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ANALYSIS OF STUDENTS' MATHEMATICAL REASONING ABILITY AND SELF-CONFIDENCE IN SOLVING PROBLEM-BASED QUESTIONS

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Artikel info

Abstrak

Analysis of students' mathematical reasoning abilities and self-confidence in solving problems based on background problems in this study, namely the low students' reasoning abilities and self-confidence in learning mathematics. This study aims to: (1) Describe the level of students' mathematical reasoning abilities in solving problem-based questions. (2) Describe the level of self-confidence of students in answering problem-based questions. This study uses a qualitative descriptive research method. Methods of data collection using: (1) Test (2) Questionnaire (3) Interview. Data analysis techniques use: (1) data reduction (2) data presentation (3) conclusion drawing. Based on the results of tests and questionnaires conducted on class VIII B students at SMP Negeri 10 Metro, this study showed that students who had reasoning abilities and high self-confidence in solving questions and questionnaires showed very good results. Meanwhile, students who have reasoning skills and self-confidence who are currently solving questions and questionnaires show quite good results. As for students who have low reasoning abilities also have a low level of self-confidence.

INTRODUCTION

The era of the industrial revolution 4.0 has become a new milestone for the development of human life. Learning mathematics and the ability to reason mathematically is interconnected, bound, and cannot be separated (Davis & Simmt, 2014). However, mathematical reasoning is a crucial aspect of learning mathematics; still, many students need

to improve their ability to reason mathematics. Results from the Third International Mathematics and Science Study (TIMSS) show that self-confidence in Indonesian students is still low, namely below 30% (TIMSS, 2015). The results of the study by (Kartikasari & Widjajanti, 2017) show that ability self 50% of students' mathematical confidence is still low, 25 % medium, 20% high, and 5% high. In mathematics, learning not only develops cognitive aspects but also affective aspects to support the success of the learning process at school. One of these affective factors is students' self-confidence (Tee et al., 2019). Self-confidence is important for students (Moneva & Tribunalo, 2019) because the level of trust in the student influences student success in studying mathematics. There is a feeling of self-confidence, then students will study mathematics and be more motivated, so the expected performance in studying mathematics student later will be more optimal (Akbari & Sahibzada, 2020; Soeseno & Ikashaum, 2024). Therefore, self-confidence is capable of supporting motivation and student success in the study of mathematics (Inagaki, 2022).

Based on the results of a pre-survey conducted by researchers at State Middle Schools 10 Metro, researcher interviewed mathematics subject. Teachers of mathematics in school say that the ability of reasoning students and their self-confidence in learning mathematics is still low, which is known based on the results observation teacher to student while learning mathematics because the low level of reasoning students which tend low causes passive students in learning like moment stated question or for answer. After conducting research during a pre-survey on students regarding mathematics scores, it was indicated that lots of students were not yet able to understand the meaning of the question given to them students not. However, an exciting conclusion is that they tend to be silent, do not believe in themselves, and do not answer questions that embarrass teachers. Besides, when given a test, students need more confidence in their abilities, so they cheat. This can be seen from the students' self-confidence, which covers the trend of looking at mathematics as something useful and valuable, believing in the self, being persistent, and being tenacious in questioning mathematics.

Moreover, flavor wants to know that mathematics needs improvement

1. Tono mempunyai sebuah akuarium berbentuk balok dengan panjang 80 cm dan tinggi 45 cm. Jika luas alas akuarium tersebut 3440 cm^2. Berapa liter air yang dapat di tampung oleh akuarium tersebut?

(Muryaningsih, 2020). From some problems, they saw that students were still low in matter ability, mathematical reasoning, and self-confidence; students were still not yet capable of developing the ability to reason mathematics well and needed more themselves to do questions (Surya et al., 2017). To prove my opinion, the researcher did a pre-survey with four question-based problems by mathematically indicator reasoning to student class VIII Junior High School Country 10 Metro with meter cube and beam. Election material cube and beam based on its relationship to the material in junior high school. Besides that, based on interviews, students consider teacher material more accessible if it is formed from questions about the problem. Following wrong one question and results answer pre-survey student:

> Tono has a block-shaped aquarium that is 80 cm long and 45 cm high if the area of the aquarium base is 3440 cm2. How many liters of water can the aquarium hold?

