

13. Mathematical Concepts

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Mathematical Concepts Understanding Skill of Class VIII Students on Relation and Function Using Problem Based Learning Models

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ABSTRACT

This research is a research design with a qualitative descriptive type of research that aims to see mathematical concept understanding skill in relation and function material using a problem based learning model. Learning will be made in the form of learning activities carried out in class. The activities made are also accompanied by student worksheets (LKPD) to support the learning process. The research subjects were students of class VIII SMP Negeri 45 Palembang, while the focus of the study was 6 students with varying ability, namely high, medium, and low which were selected based on the results of the tests carried out later. The research was carried out in three stages, namely: (1) Preparation Stage; (2) the implementation stage of teaching; (3) The final stage is data analysis. This research was conducted by following the learning system in schools. Research data is collected and will be analyzed qualitatively. The results showed that the ability to understand concepts using a problem based learning model can be seen in the students of SMP Negeri 45 Palembang in solving relation and function tests.

Keywords: Concept understanding skills, Problem based learning, Relation and function.

1. INTRODUCTION

Mathematics is one of the most critical subjects and must exist in every educational lesson. Learning mathematics aims to prepare students to grow creative, innovative, and imaginative thinking patterns to compete in society. Mathematical skills can be classified into five main competencies based on their type: problem-solving skills, communication skills, connection skills, reasoning skills, and representation skills [1]. Through learning mathematics, one of the expected goals is to solve problems, including understanding problems, designing mathematical models, solving problems, and the skill to explain the solutions obtained [2].

To achieve this, a good understanding of concepts is required. Student's ability to understand mathematical concepts significantly affects learning outcomes in solving mathematical problems; without having the skill to understand, students cannot apply the concepts, or processes of the material they get [3,4]. Students must be able to understand a concept first to understand the

learning material. Understanding the concept itself is a bridge for the reasoning process [5].

However, in reality, junior high school students have power of reasoning that can be categorized as low, even though the reasoning is a concept essential to carry out a thought process that points to a conclusion as a new statement from several other statements and has known. Moreover, one of the causes of failure in learning mathematics is that students do not understand mathematical concepts or students misunderstand mathematical concepts [6,7]. And because students' understanding of concepts is not optimal. Students often have difficulty in solving problems, due to low mastery of mathematical concepts [8].

One of the mathematics learning materials that require reasoning is relations and functions; relation and function material is one of the mathematics materials and is taught to class VIII SMP/ equivalent, relations and functions are essential concepts in mathematics; by recognizing functions or functional relationships between mathematical elements, it is easier for us to understand a

problem and solve it [9]. Previous research has shown that there is still a lack of understanding of mathematical concepts in relation and function material requires good skills of mathematical concepts. In this study the percentage of learning errors that grade VIII students of SMPN 3 Koto Singkarak make in relation and function in using concepts is 45.91% and it is necessary to use good learning models [10].

Although the ability to understand mathematical Problem-based learning is expected to support the understanding of concepts. Students in the problem-based learning method discuss professionally relevant problems in small groups. Problems are discussed first before preparation, or independent study is carried out to activate students' prior knowledge, and problem-based learning is curriculum development and a good learning process to understand the concept of contextual problems [11,12]. From research that has been done, there is an increase in the ability to understand mathematical concepts of students who receive problem-based learning, and the ability to understand mathematical concepts of students who receive problem-based learning is better than students who receive conventional learning [13,14]. The purpose of this research is to describe the students' mathematical concepts understanding skill in answering questions of relation and function with problem-based learning models.

2. METHOD

2.1. Research Design

In this study, the researcher used descriptive research to describe the ability to understand mathematical concepts of class VIII students in relation and function material with a problem-based learning model. Descriptive research is a type of research that aims to describe current conditions.[15]

This research was conducted through 3 stages, namely: (1) experimental preparation, (2) experimental implementation, (3) data analysis. Data analysis was carried out on students' test answers by describing each indicator contained in the test questions.

