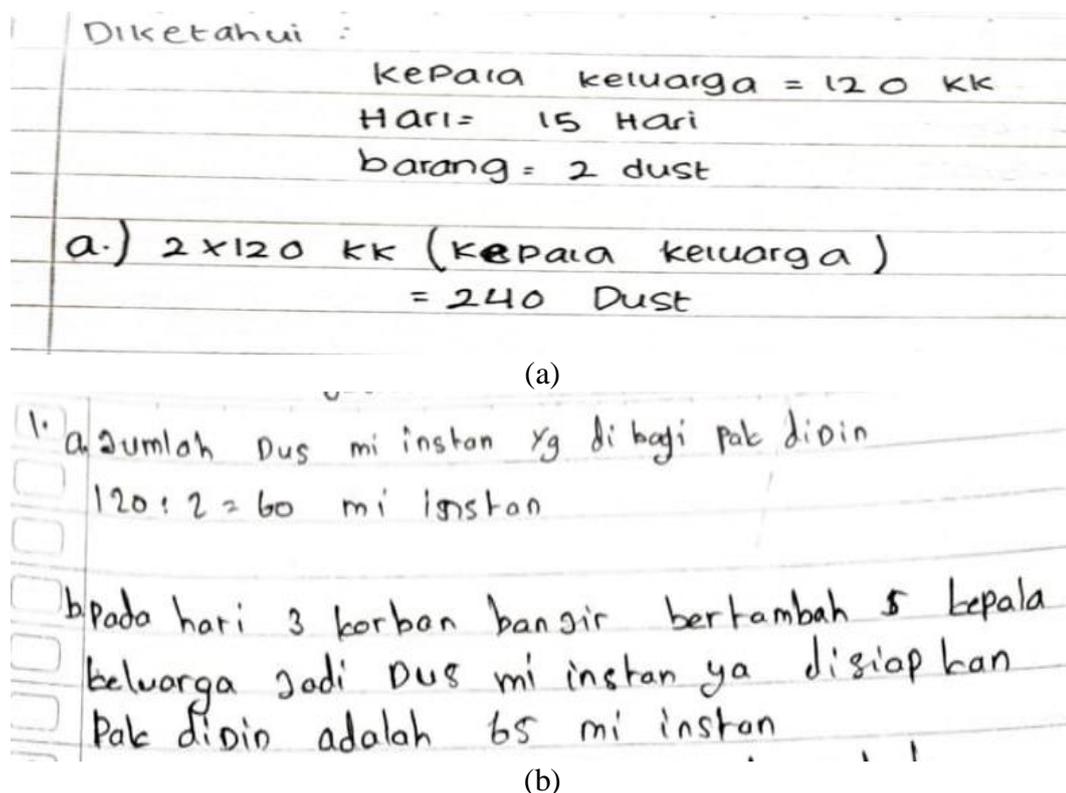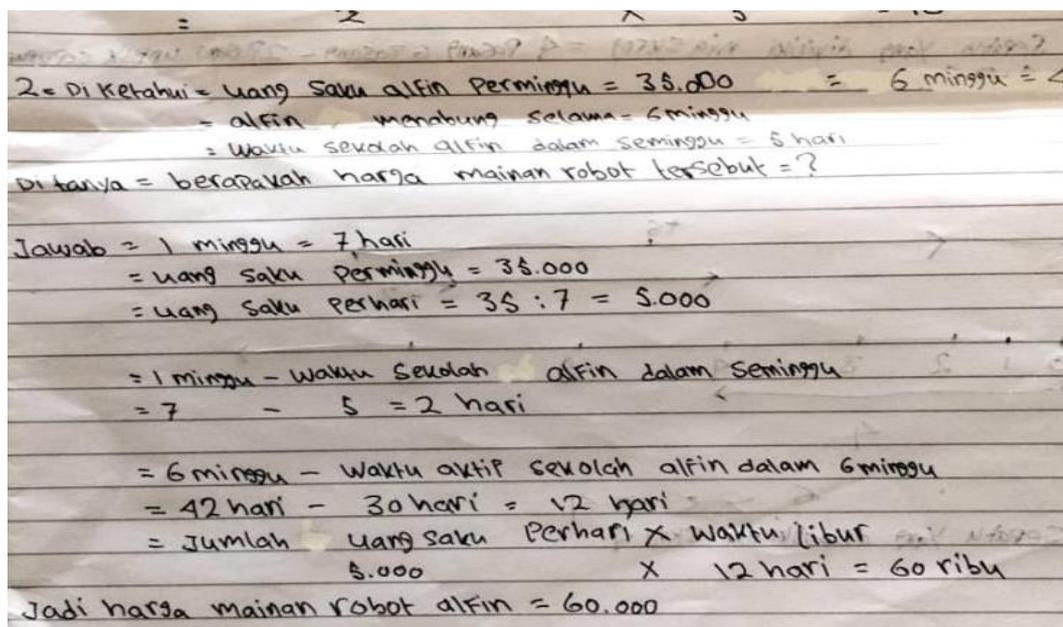

(a)

