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Mathematical Understanding Ability To Solve The Word Problem

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Abstract − This study aims to describe the ability of students to mathematical understanding a solved word problem. The study subjects were 28 grade VII students of Junior High School. Data collection techniques were carried out in the form of tests of students' abilities in mathematical understanding and unstructured interviews. The test used to measure the ability to understand the concept is in the form of description questions as many as 4 questions with integer operation material on the story problem. The results of this study indicate that students' mathematical understanding with a high category is 17%, the medium category is 10%, and low category is 73%.

Keywords: Ability, Mathematical Understanding, Word Problem

Abstrak *− Penelitian ini bertujuan untuk mendeskripsikan kemampuan pemahaman matematis siswa terhadap soal cerita yang telah diselesaikan. Subjek penelitian adalah 28 siswa kelas VII SMP. Teknik pengumpulan data dilakukan berupa tes kemampuan pemahaman matematis siswa dan wawancara tidak terstruktur. Tes yang digunakan untuk mengukur kemampuan pemahaman konsep berupa soal uraian sebanyak 4 soal dengan materi operasi bilangan bulat pada soal cerita. Hasil penelitian ini menunjukkan bahwa pemahaman matematis siswa dengan kategori tinggi sebesar 17%, kategori sedang sebesar 10%, dan kategori rendah sebesar 73%.*

Kata Kunci: *Kemampuan, Pemahaman Matematika , Soal Cerita*

1. INTRODUCTION

Mathematical understanding of the material is the basis for someone to solve problems. The purpose of teaching and learning mathematics in secondary schools is to understand mathematical concepts, describe the relationship between concepts and apply concepts or algorithms in solved problems flexibly(Kristianti et al., 2022). The ability of a person related to mathematical understanding ideas as a whole and functionally is called conceptual understanding. In fact, the TIMSS resulted in 2015, 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 ability where low ability is 54%, the medium ability is 15% and high ability is 6%. Based on the results of interviews with mathematics teachers that the students' ability in mathematics was low and the data on the 2017 national examination scores for mathematics at Junior High School got a mean of 31.80.

The author suspects that students' low math abilities are due to teacher-centred learning and students are rarely involved in solving math problems (Celik et al., 2024; Setiyani & Winanto, 2024). The conventional approach taken by the teacher is not bad but cannot develop high-order thinking skills, one of which is problem solving and the teacher does not pay attention to making teaching materials. The problem is how to improve students' conceptual understanding skills so that they can easily solve story problems (Mayasari et al., 2022; Zulkarnain, 2023). Concept understanding indicators where students are able to understand concepts if 1) use images to help solve problems, 2) provide examples and not examples for a concept, 3) classify examples into a concept, 4) are able to apply mathematical equations between concepts and procedures, 5) understand and use the right patterns to solve problems, 6) apply similarities or differences to solve problems, 7) explain the solution(Fahruddin et al., 2025).

The above abilities will be useful for students in solving problems related to their daily lives. The development of mathematics lessons currently emphasizes the application of concepts that connect students' daily lives to mathematics. The applied subject matter is expected to be able to apply real situations with the aim of students being able to relate daily problems to mathematics so that students' understanding skills can increase. The application of students' conceptual understanding skills can be done in a word problem. Through the application of everyday problems with story questions related to mathematics. This will make students understand more about the teaching material.

In fact, the learning that occurs in the field still uses questions that are contextual (Hayati M et al., 2023; Kontorovich et al., 2024). Where after the teacher has finished presenting the learning material, the teacher gives questions directly to students without connecting daily life with mathematics (Ilhan & Akin, 2022; Rohmah et al., 2022). In solving the questions, students hurriedly wrote down each concept from the material presented without understanding what they were recording. Even students were less able to understand the concepts on their notes when they were given practice questions. If this continues, students will be trained to be spoiled students and have a negative impact on learning outcomes.

Thus through understanding the concept can help students to understand what is meant, be able to find a way to express the concept (Abuhasanein, 2025), and be able to explore possibilities related to problem solving. Based on the background, the problem in this study was to see how the ability of students to understand concepts in solve word problems

2. METHOD

This research is a descriptive type with a qualitative approach. This study will analyze phenomena, events, social activities, beliefs, attitudes, perceptions, about a person or group. 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. The subjects in this study were VII grade students of Junior Hig School. With 28 students consisting of 16 boys and 12 girls. This research was conducted by following a preliminary procedure, compiling a test of the ability to understand mathematical concepts, validating instruments with peers, collecting data, analyzing data and drawing conclusions. In the introduction, it was done by finding problems when implementing learning in class VII Junior High School, and it was seen that the students' conceptual understanding was still very low. Based on these results, researchers conducted research with 9 students as the subject.

