



Analysis of Students' Ability to Understand Mathematical Concepts in The Material Relations and Functions

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Abstract- The role of mathematics needs serious attention, considering its benefits in everyday life. Mathematics lessons are provided starting from elementary school to tertiary institutions in order to equip students to have the ability to think logically, critically, and creatively. The low ability to understand students' mathematical concepts is due to the fact that previously, students carried out online learning, so the teaching carried out was not adequate, and many students did not do the assignments given, resulting in students not understanding mathematical concepts correctly. The purpose of this study was to describe the ability to understand mathematical concepts of class VIII.1 students of SMP Negeri 2 Tanjung Raya. The subjects of this research were class VIII.1 students of SMP Negeri 2 Tanjung Raya. The research method used is a descriptive method with a qualitative approach. The sampling technique used purposive sampling. Instruments are used to collect data in the form of tests of ability to understand the concept, interviews, and documentation. The test results were analyzed based on indicators of understanding the concept. The results of the research on academic ability related to the ability to understand concepts are high, medium, and low from the test results.

1. Introduction

According to Suherman (2018), "Mathematics taught in primary and secondary education in school mathematics." Given the importance of learning

learning mathematics.

Mathematics is a lesson related to ideas and concepts that are based on layers and deductive thinking (Herawati, 2018). problem-solving (Depdiknas, 2014). Based on the quotation above, the first ability that students must master is understanding the concept of solving problems. The general objectives of learning mathematics in elementary and junior high schools, as presented, are as follows (Kamarullah, 2017). Understand mathematical concepts, explain the interrelationships between concepts, and apply concepts or algorithms in a flexible, accurate, efficient, and precise way to solve problems. Learning related to understanding students' concepts still has difficulties in solving questions given by the teacher, such as difficulties in applying mathematical formulas and not being able to find ideas for solving mathematical problems from the questions given. It causes students to think that mathematics is a problematic and feared subject. The difficulty of mathematics is due to a lack of understanding of the basic concepts given by the teacher during learning. Those who think that mathematics only has to be understood to the extent of KaBaTaKu (Multiply, Divide, Add, Less) are operations that are very widely used in everyday life. In simple terms, mathematics does understand the mathematics of life, but this also continues for more complicated matters, such as in the fields of physics, chemistry, and technology used today.

Problems with understanding concepts in solving math problems were also experienced by students in class VIII.1 at Tanjung Raya 2 Public Middle School. The results of observations and observations at Tanjung Raya 2 Public Middle School. The minimum completeness student daily test that must be obtained if learning is said to be successful is around 65% of the number of students. After being recorded, it turns out that completeness is still below 35%; this means that there is something that needs to be reviewed, both by students and teachers. If the understanding of the concept is good, it will be easier to achieve the learning objectives properly. Hutagalung (2017) suggests that students' understanding of mathematical concepts is still relatively low; this is because most students have not been able to complete the test correctly. It can be seen from the answer sheet in the following figure:

Problem: If you know the sets A {3, 4, 5, 6} and B {9, 11, 13, 15} with the ordered pairs {(3,9), (4, 11), (5, 13), (6, 15)}. Determine the forming formula can be seen in Figure 1.

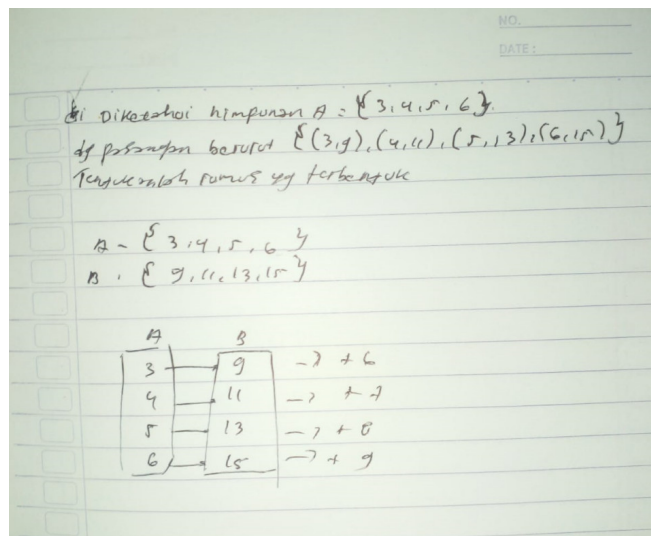


Figure 1. Student answer sheets

Based on the analysis of the answer sheet that the presenter did, some students were able to represent the concept in the form of an image, but the problem-solving was incomplete. Supported by the results of interviews, students could not write down the formula concept because they did not understand it. They don't know how to solve problems because they don't repeat studying at home; every assignment they give is just cheating on their friends who are able to complete it.