2.2. Procedure

First of all, in the preparation stage, the researcher formulates the problem, determines the school and research subject, examines the literature on the research to be carried out, makes learning tools in the form of LKPD, RPP, interview guidelines, and test questions of relational and function materials with problem-based learning models and validate the instrument to the lecturer.

Implementation stage, after the researchers compiled learning tools in the form of LKPD, RPP, and test questions by adjusting the PBL approach. Then activities will be carried out following the previous planning, namely the learning process using the PBL approach. The activities referred to are as follows:

Apperception will be carried out before entering the core material by adjusting the planned time to not take much time. Then students will be asked to sit openly with the rules that one group only consists of 4 students. Core Activities, namely students in groups, observe authentic problems contained in the LKPD and analyze any data contained in the problem, which will be formulated in steps -the steps already contained in the LKPD to get an understanding of the concept of the material, namely, relations, functions, domains, codomains, and ranges. Closing, student representatives explain the results obtained to discuss harmonizing the concepts obtained from each group

The final stage, namely data analysis. The activities that take place in the final scene are as follows: collecting data in the form of test questions that students have done after learning has taken place, analyzing the results of the instrument, for test questions analysis is carried out by looking at each student's indicators and then analyzing the results of the test, summarized and marked the important things and will look for coding indicators on the indicators that appear. The conclusions from the analysis carried out at this stage are used to answer the formulation of the problem. The subjects in this study were class VIII students of SMP Negeri 45 Palembang in the 2021/2022 academic year. The students who became the focus of the research subject consisted of 6 students with high, medium, and low test result.

3. RESULT AND DISCUSSION

Learning is done face-to-face and online. Face-to-face learning is carried out at the third meeting, and online learning through google meets at the second meeting. This research was conducted by class XIII.8 students of SMP Negeri 45 Palembang and researchers will act as model teachers, and subject teachers will act as observers with the assistance of research partners. At the time of learning, the LKPD, which consists of 3 problems, one problem for each meeting, is used as authentic problem-based learning to get the concept of relation and function material. Then a test is conducted to see how the students' understanding of the concept after learning with a problem-based learning model is carried out. Giving test questions is given at the time after the learning process is carried out. The test questions consist of 5 questions with a relation and function material.

3.1. Analysis Test and Interview

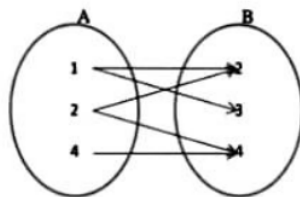
4 Test questions are given to analyze student answers following the indicators of mathematical concepts understanding skill. The question consists of five questions, and for each question, there are indicators to

be analyzed. The researcher will analyze student test results by describing whether their answers follow the indicators in the questions. To make it easier for researchers to code the fifth indicator described in the following table:

Table 1. Table code indicators

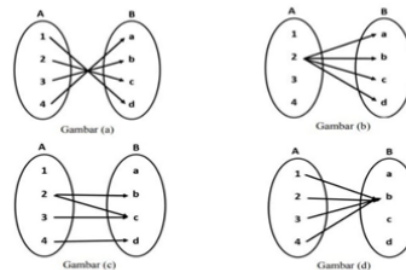
Number Of Question	Code Of Indicators	Indicators	Descriptor
1	P1	restating a concept	Determining the right concept/way and being able to state a concept correctly
2	P2	Apply concepts logically	Implementation of concepts to answer questions
3	P3	Identify examples and non-examples	Determine which is an example and not an example
4	P4	12 Presenting concepts in various forms of mathematical representation	Presenting relations and functions in various forms of mathematical representation
5	P5	Classify objects that meet the requirements that make up the concept	Classify relations and functions based on whether or not the requirements of a relation and function are met

From the table above, there are five questions where; There are five questions with each indicator, for question number 1 indicator P1, number 2 indicator P2, number 3 indicator P4, number 4 indicator P3, and number 5 indicator P5. The following are the details of the emergence of students who were taken based on three indicator criteria that emerged from low, medium, high results of the test



What is the exact relation from set A to set B? Give the reason!

