Analysis of Students' Understanding Concepts on Algebra Topics Reviewed from Students' Attitude Toward Mathematics

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ABSTRACT

This research discusses how students' abilities to understand mathematical concepts are grouped into three types of students' attitudes toward mathematics. Three types of student attitudes were obtained using a questionnaire which then obtained positive, neutral, and negative attitudes towards mathematics. This research aims to find out how students' ability to understand concepts with positive, neutral, and negative attitudes towards mathematics. The form of research used is qualitative descriptive research because it prioritizes process rather than results. Students are given test questions and interviews are conducted to validate the validity of the student test result data. The indicators for understanding the concept used in this research are 7 indicators. This research shows that students with positive attitudes toward mathematics fulfill 6 indicators of the 7 indicators of conceptual understanding used in this research. Students with a neutral attitude towards mathematics can fulfill 5 of the 7 indicators of understanding the concept. Students with negative attitudes are only able to understand 1 indicator and tend to be lazy when taking tests.

Keywords: Understanding of concepts; student attitudes

INTRODUCTION

Mathematics is one of the main components of the Indonesian education curriculum and is treated as a mandatory subject at every level of education, including secondary school. Minister of Education and Culture Regulation No. 22 of 2006 notes that mathematics subjects need to be given to all students from elementary school to equip students with reasoning, analytical, systematic, critical, and creative abilities and the ability to work together. Mathematics is also considered the basis of scientific and technological knowledge that is valued throughout the world and is believed to be an instrument for political, socio-economic, scientific, and technological development [1]. Mathematics is often linked to how to solve given problems, so it requires the ability to understand mathematical concepts.

Understanding concepts is the basis for understanding principles and theories [2]. Understanding concepts is a student's ability in the form of mastering several subject matters, but being able to express it again in another form that is easy to understand, provide interpretation of data, and being able to apply concepts that are by their cognitive structure [3]. Understanding concepts is in the form of mastering several learning materials, where students do not just know and know but can re-express concepts in a form that is easier to understand and can apply them [4]. Based on several opinions above, it can be interpreted that understanding mathematical concepts is an ability that students achieve after experiencing a learning process and then being able to apply everything they receive or understand in various situations and conditions.

Understanding mathematical concepts is one of the mathematical skills or proficiency that is expected to be achieved in learning mathematics, namely by demonstrating an understanding of the mathematical concepts being studied, explaining the relationship between concepts, and applying concepts or algorithms in a flexible, accurate, efficient and precise manner in solving problems [5]. Understanding mathematical concepts is students' thinking in understanding mathematical concepts so that they can restate these concepts, classify objects according to certain properties, provide examples and non-examples of concepts, present concepts in mathematical representations, use certain procedures, and apply the concepts to problem-solving in the

mathematics learning process [6]. In line with Karim & Nurrahman who say that the ability to understand mathematical concepts is the ability to understand concepts, differentiate between several mutually exclusive concepts, and the ability to carry out meaningful calculations on broader problems [7].

Understanding concepts is often related to students' attitudes toward mathematics. Research related to students' attitudes towards mathematics with understanding of mathematical concepts and student achievement has been carried out by several researchers. Among them, Chandra stated that there is a correlation between students' attitudes towards mathematics and their mathematical [8]. Then students' attitudes towards mathematics influence student achievement [9]. The student's perceptions of the students then have an impact on their achievement [1]. Furthermore, there is a significant influence between students' attitudes toward mathematics on students' mathematics learning achievement [10].

Attitude is the ability to assess something which is reflected in an attitude of accepting, rejecting, or ignoring [11]. Robbins defines attitudes as evaluative statements or judgments relating to an object, person, or event [12]. A person's attitude is the result of a psychological process so it cannot be observed directly but must be inferred from what is said or done. Knight divides attitudes into three components beliefs, emotional responses, and behavior, and states that attitudes are one of the important factors of achievement [13]. Some of these opinions show that attitude is a response, reaction, or expression of a person's natural feelings towards an object and has a positive or negative value which can be seen from what is said and done.