(b)

Figure 2. Student's Completion of Problem Number 1

Figure 2a is the student's correct completion, while Figure 2b is the student's with inaccurate accomplishment. In Figure 1a, the students have understood that there were 120 families and two boxes of noodles were distributed, which means 120 x 2 = 240. The results of the interview show that students failed to understand the concept of integer
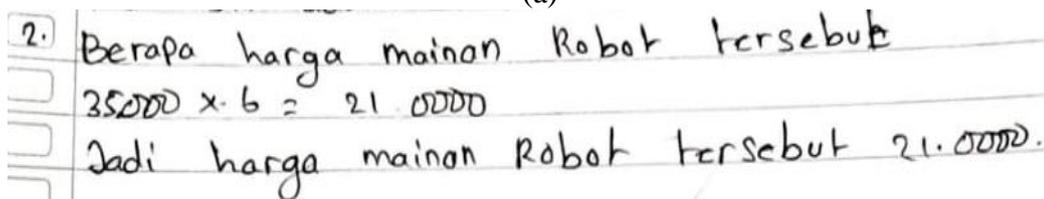
multiplication by classifying certain objects in an integer concept of operation. Students were not able to study what was known and what was asked in the questions. This is supported by a research (Agustina et al., 2019) that students cannot interpret the meaning of a problem. Students face difficulty in solving the questions caused by a) the purpose of the questions is not understood by the students, b) the students do not pay attention to the questions properly. Some indicators of conceptual understanding (Diana, Suryadi & Dahlan, 2020; Jannah, Ahmad & Duskri, 2014) include being able to apply mathematical equations between concepts and procedures and applying equations or differences to solve problems which can be seen in solving question number 2 (Every week Alfin is given money Mother's pocket is Rp. 35,000. Alfin goes to school from Monday to Friday while Saturday and Sunday are off. During the days off, Alfin does not eat any snacks, so his pocket money is still intact. The money he did not spend was saved to buy robotic toys. Alfin saved his money for six weeks. How much is the price of the robotic toys?) The result of student's answers can be seen in Figure 3 and table 2.

(a)

(b)

Figure 3. Student's Completion of Problem Number 2

Table 2. Description of Student's Completion of Problem Number 2.

Description of Student's Completion	Subject
Applying wrong concepts or procedures in the process.	S1, S3, S6, S7, S8, S9, S10, S11, S12, S13, S14, S16, S18, S19. S20, S21, S22, S26, S27, S28
Shows aspects of mathematical understanding that correspond to the problem but solves it wrongly.	S15, S17
Shows aspects of mathematical understanding that correspond to problems and complete operations but lead to wrong answers.	S5, S23, S24
Shows aspects of mathematical understanding that correspond to the problem and complete operations but leads to the correct answer.	S2, S4, S25

In Figure 3a, students completed the problem by writing the concept that 1 week = 7 days and properly explaining the relationship between the number of days to count the price of the robot. In Figure 3b, students did not understand how to apply the concepts and procedures needed to solve question number 2.

From the results of the interview, it was concluded that the students in Figure 3a) were able to apply the concept between 1 week = 7 days and the problem. In this case, students did not only memorize the formula but were able to interpret the learning itself. In Figure 3b) it can be seen that students immediately apply the concept of integer operations without acquiring the initial concepts and procedures for solving the problem. There are 2 learning processes according to Ausebel, namely a meaningful learning process and memorizing (Aminah & Ayu Kurniawati, 2018). Learning is meaningful where students are able to connect the information received in the problem with the concept and solve it according to the procedure. Learning to memorize is in the form of memorizing mere facts so that the concepts learned are not fully understood and easy to forget. This is further argued in Margaretha's research (Rismawati & Asnayani, 2019) where in solving problems, students are less competent in transforming the ideas contained in the questions and using solutions with unclear steps for solving them (Rismawati & Hutagaol, 2018).