Figure 1 Question number one



Which is a function and which is not a function? Give the reason!

Figure 2 Question number two

In a class, four students have extracurricular activities to participate in. The four students are Joni, Meru, Rana, and Galang. Joni chose paskibraka and scout activities. Meru chooses basketball activities. Rana chose soccer and scouting activities. Galang chose paskibraka and basketball activities. Make an arrow diagram with the set of ordered pairs!

Figure 3 Question number three

$f(x) = -2x + 7$. If $f(k) = 17$, the value of k is

Figure 4 Question number four

If $A = \{2, 3, 6\}$ $B = \{2, 4, 6, 8, 10, 11\}$.
The relation from set A to B is "Factor of",
Express the relationship with an arrow diagram
and determine:
a. domain
b. codomain
c. range

Figure 5 Question number five

3.1.1. Analysis of Understanding Mathematical Concepts of ANN Subjects

ANN Subjects are categorized as competent subjects, because the subject meets all indicators of the ability to understand mathematical concepts. The following is an analysis of understanding mathematical concepts of ANN subjects:

In question number one, it can be seen that the indicator of P1 appears because the student can correctly answer the relation of the two sets but he did not write down the reason why he answered so, then during the interview the ANN student was able to explain well the reason for the answer to question number one.



Figure 6 Answer from subject ANN

In question number two, the subject of ANN has also fulfilled the P2 indicator where the ANN students are able to answer questions properly by applying the concept of a function correctly for determine the function, in the answer to figure 7 below, the question where student was asked to determine the function of some of the given relations, but they also do not write down the reasons or concepts for how they got the answer, so that during the interview the researcher asked this and the ANN students could explain clearly, good reason for the answer.

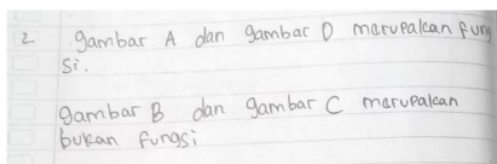


Figure 7 Answer from subject ANN

In question number three, the subject of ANN has also fulfilled the P4, it can be seen in the picture above the student's answer to question number 3, the P4 indicator

appears from the student's answer, students can represent daily problems in the form of arrow diagrams and a set of pairs in sequence correctly.

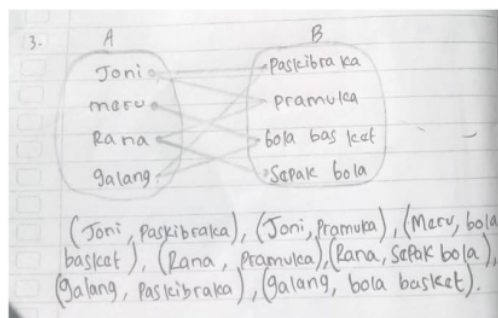


Figure 8 Answer from subject ANN

In question number four, the subject of ANN has met the P3 indicator, it can be seen in the picture above that the student's answer to question number 4 with the P3 indicator, students can apply the concept to answer the question well.

$$\begin{aligned} 4. \quad f(x) &= -2x + 7 \\ f(k) &= 17 \\ 17 &= -2k + 7 \\ -2k &= 10 \\ k &= -5 \\ \text{maka nilai } k &\text{ adalah } = -5. \end{aligned}$$

Figure 9 Answer from subject ANN

And lastly for question number 5 with the P5 indicator, students bring up the indicator where students are asked to classify the domain, codomain, and range of a function, students can answer correctly.

