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Analysis of the Abilities and Creative Thinking of Students of Muhammadiyah 3 Middle School Surabaya on Flat-Sided Space Structures

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ABSTRACT

This study aims to analyze junior high school students' comprehension and creative thinking abilities Muhammadiyah 3 Surabaya material on flat-sided spatial structures. This research is descriptive qualitative research. The subjects in this study were junior high school students. Muhammadiyah 3 Surabaya class VIII which was taken online randomly, namely 10 students. The instrument used in this study, namely descriptive questions consisting of 6 questions. These questions are divided into two groups of questions as follows: 3 comprehension questions and 3 creative thinking questions mathematical. The results of research from several students who have been working on questions showing low creative thinking students in understanding and solving questions and flat-sided geometric material because it can be seen from the results that the percentage of student achievement is low. The psychology of students also can affect low understanding ability and students' creative thinking.

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1. Introduction

Mathematics is a tool for developing thinking. Mathematics arises from thoughts related to human ideas, processes, and reasoning. Mathematics is one of the important subjects in education, so that mathematics learning develops according to the demands of the times. Modern developments require every student to have the ability to understand mathematics and think creatively when solving

existing mathematical problems. According to Wiharno (Sariningsih, 2014) the ability to understand mathematics is a strength that must be taken into account in the process of learning mathematics, especially in obtaining meaningful mathematical knowledge and according to Ghufron, M. N., & Risnawita, (2010), the ability to think creatively plays an important role in life, because activity is a human resource that can be relied on to advance humans in terms of research, development and new discoveries in science, technology, and in all fields of activity. Understanding a mathematical concept is one of the learning objectives in schools, which will be achieved if the mathematics teaching and learning process runs well, both in the short and long term. According to Nurjaman & Sari, (2019), understanding mathematics is a field of cognitive ability that includes intellectual aspects, such as knowledge, understanding, and thinking skills with a focus on behavior. Understanding indicators according to NCTM include (1) defining concepts orally and in writing; (2) identifying and creating examples and non-examples; (3) using models, diagrams, and symbols to represent concepts; (4) changing from one representation to another; (5) studying the differences in meaning and interpretation of concepts; (6) identifying the properties of a concept and knowing the conditions that govern the concept; (7) comparing and contrasting concepts (Nurjaman & Sari, 2019; Widiastuti & Putri, 2018). Meanwhile, creative thinking ability is an individual's thinking activity to develop new ideas or ways of solving problems and creating different possible answers (Tianingrum & Sopiany, 2017).

One of the branches of mathematics taught at all levels of education, from elementary school to college, is geometry. Geometry can be said to be one of the materials that is considered important because it is one part of mathematics that has a close relationship with other parts of mathematics. In the process of learning geometry, students will go through sequential levels of thinking (Susanto & Mahmudi, 2021). Based on the facts at school, various problems were found related to students' difficulties in understanding geometry material which resulted in low geometry learning outcomes, especially on flat-sided geometric material. This is based on research that was conducted by Apriansyah & Ramdani, (2018), et al with the research title "Analysis of Mathematical Understanding and Creative Thinking Capabilities of MTs Students on Flat Sided Space Construct Material". The results of this study obtained that the ability to understand mathematics and creative thinking of MTs students in the material of flat side shapes is still relatively lacking. Based on background of this study, it aims to analyze the ability to understand and think creatively among SMP Muhammadiyah 3 Surabaya students, especially in the material of flat-sided shapes.

2. Method

This study employed a descriptive qualitative research method. Descriptive analysis was chosen to examine in depth the students' mathematical comprehension, which is the primary focus of this study (Hernaeny et al., 2021). The research subjects consisted of 10 eighth-grade students from SMP Muhammadiyah 3 Surabaya, selected through purposive sampling to focus the study and obtain more accurate and in-depth information. The instrument used in this study was a set of six essay questions, divided into two categories: three questions assessing

comprehension and three questions assessing mathematical creative thinking.

The indicators for the third comprehension question were: 1) Identifying the properties of a concept and understanding the requirements for determining it; 2) Comparing and contrasting concepts Meanwhile, the indicators for the third creative thinking question were based on three aspects:

1. Fluency
   a. Generating multiple ideas, answers, problem solutions, and questions
   b. Offering various alternative methods
   c. Always thinking of more than one answer
2. Flexibility
   a. Producing diverse ideas, answers, or questions
   b. Viewing problems from multiple perspectives
   c. Exploring many alternatives or directions
   d. Shifting approaches or thought processes
3. Elaboration
   a. Expanding and refining ideas or products
   b. Adding details to make an object, idea, or situation completer and more appealing. The data analysis technique used was observation.