Another understanding of the concept is to classify examples into concepts and apply similarities or differences to solve them (Minarni et al., 2016). In question number 3 (Ivan wants to buy a toy but he doesn't have enough money. Starting the next day Ivan saves as much as Rp. 5,000 per day, after 25 days what is left is Rp. 225,000. How much money did Ivan have in the beginning?) Students were

asked to explain clearly the process from figuring out the amount of Alfin's money at first to finally accomplish the problem. Figure 4 is an example of student's completion.

(a)

(b)

Figure 4. Student's Completion of Problem Number 3

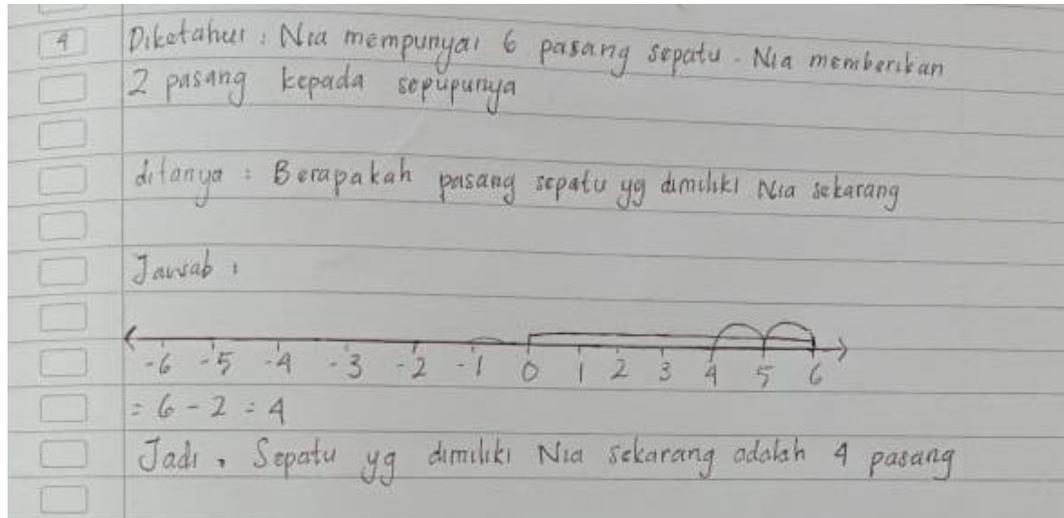Table 3. Description of Student's Completion of Problem Number 3.

Description of Student's Completion	Subject
Applying wrong concepts or procedures in the process.	S3,S8,S9,S10,S11,S13,S16, S17,S18,S19,S20,S21,S22
Shows aspects of mathematical understanding that correspond to the problem but solves it wrongly.	S26
Shows aspects of mathematical understanding that correspond to problems and complete operations but lead to wrong answers.	S1,S4,S6,S12S15,S23.S27, S28
Shows aspects of mathematical understanding that correspond to the problem and complete operations but leads to the correct answer.	S2,S5,S7,S24,S25

Another indicator of conceptual understanding is using images to do problem solving (Benölken, 2015). In question number 4 (Nia has 6 pairs of shoes in her house. Nia gives 2 pairs of shoes to her cousin. How many pairs of shoes does Nia have now? Draw the solution in the number line). In this

question, students will answer the problem through a number line. Figure 5 and table 4 are the student's completion.

(a)
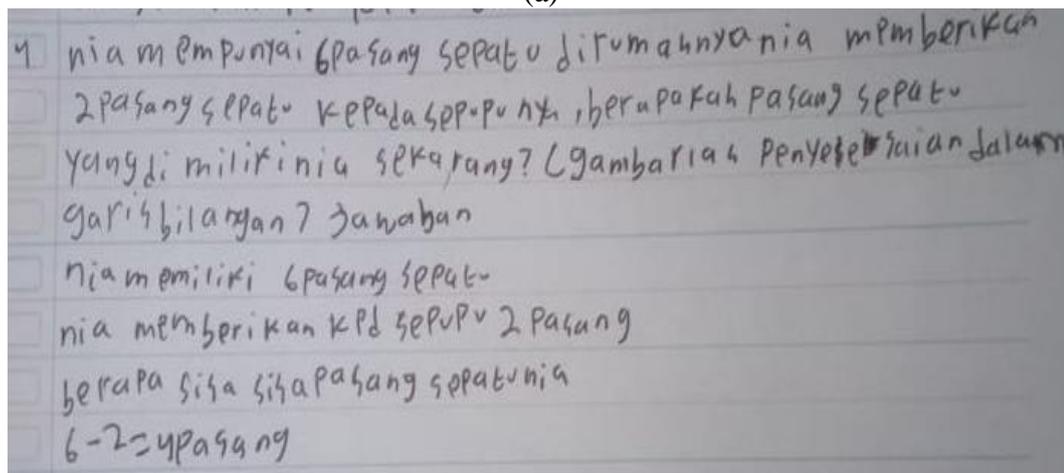
(b)

Figure 5. Student's Completion of Problem Number 4

Table 4. Description of Student's Completion Problem Number 4.

