



Description of Grade VII Students' Concept Understanding on Set Topic

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Abstract- This research has the aims to explain about the understanding of student's mathematical concepts on set topic. This research is a descriptive research whose population is 7th grade students with a sample of 94 students from SMP Negeri 34 Padang. The instrument used in this research is a test question regarding the set material which contains indicators of mathematics conceptual understanding. The result of the test analysis show that as many as 8,51% of students with excellent concept understanding, 11,7% of students with good concept category, 6,38% of students with sufficient category, 13,83% of students with low concept criteria, and 59,57% of students with lowest concept understanding criteria.

1. Introduction

Education is a very fundamental need in advancing the nation. The progress of a nation is influenced by the quality of its education. Education can be used as a guide in carrying out human life. Through education, everyone will compete to improve and develop all areas of ability through the acquired knowledge of education (Suraji et al., 2018). The educational process must be able to create a pleasant learning and learning atmosphere and facilitate students so that all their potential can be developed so that the expected educational goals are achieved. It is also should lead to producing graduates which has competencies related to the current era (R Rifandi et al., 2020; Widya et al., 2019).

Mathematics is one of the fields of science that takes part in the nuances of education (Maysara & Yerizon, 2019).

This subject is seen as basic knowledge that is growing rapidly and a science that must be taught at all levels of education from elementary school to high school. Mathematics is a discipline that needs to be mastered by students. Mathematics is very useful and very supportive of humans in life activities, especially in dealing with various problems that use a skill and ability to solve problems. In addition, mathematics can equip students with critical, systematic, analytical, logical, creative and collaborative thinking skills. Those skills are needed by the students when they continue their study into a higher level and also in their daily life later on (Aziz et al., 2020).

The main ability to be developed in mathematics learning activities is the ability to understand concepts. This is because there is a connection and continuity between concepts in mathematics. Mathematical concepts are neatly and structured, starting from easier concepts to more difficult concepts (Ruqoyyah et al., 2020). Therefore, in mathematics, the understanding of concepts needs to be mastered by students. To achieve good learning scores in mathematics, it is necessary to have a good understanding as well (Irham & Armiami, 2019).

The ability to understand mathematical concepts for students is also an ability that is used as a foundation in improving other mathematical abilities. Concept understanding is the earliest ability that must be achieved in teaching mathematics, so it can be said that in learning mathematics, understanding concepts as a foundation that must be solid to achieve other abilities (Zulmaulida et al., 2021).

Knowledge of good concepts will facilitate students in developing mathematical procedural knowledge. Concepts in mathematics are said to be optimal if the understanding of the previous concepts (prerequisites) is also optimal. So that students can apply it easily in real life (Mayani & Yarman, 2022). In solving a mathematical problem, students will find it difficult if they do not understand the concept well. Therefore, if in learning mathematics it is found that the ability to understand mathematical concepts of students is weak, then this situation becomes a matter of concern so that there is a need for follow-up from teachers for students so that these basic abilities can be increased. This will relate and become one of the foundation for improving other mathematical ability such as critical thinking ability. As it is known that critical thinking is one of skills that is demand by the workforce nowadays (Meirisa et al., 2018; Puspita et al., 2019; Ronal Rifandi et al., 2022).

Based on the results of observations at SMP Negeri 34 Padang City on July 21, 2021 to December 20, 2021, an overview of the learning process in the classroom was obtained. Seen in learning mathematics when the teacher is delivering the material, many students do not pay close attention and there are even students chatting with their next door friend when the teacher explains. Students tend to accept what is explained by the teacher, and rarely express opinions or questions. When teachers ask questions, students tend to be silent and when given practice only a few students work seriously.

Likewise, when online learning takes place, it can be seen that teachers have maximally provided material to students through Geschool, learning videos, and WhatsApp groups (Nupus, 2022). However, the dominant students have not shown participation when participating in learning activities. There are still many students who don't want to ask teachers through WhatsApp Groups about materials they think are difficult. When doing the exercises, only a few students answered the exercises correctly. Generally, students choose to copy photos of their friends' answers.