The results of interviews with subject teachers stated that student learning outcomes were indeed deficient. The low ability to understand students' mathematical concepts is due to the lack of interest in students repeating to study at home and the low level of knowledge of something new. In addition, there is a time limit in the learning process where 45 minutes per one-hour lesson is now 40 minutes per one-hour lesson. The teacher must maximize this little time to explain the material while at the same time making the students able to understand the material being conveyed; with this limited time, some

very many students do not pay attention to the teacher's explanation, so students do not understand the material presented.

Based on the teacher's statement, the relation & function material is also one of the materials that have the least completeness in both daily tests and semester exams in previous years. In addition, the ability of students to understand different subjects so that some students who have been taught are still confused in solving problems related to relations & functions. This material is also one of the prerequisites for understanding high school material, namely quadratic functions. This material is advanced learning from what was studied in class VIII, semester 2; we usually find this material in everyday life in linear programming, market mathematics (finance), and so on.

Given the importance of the ability to understand concepts for students, it is necessary to have a test. The ability to understand concepts is one of the abilities that must be mastered by students in the first steps of solving mathematical problems. This test aims to determine the extent to which students' ability to understand mathematical concepts improves the quality of learning.

2. Methods

This research is quantitative research with a descriptive study. Quantitative research is research that collects data in the form of presentation data. Research subjects were selected by purposive sampling. According to Sugiyono (2013), "purposive sampling is a sampling technique with certain considerations." Based on the considerations made in the selection of subjects and suggestions from the subject class teacher, the subject class selected was class VIII.1 SMP Negeri 2 Tanjung Raya, as seen from the lowest average grade VIII.

According to Arikunto (2010), "Research instruments are tools used to measure by researchers in collecting data so that their work is easier and the results are better, in the sense that they are more thorough, complete and systematic so that they are easier to process."

The research instrument is a data collection tool that is carried out in a study. The data collection tools used are in the form of tests and non-tests. The test is given in the form of an essay, which is used to measure the ability to understand students' mathematical concepts, while the non-test is in the form of interviews conducted with students. The instrument used is as follows:

a) Concept Understanding Ability Test

According to Arikunto (2010), "The test is an instrument used to measure the presence or absence and the magnitude of the ability of the object under study. The concept understanding test is a test designed for the purpose of determining the level of ability of students to solve concept understanding questions. The type of test used in this study is a description test, which contains material that is in accordance with the indicators of understanding the concept so that it can be seen the procedures and systematics of students in providing answers to questions about understanding mathematical concepts.

The steps for preparing the test kit are as follows:

1. Compile Test Questions
 - a. Make restrictions on the material
 - b. Determine the form of questions used.
In this study, the form of the questions used were description questions in the form of conceptual understanding.
 - c. Determine the number of items and the amount of time allotted.
 - d. Arrange a grid of conceptual understanding test questions based on the grid that is made.
 - e. Make a test answer key.

2. Test Validity

Test validity is a test measure that measures what is to be measured. Arikunto (2010) states that "A test is said to have content validity if it measures particular specific objectives that are parallel to the subject matter or content provided; therefore, the material taught is listed in the curriculum, content validity is often also called curricular validity.

A test is said to be valid if the test can measure what is the purpose of measurement. When we determine whether the learning outcomes test has rational validity or not, it is necessary to search two aspects, namely in terms of content and structure or construction (Mujiyanto, 2017):

1) Content Validity

Content validity is also called curriculum validity because the material taught is contained in the curriculum. In preparing the questions, one must pay attention to and adjust the material to the curriculum used in the school and adapt it to the material that has been taught.

2) Construct Validity

According to Widoyoko (2009), "a test is said to have construct validity if the items that construct the test measure every aspect of thinking as stated in the learning objectives or measure something according to the definition used. Construct validity is the extent to which the calculated scores of an instrument reflect the theoretical constructs that underlie the preparation of the instrument—the construct validity of the estimate is through its indicators with statistical analysis. Construct validity corresponds to indicators of problem-solving ability.