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, researchers act as planning, data collectors, analyzers, interpreters and reporters of the research results. It is the same as stated (Moleong, 2004) that the researcher acts as the main instrument. The researcher compiled a conceptual understanding problem consisting of 4 description 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 collection is carried out using the following technique: Giving tests : the test will be given in the form of 4 description questions. The scoring guide is carried out with a rubric that will assess the overall completion process. The rubric will be adjusted to the indicators of concept understanding. Interview : Interviews were held in an unstructured manner to find out the reasons for each solution given by students. Documentation : The documentation is carried out in the form of recordings and photos of the research implementation.

Data analysis was carried out through the stages of data reduction, data presentation and drawing conclusions and verification. To determine the quality of the research is believed to be the validity of the data which can affect the final results of the study. Test the credibility of data triangulation in various ways and times. In this research, the research uses test result data and interviews to see the truth and perfect picture of certain information

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3. RESULT AND DISCUSSION

There were 28 students of class VII A. At the beginning of the research activity, the test scores had been carried out. The researcher divided the students' abilities into three categories according to their mathematical abilities, namely: High (T), Medium (S) and Low (R). The researcher took S2 for high math ability category, S7 for medium math ability category and S13 for low math ability category.

This data collection aims to determine the initial ability of students to understand mathematical concepts after learning two-variable linear equation systems. The level of understanding of mathematical concepts through tests can be seen from the results of students' answers to integer operation material

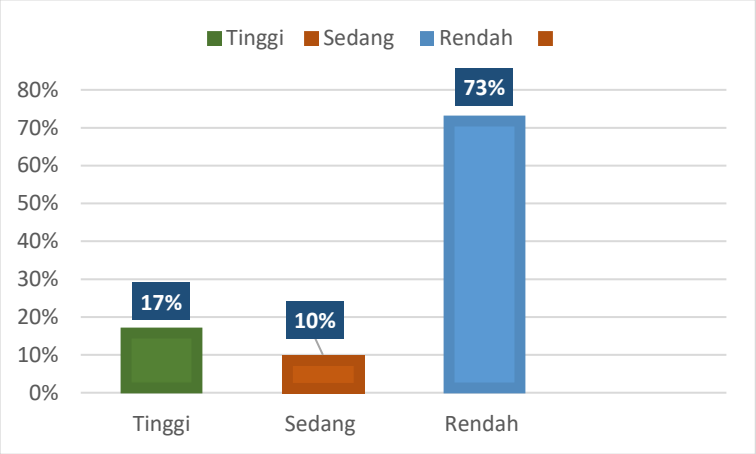

Figure 1. The Percentage of Understanding of Student Mathematical Concepts

From figure 1 obtained results that students who belonged to the high category 17%, the moderate category 10% and the low category as much as 73%. This shows that there are still many students who do not yet understand the concept of integer operation Indicators understanding concepts: rea stating a concept, applying equations or differences to solve problems and explaining the solution Problem number 1: There was a flood event in merauke area, an activist named Pak Didin helped flood victims for 15 days. 2 instant noodles are divided against each head of the family, there are 120 families who are victims of flooding. How many instant noodles has Mr. Didin shared?

Tabel 1. Holistic Analytic Marking Scheme for Math Understanding Test Number 1

No	Student Perform	Subject
1	Use incorect concept or procedures that lead to incorrect answer	S1, S3,S6, S7, S8, S9, S10, S11,S13,S14,S16, S17,S18, S19, S20 ,S21,S22,S26,S27,S28
2	Showing an aspect of mathematical understanding which is fit to the problem	S5,S12,S15,S23
3	Understand the problem by represent It in the orm that can aid a correct answer if followed by an attempt to solve it	S24
4	Showing as an aspect of mathematical understanding which is fit to the problem	S2, S25

An indicator of the ability to understand the concept that can be found in question number 2 is to understand and use the right pattern to solve problems, apply equations or differences to solve

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problem Number 2: Alfin gets pocket money from Mrs. Rp35,000 per week. Alfin School has implemented a Full Day system so that Saturdays and Sundays are closed. Because Alfin's days off are at home, he doesn't snack. The money he didn't spend was to buy robot toys. The toy can be purchased if it saves for 6 weeks. How much does a robot toy cost?

Tabel 2. Holistic Analytic Marking Scheme for Math Understanding Test Number 2

No	Student Perform	Subject
1	Use incorect concept or procedures that lead to incorrect answer	S1,S3,S6,S7,S8,S9,S10,S11,S12,S13,S14 ,S16,S18,S19.S20,S21,S22,S26,S27,S28
2	Showing an aspect of mathematical understanding which is fit to the problem	S15,S17
3	Understand the problem by represent It in the orm that can aid a correct answer if followed by an attempt to solve it	S5,S23,S24
4	Showing as an aspect of mathematical understanding which is fit to the problem	S2, S4, S25

The concept understanding indicator that can be seen in question number 3 Classifies the example into a concept, Able to apply mathematical equations between the concept and procedure Problem Number 3 Ivan wants to buy a toy but the money is not enough. Starting the next day Ivan saves rp.5.000.00 every day, after 25 days Ivan's money becomes Rp225,000.00. What was Ivan's money in the first