This condition shows that the ability to understand mathematical concepts of students is classified as low so that students are unable to solve the problems they face.

Students who have difficulty in solving various problems are caused by understanding concepts that are less supportive. Without a good understanding of the concept, students will be confused about how to relate the various knowledge they have to be able to work on the problems at hand. This difficulty occurs in all mathematics subject matter, especially in set material. The set is the material studied by junior high school students. The set material is one of the materials that many students find difficult. It is not uncommon for students who are less than optimal in completing questions related to the topic of set.

The description of the ability to understand students' mathematical concepts on the topic of sets has also been carried out by several previous studies such as the research conducted by expert which revealed that the ability of students to understand mathematical concepts of set material in one of the SMPN Karawang class VIII schools was still categorized low (Asih & Imami, 2021). Furthermore, research conducted by Kartika (2018). The results of Kartika's research illustrate that the ability to understand mathematical concepts of seventh grade students of SMP Muhammadiyah, especially material on algebraic forms is still classified as low (Kartika, 2018).

The purpose of this study was to analyze and describe the understanding of students' mathematical concepts in the set topic.

2. Methods

This study used a descriptive type of research that aims to describe the phenomenon or state of understanding the concept of students on the topic of the set.

The data for this study were sourced from seventh grade students of SMP Negeri 34 Padang for the 2021/2022 academic year. Considering the large number of population and the limitations of several factors such as time and cost, the subjects of this study were only 94 students.

The ability to understand mathematical concepts is a variable in this research. Meanwhile, the instrument used is in the form of test questions regarding set material which contains three indicators of understanding mathematical concepts, namely, linking various concepts in mathematics and outside mathematics, applying concepts logically, and identifying the properties of operations or concepts.

After being given a test, the test scores are then analyzed and classified based on the classification of the level of understanding of concepts that require the following group references:

Table 1. Concept Understanding Level Criteria

The value of the ability to understand the concept	Criteria
$80 \leq \text{value} \leq 100$	Very Good
$65 \leq \text{value} < 80$	Good
$55 \leq \text{value} < 65$	Sufficient
$40 \leq \text{value} < 55$	Low
$0 \leq \text{value} < 40$	Very Low

3. Results and Discussion

Data on student test results on the set material are listed in the following table:

Table 2. The Result of Test Students' Mathematical Concepts

Predicate	Amount	Percentage
Very Good	8	8.52%
Good	11	11.70%
Sufficient	6	6.38%
Low	13	13.83%
Very Low	56	59.57%
Amount	94	100%

Based on the results of the analysis of students' mathematical concept understanding test answers, it was found that as many as 8.51% of students had very good concept understanding criteria, 11.7% students had good criteria, 6.38% had sufficient criteria, 13.83% had low criteria, 59.57% very low criteria. This informs that almost many or most of the students have problems in understanding concepts. This is evidenced by the achievement of the average score for each indicator, which can be read in more detail in the following table:

Table 3. The Average Score of the Indicators Understanding The Concept

Indicator	Average
Indicator 3	1,67
Indicator 4	1,72
Indicator 7	1,52

Table 3 shows that the highest average score is on indicator 4, which is 1.72, then followed by indicator

3, which is 1.67. This means that the ability of students for indicator 4 is better than indicator 3. Then for indicator 7 an average of 1.52 is obtained which is the lowest average of the other indicators. However, when viewed based on the average score, of the 94 students who have taken the test are in the score range of 1 to 2. While the highest average range is 4, but each indicator only gets an average of below 2. This illustrates that the ability of students in each indicator has not been met properly in the set material so that the average score of the indicators obtained is still not satisfactory. More complete data regarding the test results tested on each indicator is attached to the following data description:

Indicators identify the traits of the operation or concept

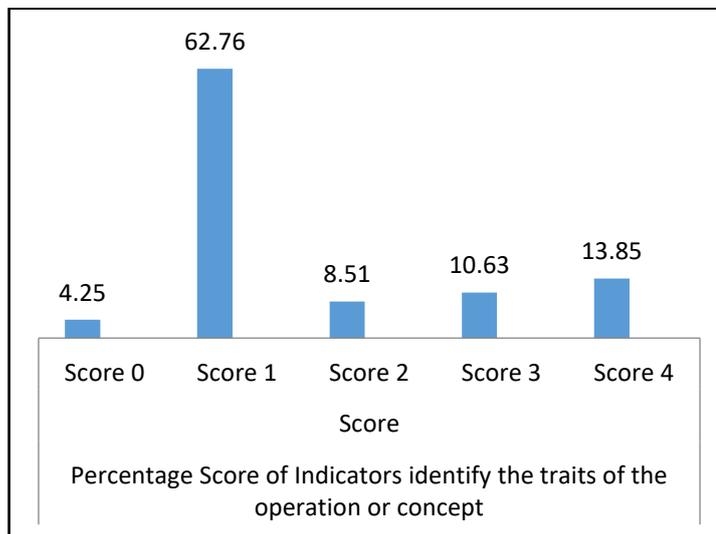


Figure 1. Percentage Score Indicator 3

From Figure 1, it is found that the highest score percentage lies in score 1, which is 62.76%, while score 4 is obtained as much as 13.85% of students. The meaning is that the ability of students to identify the properties of set operations is still not good so that only a few students get a score of 4. The following questions can test this indicator as follows.

"If $A = \{x \mid x < 15, x \in \text{Odd Natural Number}\}$ and $B = \{x \mid 1 < x < 10, x \in \text{prime number}\}$. Then $A - B$ is..."

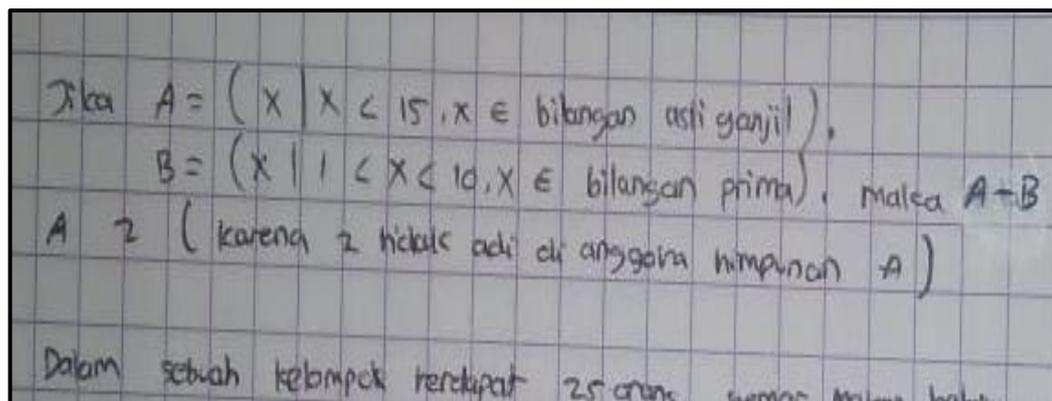


Figure 2. Student Answer A

Figure 2 shows that students have not been able to identify the properties of set operations. From the questions given, students are asked to determine the results of the operation of subtracting two types of sets where the set A is subtracted from the set B, which means students are asked to find out which members of set A are not included in the set B. However, what students do is determine which members of set B are not classified as set A, it means that students are still not able to identify the properties of set operations correctly. In addition, it appears that students also do not present the members of set A and set B first, causing errors in providing answers related to the questions posed. Errors in answering these questions were also made by other students as in the following example:

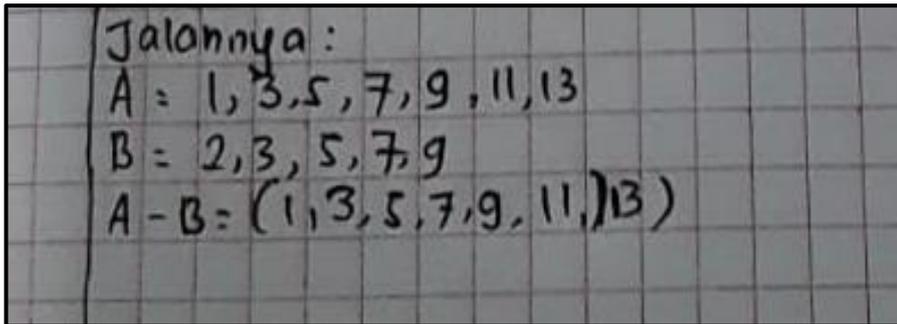


Figure 3. Student Answer B

The student's answer then shows that the student has been able to register all the members of the requested set before solving the problem. However, from the answers, it appears that students still cannot identify the properties of set operations. Where students are unable to answer any members of the result of subtracting two sets, set A is subtracted from set B. Students answer the question by registering all members of set A. It means that students do not understand the meaning of subtracting two sets so that students cannot answer The questions asked are in accordance with the expected answers. Here is a description of the correct answer:

$$A = \{1, 3, 5, 7, 9, 11, 13\}$$

$$B = \{2, 3, 5, 7\}$$

$$A - B = \{1, 9, 11, 13\}$$

From the two pictures, it shows that students in identifying the properties of set operations are still not good.

Indicators apply concepts logically

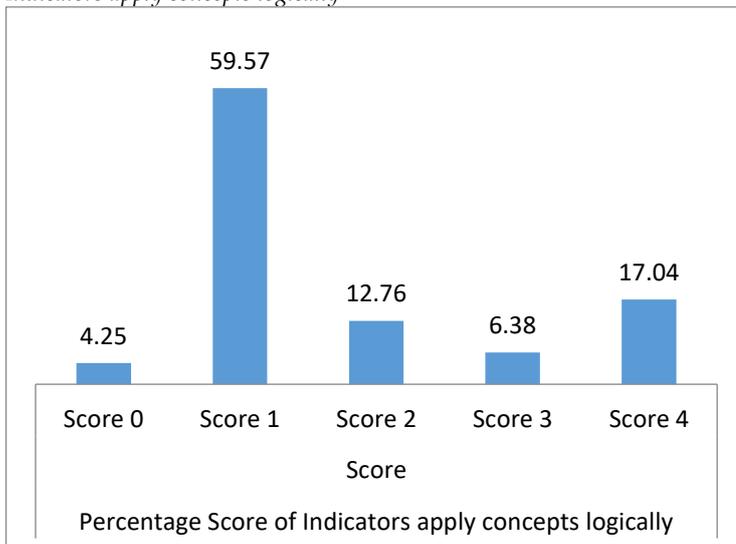


Figure 4. Percentage Score Indicator 4

In this indicator, students who get a score of 4 are 17.04%. Most students get a score of 1 which is 59.57%. This shows that the ability of students on this indicator is still not optimal. The following questions can test this indicator as follows.

“In a group there are 25 people who like to eat meatballs, 18 people like to eat satay, 10 people like to eat meatballs and satay, and 2 people don't like to eat both. Many of the members in the group are...”