Figure 1.1. Pra Survei Test

> Students immediately answer the questions do not estimate the process of solving the questions given by writing down what they know and asking, so the first reasoning indicator is not fulfilled.

Figure 1.2. Pra Survei Answer

From one of the results of a pre-survey test that researchers conducted on students, information was obtained that the student had not met the first indicator of ability reasoning, which was given. From the test done on 32-person students, the data obtained was that 50% of students had not been able to solve all the questions, 30% of students were able to answer some of the questions, and 20% of students were able to answer all of the questions. This indicates that students' self-confidence is still low. The assessment is carried out by administering a questionnaire related to measuring self-confidence with 20 statement items. Moreover, the ability of mathematics students, especially in class VIII, to work on building space material side flat still needs to improve.

To find out how students' mathematical reasoning abilities and self-confidence are, researchers need to analyze these two abilities through predetermined indicators. The researcher will conduct a study with several subjects to analyze how big the students' mathematical reasoning abilities and self-confidence are can describe so far where ability is on each student. Based on the background behind this, the researcher wishes to study "Analysis Ability Reasoning and Self Confidence Mathematical Student in Finish Question Based Problem."

METHODS

This type of research is descriptive qualitative. In this study, researchers gave problem-based questions using flat-side space building material to measure students' mathematical reasoning abilities in answering questions. The results of students' answers are described to obtain the level of students' mathematical reasoning abilities in solving problems. Apart from that, researchers also gave students self-confidence questionnaires, and the results were used to measure students' self-confidence in answering questions. The research was conducted at JHS 10 Metro. The research subjects were 32 students in class VIII B. This subject was chosen through special consideration by researchers considering the heterogeneous mathematical abilities of students in this class

Data collection techniques are tests, questionnaires, and interviews. The test is in the form of problem-based questions that contain criteria that measure students' mathematical reasoning abilities to obtain in-depth analysis results regarding mathematical reasoning criteria. A questionnaire with self-confidence indicators consisting of 4 indicators, namely: (1) Believing in one's own abilities, (2) Acting independently to make decisions, (3) Having positive feelings (4) Dare to express your opinion. The interview is unstructured, where the researcher will ask the respondent in general about mathematical reasoning ability after the respondent has completed tests. The process of classifying students into categories of students with high, medium and low mathematical reasoning abilities and self-confidence is obtained from analysis of student answers and self-confidence questionnaires. The data analysis techniques used in this research are Data Reduction, Data Presentation, and Conclusion Drawing.

RESEARCH RESULTS AND DISCUSSION

1. High level of reasoning ability and self-confidence

    Based on the test results, the mathematical reasoning abilities and self-confidence of class VIII B students have excellent reasoning abilities and self-confidence in solving questions and questionnaires. In both subjects, they could complete questions and questionnaires correctly and precisely. This is based on the test scores obtained for subjects 1 and 2, namely 100, and the questionnaire score for subject 1, namely 80.88, and subject 2, namely 81.61. The values above are included in the high group. The results of the two students' answers show that students who have high reasoning abilities also have high self-confidence. Both subjects solved the questions with high reasoning and self-confidence, thus getting high results. Based on the results of the interview, the reasoning used by the subject corresponds to 4 indicators of reasoning: estimating the solution process, using patterns and relationships to analyze mathematical situations, compiling valid arguments using systematic steps, and drawing logical conclusions. The results is relevant to (Tambunan, 2019) research that students with high reasoning abilities can estimate the steps to solve a problem and provide explanations for the estimates made, have good abilities in finding patterns in a problem, can formulate valid arguments with systematic steps, and being able to draw logical conclusions and provide appropriate reasons for completion steps (Tambunan, 2019).

2. Medium level of reasoning ability and self-confidence

    Students with reasoning abilities and self-confidence are good at solving questions and questionnaires. Both subjects solved the questions with moderate reasoning and self-confidence, so the results obtained in working on these questions were quite good in the medium category. The reasoning used by the subject corresponds to 4 indicators of reasoning: estimating the solution process, using patterns and relationships to analyze mathematical situations, compiling valid arguments using systematic steps, and drawing logical conclusions. Based on the test and interview results, there are similarities between subjects 1 and 2 in estimating the solution process; both have good abilities in estimating the solution process, and both can estimate what steps will be taken to solve the problem given.