Tabel 3. Holistic Analytic Marking Scheme for Math Understanding Test Number 3

No	Student Perform	Subject
1	Use incorect concept or procedures that lead to incorrect answer	S3,S8,S9,S10,S11,S13,S16,S17,S18,S19 ,S20,S21,S22,
2	Showing an aspect of mathematical understanding which is fit to the problem	S26
3	Understand the problem by represent It in the orm that can aid a correct answer if followed by an attempt to solve it	S1,S4,S6,S12S15,S23.S27,S28
4	Showing as an aspect of mathematical understanding which is fit to the problem	S2,S5,S7,S24,S25

From interviews with S2 students, it shows that students do not understand correctly the concept of integer operations, S2 cannot restate the concept and its application in solving problems. Finally, during the interview, the researcher gave guidance in the form of questions about the concept of integer operations. At the completion of the questions, S2 students can give examples of integer operations, while S2 seems unsure of writing the appropriate concept to solve the questions, the researcher directs the students to choose the right concept. Thus understanding the concept with indicators restating a concept, applying similarities or differences to solve problems and explaining S2 students' solutions are good.

S7 students can draw and give examples and not examples according to the concept well. S7 can classify mathematical equations but lacks application to problems. S7 students can only write down concepts that cannot provide meaning or explanation based on what S7 has learned. This shows the S7 on the indicator using the appropriate concept in solving the problem is still low. Through the results of the interview, S7 students understand the right pattern to solve problems but

are in vain confused in applying these patterns in solving problems. But when the S7 student is given a problem to solve, he is able to determine the appropriate pattern but needs direction to apply the pattern.

In solving problems, S13 students cannot provide examples of integer operations. When asked, S13 mostly forgot when asked. When the researcher gave the questions directly to S13 students, he seemed unsure about solving them. This is because S13 students do not understand the concept of integer operation, so that in solving questions S13 students do not solve the problem.

This research was conducted on grade VII students of Junior High School in semester 1, the subjects studied were 28 students and 9 of them were used as interview subjects. This study wanted to analyze the description of students' ability to understand mathematical concepts in solving problems in the material of two-variable linear equations systems. The researcher wanted to know the students' understanding of the concept through essay questions and unstructured interviews. There were 4 questions consisting of integer operation material adjusted to the concept understanding indicator. From the results of these questions, researchers can categorize students based on high, medium and low categories.

Based on the data analysis, it was found that 17% of the students were in the high category, 10% in the medium category and 73% in the high category. This shows that the students' understanding of the concept of solving integer operation problems is categorized as low. Researchers also analyzed students' understanding of concepts based on material tailored to the indicators of concept understanding ability.

Based on the test result data given to students which contain indicators using pictures to help solve problems, provide examples and not examples for a concept, classify examples into a concept, be able to apply mathematical equations between concepts and procedures, understand and use the right patterns for solve problems, apply similarities or differences to solve problems, describe the solution.

Based on the results of the test data too, has the highest understanding of concepts in question number 4 with indicators using pictures to help solve problems, providing examples and not examples for a concept, where 8 students answered correctly, 10 students used concepts or procedures problem solving, 6 people showed correct mathematical understanding with wrong solving, 2 people showed proper understanding and complete operation but led to wrong solving.

Based on the results of the interview analysis, it was obtained an overview of the students' ability to understand mathematical concepts in the high, medium and low categories in solving problems with the two-variable linear equation system, namely:

a. The ability to understand mathematical concepts in the high category of S2

It is quite difficult for S2 when restating a concept, where S2 cannot explain the meaning of integer operations in its own language. When answering questions, there were also some errors in integer operations performed by students. Overall, in solving integer operation problems, S2 can demonstrate the ability to understand mathematical concepts.

b. The ability to understand mathematical concepts in the moderate category S7

It is quite difficult for S7 when restating a concept, where the S7 also cannot explain the meaning of integer operations in its own language. The errors that S7 also make is when operating integers. Overall, in solving integer operation problems, S7 can show the ability to understand mathematical concepts. choose a specific procedure, apply the concept / algorithm to problem solving.

c. The ability to understand mathematical concepts in the low category S13

It is quite difficult for S13 when restating a concept, where S13 cannot explain the meaning of integer operations in its own language, so that in number 2 with indicators providing examples and not examples S13 also cannot answer the problem. S13 also experienced difficulties when making several mathematical models, namely questions number 6 and 7, so it needed the help of

researchers in making some of these equations. Overall, in solving system problems of linear equations, S13 can show the ability to understand mathematical concepts

4. CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the students' ability to understand concepts is still low. This is seen through the results of the concept comprehension ability test. The results of this study will be used as information for teachers to understand the conceptual understanding of students in mathematics lessons. The ability to understand important concepts in mathematics learning so that teachers are expected to be able to design learning activities to increase the ability to understand concepts. In this case the researcher suggests that for further research 1) conduct research to see the ability to understand mathematical concepts in other teaching materials. 2) the next researcher develops / designs learning to improve students' conceptual understanding ability.

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