Description of Student's Completion	Subject
Applying wrong concepts or procedures in the process.	S8, S9, S13, S14, S16, S18, S20, S21, S22, S27
Shows aspects of mathematical understanding that correspond to the problem but solves it wrongly.	S3, S15, S17, S19, S23, S24
Shows aspects of mathematical understanding that correspond to problems and complete operations but lead to wrong answers.	S1, S4, S6, S12, S15, S23, S27, S28

Shows aspects of mathematical understanding that correspond to the problem and complete operations but leads to the correct answer.	S1,S2,S4,S5,S6,S7.S1 2,S25

Figure 5 illustrates how students solve problems by using number lines. Figure 5a shows that students have understood the purpose of the problem and solved it well using a number line. Students in Figure 4a have understood the concept of subtracting integers. In Figure 5b the students did not understand the concept of integers and could not interpret it into a number line. The student in Figure 4b used an unclear way of solving the problem. Students' lack of understanding in using images has been explained in the study. This is in line with the results of the study by Hakim & Ramlah (2019) which concludes that students are not able to represent mathematical problems in the form of images.

The research was conducted in the seventh grade class of SMP Negeri 8 Merauke. The research subjects were 28 students and 9 of them would be conducted for the interviews. This study aims to describe the students' ability to understand mathematical concepts through story questions. There are 4 test questions given which are adjusted to the indicators of conceptual understanding. From the test results, the researcher categorized students according to their abilities; high, medium and low abilities.

Based on the data analysis, it was found that 5% was in the high category, 22% was in the medium category, and 73% was in the low category. This shows that the ability of the seventh grade students of SMP Negeri 8 Merauke to understand the concept is still low. The researcher also analyzed students' conceptual understanding abilities based on the indicators provided. Based on the results of the seventh grade students' tests, the highest understanding of the concept is number 5 with the indicator describing the concept of integer operation on the number line. Based on the results of the interview, a description of the ability based on the high, medium and low categories is obtained as follows;

1. High Conceptual Understanding Ability

It is quite difficult for students to apply the right pattern to solve problems where it does not only require a concept, but also several other ways. Overall, students with high conceptual ability can apply the conceptual understanding indicators well. Conceptual understanding indicators include: using images to help solve problems, providing both correct and incorrect examples for a concept, classifying examples into a concept, being able to apply mathematical equations between concepts and procedures, understanding and using the right patterns to solve problems, applying equations or differences to solve the problems, and explaining the solutions.

2. Medium Conceptual Understanding Ability

For students with moderate abilities, it is difficult to provide both correct and incorrect examples in a concept and apply the right pattern to solve problems. In four questions in the description, the students did not understand the meaning of the

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questions and applied the formula to the problem solving. Conceptual understanding indicators include: using images to help solve problems, providing both correct and incorrect examples, classifying examples into a concept, being able to apply mathematical equations between concepts and procedures, understanding and using the right patterns to solve problems, applying equations or differences to solve the problem, and explaining the solution.

3. Low Conceptual Understanding Ability

It is quite difficult for students to draw pictures in solving problems, apply concepts in solving problems and provide both correct and incorrect examples according to the problem. Conceptual understanding indicators include: using images to help solve problems, providing both correct and incorrect examples instead of examples for a concept, classifying examples into a concept, being able to apply mathematical equations between concepts and procedures, understanding and using the right patterns to solve problems, applying equations or differences to solve the problem, and explain the solution.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the students' conceptual understanding ability is low with the percentage of students who are in the high category 17%, 10% in medium category while 73% in low category. This can be seen through the results of the conceptual comprehension ability test. The results of this study will be used as information for the teacher to know the conceptual understanding of the students in Mathematics. The ability to understand concepts is important in learning Mathematics so that teachers are expected to be able to design learning activities to improve students' conceptual understanding.

APPRECIATION NOTE

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