3. Results and Discussion

Result

Based on written tests and interviews, the data presented in the following table were obtained.

Table 1. Students' Performance in Answering Questions

Subject	Question item number					
	1	2	3	4	5	6
S-1	✓	✓	×	×	✓	×
S-2	✓	×	✓	×	✓	×
S-3	✓	✓	✓	×	✓	✓
S-4	✓	✓	×	×	×	×
S-5	✓	×	×	×	×	×
S-6	✓	✓	✓	×	×	×
S-7	✓	×	×	×	×	×
S-8	×	×	×	×	×	×
S-9	✓	×	✓	×	✓	×
S-10	✓	✓	×	×	✓	×
Number of Correct Respondents	9	5	4	0	5	1

✓: Correct answer ×: Incorrect answer

The following is a detailed description of the analysis of test result data for each question taken from 2 out of 10 selected subjects.

a. Question 1 (Comprehension – Identifying properties and defining a concept):

Nine out of ten students answered correctly. Some students only partially answered due to limited ability in identifying geometric elements such as edges and diagonals.

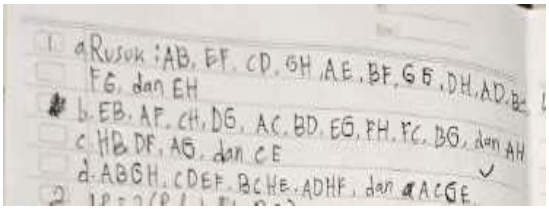

Figure 1.1 Answer to Question No. 1

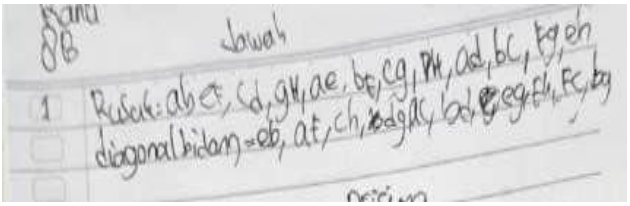

Figure 1.2 Answer to Question No. 1

The answers to the questions in Figure 1.1 show that students can provide accurate and complete answers related to the questions on identifying edges, plane diagonals, space diagonals, and diagonal planes. While in Figure 1.2 students can only identify the edges and diagonals of cuboids.

b. Question 2 (Comprehension – Comparing and contrasting concepts)

In question number 2, the identified skill was comprehension, indicated by the ability to compare concepts. In this question, 5 out of 10 students were able to answer correctly. Meanwhile, students who lacked this ability responded to the question without completing it accurately.

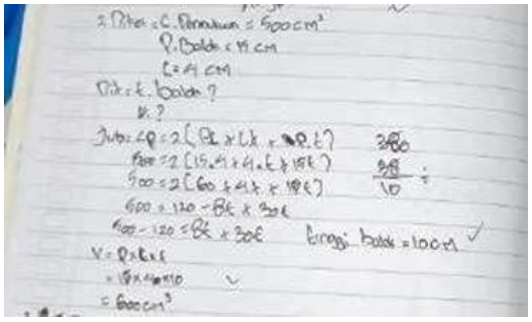

Figure 2.1 Answer to Question No. 2

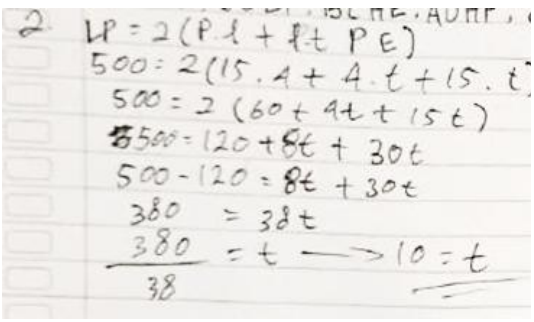

Figure 2.2 Answer to Question No. 2

Based on Figure 2.1, students can provide accurate and complete answers related to questions on determining the height and volume of a cuboid. While in Figure 2.2, students can only determine the height of the cuboid without determining the volume of the cuboid.

c. Question 3 (Creative Thinking – Fluency)

In question number 3, the identified skill was creative thinking, with fluency as the indicator—referring to students' ability to elaborate on a problem in detail. In this question, 4 out of 10 students provided correct answers. The limited ability of students to engage with tasks requiring creative thinking, along with their insufficient elaboration of the problem, resulted in responses that merely restated the known information without completing the solution

Lack of students' ability to deal with questions that require creative thinking And lack of student in explain question in a way Details cause student only can describe what is known without being able to solve it. As seen in Figure 3.