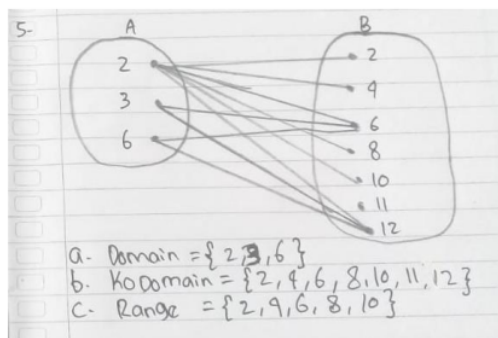


Figure 10 Answer from subject ANN

3.1.2. Analysis of Understanding Mathematical Concepts of APK Subjects

APK subjects are categorized as moderately capable subjects. because the subject only meets three indicators of understanding mathematical concepts from five existing indicators. The following is an analysis of understanding mathematical concepts of APK subjects:

In this question, the subject of APK has not fulfilled indicators P1 In the answer above, it can be seen that the indicator from P1 does not appear because the relation he mentioned is not in accordance with the question, and during the interview, the subject apk said he understood the concept of the relation, but he had an error in determining the rules of the relation

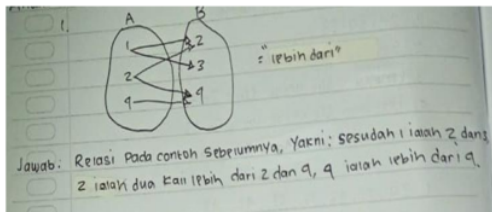


Figure 11 Answer from subject APK

For question number two, you can see the answer from the subject apk, the P2 indicator appears partly from the student's answers but only for point a, and the others still do not emerge from the student's responses; during the interview, apk said he was not proficient in distinguishing functions because he was too hasty.

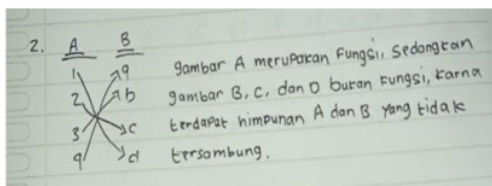


Figure 12 Answer from subject APK

In question number three, the subject of ANN has also fulfilled the P4, it can be seen in the picture above the student's answer to question number 3, the P4 indicator appears from the student's answer, students can represent daily problems in the form of arrow diagrams and a set of pairs in sequence correctly.

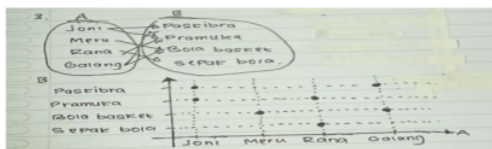


Figure 13 Answer from subject APK

In question number four, the subject of APK has met the P3 indicator, it can be seen in the picture above that the student's answer to question number 4 with the P3

indicator, students can apply the concept to answer the question well.

Figure 14 Answer from subject APK

And lastly for question number 5 with the P5 indicator, students bring up the indicator where students are asked to classify the domain, codomain, and range of a function, students can answer correctly.

Figure 15 Answer from subject APK

Based on the research that has been done, it shows that of the 5 indicators of the ability to understand mathematical concepts used, indicators of logically applying concepts have appeared in all subjects. For other indicators that seem dominant are presenting data into various mathematical representations and classifying objects that meet the requirements that make up the concept, what has not emerged dominant is restating the concept and providing examples instead of examples.

The results of this study are in line with the results of previous studies, showing that through learning with a problem based learning model, most of the students can develop the ability to understand concepts, students become better at understanding mathematical concepts taught with problem-based learning because they themselves discovered the concept.

4. CONCLUSION

This study aims to see the ability of students to understand mathematical concepts using a problem based learning model. Based on the results of the analysis, it can unlock problem solving for most students. The indicators that appear the most are indicators P2, P4 and P5. Meanwhile, indicators that rarely appear are indicators P1, P3, this is because students are still less thorough in understanding and misconceptions that occur. In this study, several inhibiting factors affect students' answers. Some inhibiting factors include processing time, student accuracy, and students' understanding of the material.

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