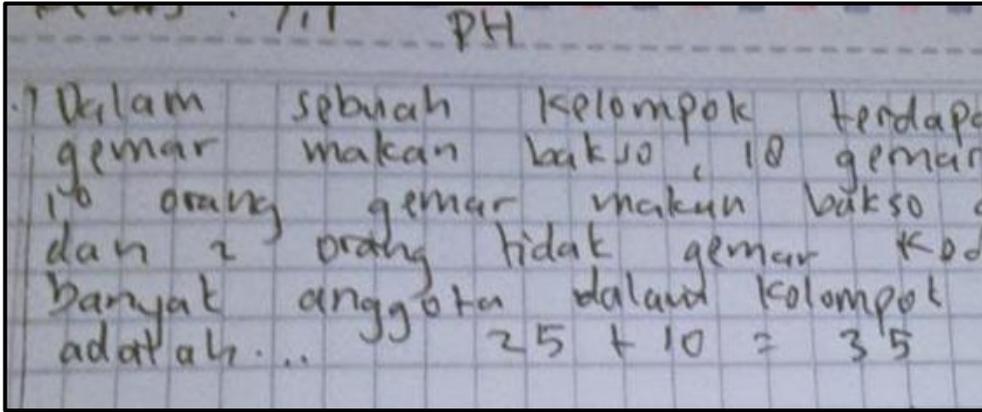


Figure 5. Student Answer C

Figure 5 shows that students have not been able to apply the concept of a set logically. In the questions asked to determine the number of members in a group. Where it is known the number of people who like to eat meatballs, likes to eat satay, likes to eat both and who doesn't like to eat both. Students answered the question incorrectly. Students are not able to count in advance many members who only like to eat meatballs and many members who only like to eat satay. Students do not know the meaning of the questions asked so that they are confused about how to work on the problem. Thus, students are classified as low on this indicator. Likewise, for the next student's answer.

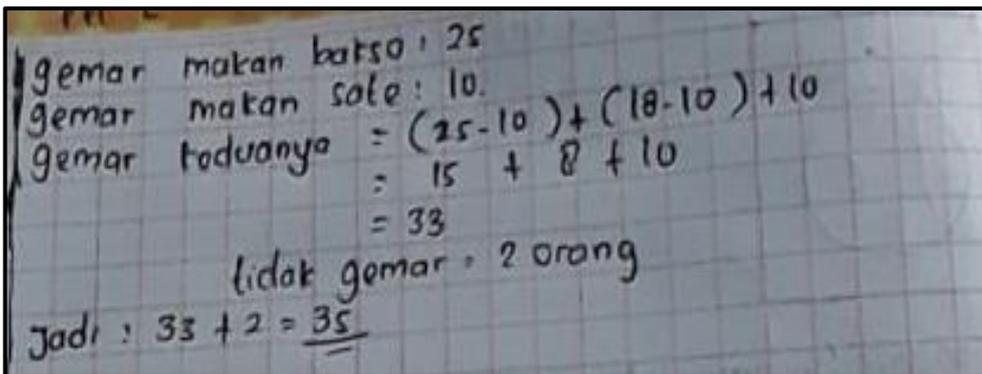


Figure 6. Student Answer D

In the answer above, students are also not able to apply the concept of a set logically through the given story questions. Students have tried to classify the number of each member who likes to eat meatballs, eat satay, likes to eat meatballs and satay, and doesn't like to eat both. However, the error encountered is that when students count how many members like to eat meatballs and satay only, students do not subtract it from many members who like to eat both so that the answer as above is not correct. The same mistake was made when determining the number of members who liked both. Where there are 10 people who like both while students answer 33 people. Some of these errors make it difficult for students to make answers to these questions. This shows that students have not maximally applied the concept of a logical set to the given problem.

The following is a description of the correct answers for the questions tested above:

- Many people like to just eat meatballs = $25 - 10 = 15$.
- Many people like to just eat satay = $18 - 10 = 8$.
- Many people who like to eat both = 10.
- Many people do not like to eat both = 2.

Thus, many members in the group

= Number of people who like to eat meatballs only + Number of people who like to eat satay only +

Many people like to eat both + Many people don't like to eat both

= $15 + 8 + 10 + 2 = 35$ people.