Attitudes towards mathematics also certainly have three components, namely cognitive, affective, and conative. Positive attitudes toward mathematics in students can certainly be developed by them learning to associate positive experiences or events with it, which is about teacher behavior during the learning process because even small factors can influence their attitudes towards mathematics (Mensah & Okyere, 2019). Attitudes towards mathematics have an impact on students' learning processes [14]. Based on the research explanation above, it shows that students' attitudes toward mathematics influence student ability to understand mathematical concepts.

The results of an interview with a mathematics teacher at SMP Negeri 1 Pleret were that "students are still carried away by the atmosphere of online lessons to this day and find it difficult to separate them from gadgets", he also added that "students who are allowed to bring cellphones to school also sometimes get in the way of starting the learning process at class". Behind students being allowed to bring cell phones is the result of deliberations with the student's parents, where the student's parents hope that being allowed to bring a cell phone will make the learning process easier for students and facilitate communication with the student's parents. This is also an additional task for teachers who must prepare strategies so that they can maximize class time as efficiently as possible so that the lesson material is conveyed and can be understood by students. The teacher's explanation of the interview results above conveyed that students' understanding of concepts in mathematics lessons was still less significant, but quite a few students were able to utilize the facilities they brought to school as tools for the learning process. Teachers also admit that the level of students' conceptual understanding at SMP Negeri 1 Pleret is relatively low, especially in mathematics subjects.

The presentation of several studies and problems that have been presented is related to understanding mathematical concepts and students' attitudes towards mathematics. This research aims at novelty and originality regarding how students' ability to understand mathematical concepts is viewed from students' attitudes toward mathematics on the topic of algebra.

RESEARCH METHOD

This type of research is descriptive qualitative. The research was conducted at SMP Negeri 1 Pleret which was carried out in the odd semester of 2023/2024. The subjects of this research were 29 class VII students. The selection of subjects was taken based on the categories of students' attitudes towards mathematics, positive, neutral, and negative, with all subjects being 9 students.

The data collection instruments used were student attitude questionnaires towards mathematics, concept understanding tests, and interviews. This research applies the triangulation method to test the validity of

research data. Data from student work and interviews is said to be valid if the results of the student's work match the results of the interview, and vice versa. The data collection step is to group research subjects based on the categories of students' attitudes towards positive, neutral, and negative mathematics and meeting predetermined criteria. Collect data by giving prepared concept understanding tests to selected subjects. Interviews are then used to determine the extent of understanding of the subject's mathematical concepts.

Indicators of concept understanding used in this research are interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining (Kesumawati, 2008).

The attitude indicators towards mathematics used in this research adopted the Fennema Sherman attitude scale which was modified according to the current situation where this scale consists of four, namely the belief scale, the usefulness scale, the scale that measures mathematics as a male domain, and the teacher scale [15].

An attitude questionnaire toward mathematics was prepared and then validated by expert validators. The validated student attitude questionnaire towards mathematics was then given to students at SMP Negeri 1 Pleret class VII. The results of filling out the next questionnaire can be seen in Table 1.

Table II: Results Of Filling Out a Questionnaire on Students' Attitudes Towards Mathematics

Attitude Scale	Indicators
Positive	5
Neutral	15
Negative	5

Based on the results of filling out the questionnaire on students' attitudes towards mathematics in table II, 9 subjects were then selected from the positive, neutral, and negative categories. Then students are given a test of understanding mathematical concepts and conducted interviews regarding their work to process data validity. Drawing conclusions and verifying data is expected to result in new findings and an understanding of the mathematical concepts of each research subject.

RESULT AND DISCUSSION

The data in this research are tests of understanding mathematical concepts and interviews. Test and interview data on students' understanding of mathematical concepts in the categories of positive, neutral, and negative attitudes are presented as follows:

1. Subject with a positive attitude.

The results of the conceptual understanding test for students with a positive attitude toward mathematics (S1) can be seen in Figures 1, 2, and 3.