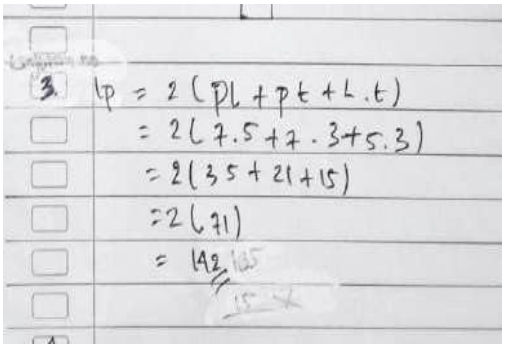

Figure 3.1 Answer to Question No. 3 S-1

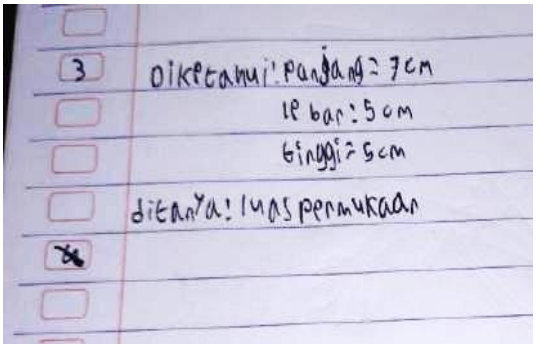

Figure 3.2 Answer to Question No. 3 S-8

Based on Figure 3.1, students can provide accurate and complete answers related to questions on determining the surface area of a plane. Meanwhile, in Figure 3.2, students can only identify what is known but cannot continue with the process of calculating the surface area.

d. Question 4 (Creative Thinking – Flexibility)

In question number 4, the ability identified is creative thinking with the flexibility indicator. namely producing varied ideas, answers, or questions. In this question, none of the students give the correct answer. Students' ability is still low in producing ideas and variations of answers.

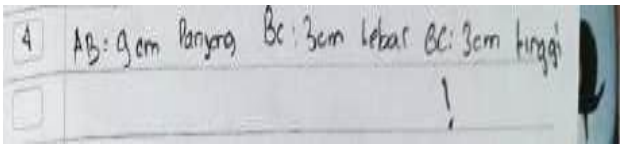

Figure 4.1 Answer to Question No. 4

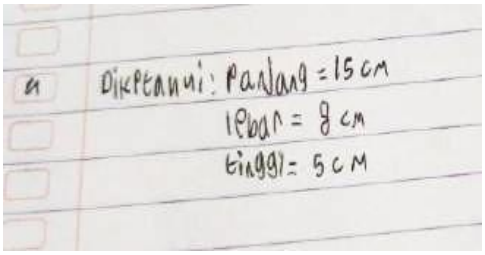

Figure 4.2 Answer to Question No. 4

Based on Figures 4.1 and 4.2, students were unable to provide accurate and complete answers regarding questions on determining volume on a plane using various methods. Students were only able to identify without explaining or understanding.

e. Question 5 (Comprehension – Using models, diagrams, and symbols)

In question number 5, the ability identified is understanding with the indicators used are using models, diagrams, and symbols to represent a concept. In this question, 5 out of 10 students were able to provide the correct answer. The weak ability of students in working on questions related to models, diagrams, and symbols in mathematics ultimately means that students can only describe two of the four cube nets. As seen in Figure 5.

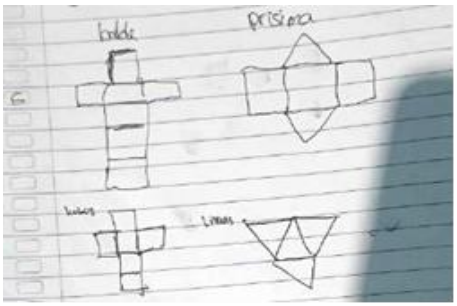

Figure 5.1 Answer to Question No. 5

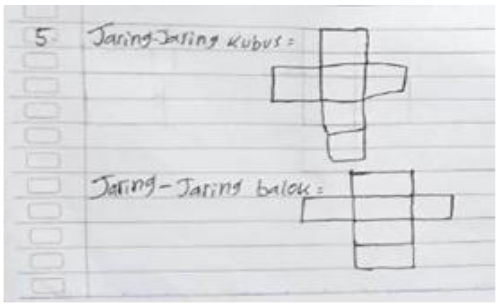

Figure 5.2 Answer to Question No. 5

Based on Figure 5.1, students can draw nets of cubes, cuboids, pyramids, and prisms. While in Figure 5.2, students can only draw two of the four cube nets requested in the question, so students cannot complete the question completely.