This is due to (Yuliany et al., 2021) research that students with moderate reasoning abilities have good abilities in estimating the process of steps to solve problems and providing explanations of the estimates made. Subjects 1 and 2 have relatively good similarities in using patterns and relationships to analyze mathematical situations. Subjects 1 and 2 were quite able to solve the questions using the connection patterns contained in the questions.

Furthermore, regarding the ability to compose arguments using systematic steps, both subjects have quite good abilities in compiling evidence of the truth of the answers. Research shows that students with mathematical reasoning abilities provide an opinion regarding the correctness of the solution quite well (Sofyana & Kusuma, 2018). Furthermore, regarding indicators of drawing logical conclusions, subjects 1 and 2 were quite good at drawing conclusions and explaining the reasons for the conclusions they reached.

3. Low level of reasoning ability and self-confidence

Students with low mathematical reasoning ability and self-confidence category solve questions with low reasoning and self-confidence, so the results obtained in working on these questions are classified as poor in the low category. Neither subject fulfilled the four mathematical reasoning indicator. In estimating the solution process, using patterns and relationships to analyze mathematical situations, construct valid arguments using systematic steps, and draw logical conclusions. Subjects 1 and 2 in estimating the solution process (Fadillah, 2019) have sufficient ability to estimate the solution process of the problem-based questions given. This is in line with Afinnas' research, which states that students with low mathematical reasoning abilities can estimate the solution process. Both subjects are classified as poor in using patterns and relationships to analyze mathematical situations. Both subjects needed help solving the questions using the patterns and relationships in the questions correctly and smoothly. Both subjects were unable to find a pattern of a problem. Subjects need help multiplying variables by known numbers, so they do not get the expected results (Hendrycks et al., 2021). Thus, the subject needs help finding regularities to formulate conjectures in search of the correct pattern.

Furthermore, both subjects had similarities in their ability to construct valid arguments using systematic steps; both were unable to provide reasons and compile evidence for the correctness of their answers. Subjects 1 and 2 cannot draw logical

conclusions in the fourth indicator. They are less able to provide appropriate reasons for the solution step because they often make mistakes and cannot answer questions, making them inaccurate and unable to conclude.

CONCLUSION

Researchers can conclude that students' reasoning and self-confidence in solving problem-based questions on flat-sided geometric material are as follows:

1. Subjects with mathematical reasoning abilities in the high category can write down all the information that is known and asked about from the problem-based questions given and can estimate the problem-solving process, subjects use known patterns, subjects can express an opinion to analyze mathematical situations so they can solve the problem, then also be able to draw conclusions accompanied by logical reasons. Apart from having high reasoning abilities, subjects in the high category also have high self-confidence, as seen from the students' ability to do all the questions confidently. Thus, subjects whose mathematical reasoning ability and self-confidence are in the high category fulfill the four indicators of mathematical reasoning ability and self-confidence.

2. Subjects with mathematical reasoning abilities in the medium category can write down all the information that is known and asked about from the problem-based questions given and are pretty capable of estimating the problem-solving process, quite capable of using known patterns, quite capable of expressing an opinion to analyze mathematical situations. Furthermore, they can also draw conclusions accompanied by logical reasons. Besides having moderate reasoning abilities, subjects in the medium category also have moderate self-confidence. Thus, subjects whose mathematical reasoning ability and self-confidence are in the moderate category fulfill the four indicators of mathematical reasoning ability and self-confidence.

3. Subjects with mathematical reasoning abilities in the low category are pretty able to write down information that is known and asked about from problem-based questions, are pretty able to estimate the problem-solving process, are less able to use known patterns, are less able to express an opinion to analyze mathematical situations, and so on. Less able to draw conclusions accompanied by logical reasons. Besides having low reasoning abilities, subjects in the low category also have low self-confidence. Thus, subjects whose mathematical

reasoning ability and self-confidence are in the low category do not meet the four indicators of mathematical reasoning ability and the four indicators of self-confidence.

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