Test validation in this study was carried out by two lecturers in the mathematics education study program at PGRI University, West Sumatra, and teachers in mathematics for class VIII SMP N 2 Tanjung Raya using validation sheets.

b) Interview

The interview that will be conducted is classified into the type of unstructured interview. Questions are flexible but do not deviate from the stated purpose of the interview. This type of interview allows for greater scope to summarize students' opinions and answers. According to Sugiyono (2013), "Unstructured interviews are free interviews where researchers do not use interview guidelines that have been arranged wholly and systematically for data collection.

3. Results and Discussion

The research subjects were class VIII students of SMP Negeri 2 Tanjung Raya in the academic year 2022/2023 odd semester, as many students for the material on relations & functions. This study aims to determine the ability to understand students' mathematical concepts in odd semester material in class VIII SMP Negeri 2 Tanjung Raya.

The ability test for understanding mathematical concepts will be held on Saturday, 5 November 2022, from 07.30 - 09.20 WIB in class. This test was carried out for 90 minutes and was attended by 17 students directly.

1. Ability to Understand Students' Mathematical Concepts based on Academic Ability

The results of the student's conceptual understanding ability test, which were identified by the level of concept understanding ability, were obtained by the student's academic ability group its can be seen in Table 1.

Table 1. Grouping of Academic Abilities of Students Taking the Concept Understanding Ability Test.

Academic Ability	Student Code	The number of students
High	IA, YRR, ASR, HI, AA, HKS	6
Intermediate	DEF, IN, ZM, AJH, DR, HR	6
Low	FA, SA, MRE, RDK, RAA	5

Based on Table 1, out of 17 students, there are six people with high abilities, six people with moderate skills, and five people with low abilities.

2. Students' Concept Understanding Ability based on Concept Understanding Indicators

The ability to understand concepts in this study is based on the six indicators of understanding concepts. The results of students' conceptual understanding ability tests based on indicators of conceptual understanding ability can be seen in the following Table 2.

Table 2. Percentage of Students' Ability to Understand Mathematical Concepts.

No	Indicator	N	Number Question	Score Ideal	Qualification Results (%)	Category
1.	Presenting concepts in the form of mathematical representations	17	1. a	4	95.58%	High
2.	restate a concept	17	1. c	4	66.17%	Intermediate
3.	classify objects according to specific properties according to the concept	17	1. b, 2	4	73.89%	High
4.	state examples and non-examples of a concept	17	3	8	57.35%	Intermediate
5.	apply the concept according to the problem-solving algorithm	17	4. a,b	8	46.32%	Low

Based on Table 2 above, it can be concluded that the student's understanding of mathematical concepts in class VIII.1 of SMP Negeri 2 Tanjung Raya on the indicator of presenting concepts in the form of mathematical representations is in the high category. On the indicator showing the concept in the form of a mathematical expression, the indicator applying the concept according to the problem-solving algorithm is in a low category. Conceptual Understanding can be developed with the strategy of teachers in teaching and learning (Rezki et al., 2022; Filmiari, 2023; Rahmi 2022). Apart from the strategies used by teachers, good teaching materials can also increase students' understanding of the material being taught (Yuliana et al., 2023; Salfitri et al., 2022; Harisman et al., 2023; Azizah et al., 2022; Armiet al., 2022; Tamrin et al., 2020).

4. Conclusion

Based on the results of data analysis and discussion that has been carried out, it shows the ability to understand mathematical concepts of class VIII. One student of SMP Negeri 2 Tanjung Raya, based on three criteria for students' ability to understand mathematical concepts consisting of high, medium, and low, can be concluded that:

1. The ability to understand mathematical concepts based on high academic value. 100% of high academic students can understand concepts in the high category.
2. Ability to understand mathematical concepts based on moderate academic grades. Of six intermediate academic students, 33% of students can understand mathematical concepts in the high category, and 50% of students have a reasonable ability to understand mathematical concepts. At the same time, 16% of students can understand mathematical concepts in the low category.
3. The ability to understand mathematical concepts based on low academic scores. Seven students have moderate intellectual skills, and 42% of students have a reasonable ability to understand mathematical concepts. 71% of students can understand mathematical concepts in the low category.

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