f. Question 6 (Creative Thinking – Elaboration)

In question number 6, the ability identified is creative thinking with the indicator used being elaboration which includes enriching and developing an idea or product. In this question, 1 out of 10 students can provide the correct answers while the other 9 cannot. Students are only able to solve the problem in 1 way, indicating the low level of students in developing an idea or concept.

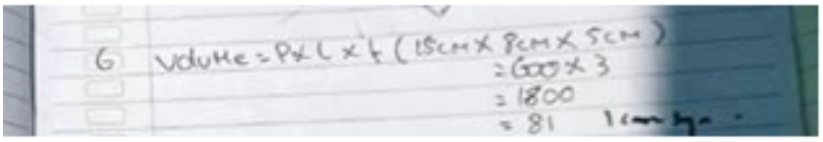

Figure 6.1 Answer to Question No. 6 S-1

Based on Figure 6.1, students can determine the volume of the story problem given correctly. While other students cannot answer and solve the problem given.

The results of the assessment of the mathematical understanding and creative thinking abilities of students at SMP Muhammadiyah 3 Surabaya on the material on flat-sided spatial structures are as follows based on the data description above as follows:

Table 2. Distribution of Students Based on Question Answer Results

Question Number	Competence	Number of **Students** Who Answered	
		Correct	**Wrong**
1	Understanding	9	1
2	Understanding	5	5
5	Understanding	5	5
Total number		19	11
Percentage		63.33	36.67
3	Creative Thinking	4	6
4	Creative Thinking	0	10
6	Creative Thinking	1	9
Total number		5	25
Percentage		16.67	83.33

Discussion

Overall, the results of this study indicate that 63% of students demonstrated an adequate understanding of mathematical concepts. In contrast, only 16.67% of students exhibited creative thinking abilities. These findings reflect the generally low levels of both conceptual understanding and creative thinking among students at SMP Muhammadiyah 3.

The low ability of students to understand concepts and creative thinking skills in solving problems is related to many factors. Among these factors is the learning approach designed by the teacher. In conventional learning, teachers as the main source of information emphasize memorization without understanding the meaning. This is as stated by Wijaya et al., (2016) that students' habit of memorizing does not train their thinking and problem-solving skills. This is the result of conventional teaching where teachers teach by applying mathematical concepts and operations and then providing examples of problem solving. This type of teaching emphasizes memorizing mathematical concepts and procedures.

Teaching techniques are very important to students' abilities because the quality of teachers affects the quality of students. The problem faced by teachers when teaching mathematics is the lack of response or enthusiasm from students. This will require teachers to enliven the classroom atmosphere and stimulate class activities so that students will be more enthusiastic in learning mathematics.

Another factor that influences the low ability to understand and think creatively is the psychological condition of students (Andiyana et al., 2018). The use of innovative learning methods has great potential to improve and train students' critical thinking in learning. Thus, the use of learning approaches and methods can improve students' critical thinking (Dores et al., 2020)

According to Widiastuti et al., (2018), the lack of students in developing ideas or concepts when students answer questions or problems is influenced by the low level of student effort in solving mathematical problems with ideas or even new concepts that can provide various correct answers, so that students are expected to be creative in understanding mathematical problems. Other factors that influence is student more expect settlement Which given by Teacher.

4. Conclusions

The mathematical understanding and creative thinking abilities of students at SMP Muhammadiyah 3 Surabaya on the material on flat-sided spatial structures are included in the low category

5. Acknowledgment

Based on research that there have been some suggestions made which can be given, among others: (1) so that students are able to think creatively, given questions continuously and consistent with the indicators creative thinking (2) giving explanation and understanding to students related to various ways to solve various problems (3) get students used to being more careful in reading and work on the questions given (4) For researchers, it is recommended to examine further related matters improving comprehension skills and creative mathematical thinking other.

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