Indicators link various concepts in mathematics and outside mathematics

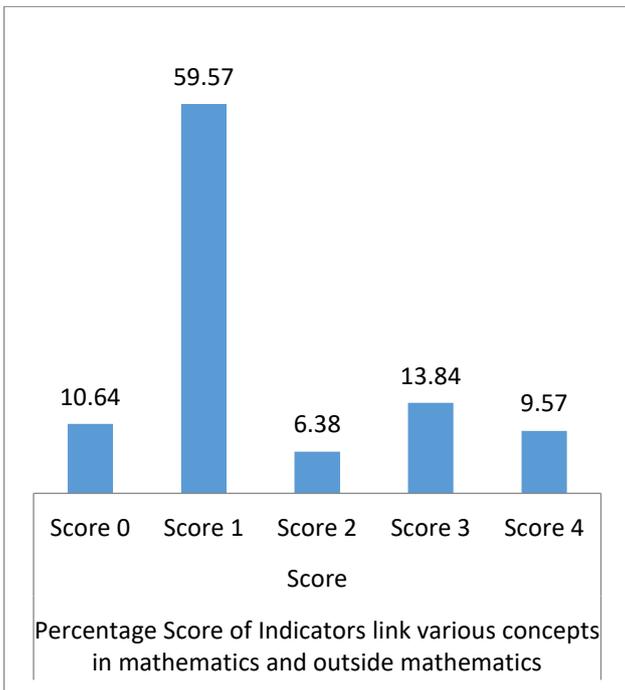


Figure 7. Percentage Score Indicator 7

Based on Figure 7, the percentage of the highest score is at score 1, which is 59.57% while the maximum score is only obtained by 9.57% of students. This means that the ability of students to relate the concept of sets into and out of mathematics is still relatively low. The following questions can test this indicator as follows.

“The number of subsets of $A = \{a, k, u\}$ is...”

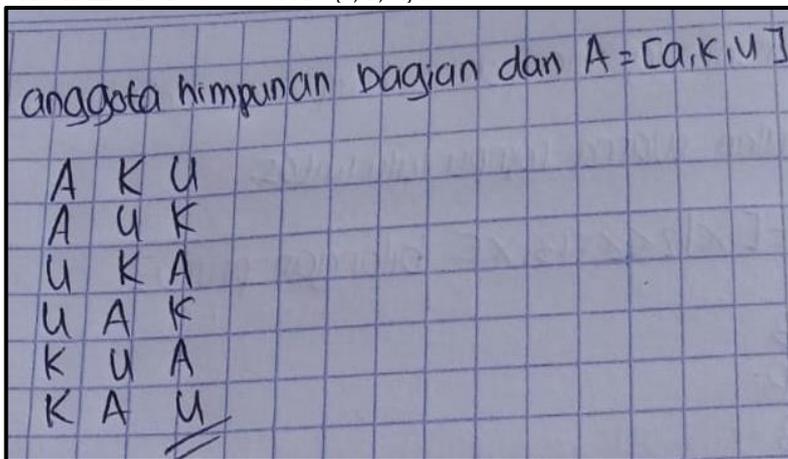


Figure 8. Student Answer E

Figure 8 shows that students have not been able to meet the indicators relating various concepts in mathematics and outside mathematics. From the questions tested, students are asked to be able to find how many members of the subset through a known set. It can be seen that students are not able to relate the concept of cardinality of a set to determine the number of members of a subset. In addition, the answers seen also illustrate that students do not understand the concept of subsets so that students answer the question incorrectly. Likewise, the following student answers:

$$\begin{aligned} (a, k, u) &= 4^2 \\ &= 4+4 \\ &= 8 \end{aligned}$$

Figure 9. Student Answer F

The student's answer F, it appears that the student has written the correct answer to the question, namely there are 8 subsets that can be formed from the set consisting of a, k, u. However, the mistake made by the students was an error in getting the answer 8. Students initially answered four to the power of two and then added four to four so that the result was eight. An answer like this is certainly wrong because it has nothing to do with the cardinality of the set on a known problem. The answer should be as follows:

$$\begin{aligned} A &= \{a, k, u\} \\ n(A) &= 3 \\ \text{Number of subsets of } A &= 2^{n(A)} \\ &= 2^3 \\ &= 8 \end{aligned}$$

From the two pictures it is clear that students have not been optimal in linking various concepts to the set material.

Based on the analysis of the research results, it was found that the ability to understand mathematical concepts of 94 students was still not significant. This is evidenced by the results of the answers to the concept understanding test in the set chapter and is supported by the results of the analysis of 3 indicators of concept understanding, each of which has a low average score. So it can be concluded that the understanding of students' mathematical concepts on the topic of the set is still not optimal.

4. Conclusion

An overview was obtained based on the results of the research, namely the ability to understand mathematical concepts of seventh grade junior high school students on the set material is still relatively low. This can be seen from the score obtained as much as 8.51% with very good concept understanding criteria, 11.7% students with good criteria, 6.38% with sufficient criteria, 13.83% with low criteria, 59.57% with very low criteria. Based on these criteria, it becomes the basis for the future that there is a need for further teaching innovations so that the understanding of mathematical concepts in students is further improved.

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