Figure 1. S1's answers to the mathematics concept understanding test 1

Figure 2. S1's answers to the mathematics concept understanding test 2

Figure 3. S1's answers to the mathematics concept understanding test 3

Based on the results of the tests and interviews that have been conducted, it appears that S1 can solve all the problems in the linear equation material provided. S1 can interpret all types of questions given and can change the form of the questions given to another form to be easier to understand, including in the form of story questions. S1 can also explain the relationship between concepts and problems given by using the properties contained in linear equations material. S1 has applied all the properties that have been studied in the linear equations material to problems 1, 2, and 3. Several steps are not quite right in the answers given by S1, but after the interview, S1 realizes this and admits that he was inaccurate in answering, which resulted in the final answer being wrong. Chandra said that there is a positive correlation between student performance and their attitudes towards mathematics [8]. In line with the results of Hwang & Tekwon's research which states that students who like studying mathematics and have confidence that studying mathematics will produce positive results and believe in their abilities [16]. Likewise, Budi & Agustin said that there is a positive and significant influence between students' attitudes towards mathematics on student learning outcomes [17]. The S1 test results show that S1 can meet 6 of the 7 indicators of conceptual understanding. This shows that undergraduates who have a positive attitude toward mathematics have a good level of conceptual understanding.

2. Subject with a neutral attitude.

Figure 4. S2's answers to the mathematics concept understanding test 1

Figure 5. S2's answers to the mathematics concept understanding test 2

Figure 6. S2's answers to the mathematics concept understanding test 3

Based on the results of tests and interviews conducted on S2, it was found that S2 was able to solve all the problems given and apply all the properties of linear equations well. In the answers given by S2, there were several wrong answers even though at the time of the interview S2 felt confident in the answers given without realizing the wrong parts. After conducting an interview. The researcher conveys the wrong part and explains the appropriate steps so that S2 can understand the input given by the researcher. S2 can fulfill the 5 indicators of understanding the concepts used in this research. This shows that students with a neutral attitude have a fairly good level of understanding in solving the problems given.

3. Subject with a negative attitude.

Figure 7. S3's answers to the mathematics concept understanding test 1

Figure 5. S3's answers to the mathematics concept understanding test 2

Figure 5. S3's answers to the mathematics concept understanding test 3

Based on the test results and interviews, S3 had difficulty changing form from one form to another, in this case it was clear that S3's answer to test problem number 2 only wrote a direct answer without any supporting explanation. Likewise, when the doctoral interview was conducted, he was unable to explain the answers written and was only able to apply the properties of equations to problem 1. Students' negative attitudes towards mathematics made students lazy when faced with mathematics problems. Karma & Tenzin said that students who have negative attitudes towards mathematics tend to have low learning achievement [9]. Students' attitudes towards mathematics certainly play an important role and influence the level of students' conceptual understanding of mathematics [18]. Teachers play an important role in analyzing students' attitudes towards mathematics and providing the necessary support to encourage the development of students' positive attitudes towards mathematics. In line with Essa (2021) who said that one of the external factors that influences students' attitudes towards mathematics is the teacher [19].

CONCLUSION AND RECOMMENDATION

This research shows that students with a positive attitude toward mathematics can master indicators of understanding mathematical concepts. This happens because students who have a positive attitude think mathematics is a fun lesson and will be useful in the future. Students with a neutral attitude mastered some of the indicators of conceptual understanding and were found to still have difficulty changing the form of story questions into a form that was easier to understand. Furthermore, students with a negative attitude tend not to work on the problems given, as well as questions that are considered difficult, because, from the start, students think that mathematics is difficult and will not be useful for their future lives.

There are many variables that researchers cannot control in this research, so in the future, it is hoped that there will be additional variables for further research, such as the facilities that students have and how to use these facilities and others. Apart from that, to deepen and strengthen the research results, interviews can be conducted with the subjects.

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