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ANALYSIS OF MATHEMATICAL CREATIVE THINKING ABILITY ON JUNIOR HIGH SCHOOL STUDENTS IN BANDUNG

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ABSTRACT

This research is motivated by the importance of quadrilateral material in mathematics lessons, especially for students as an educational subject in everyday life, while the aim is to analyze students' mathematical creative thinking abilities in solving quadrilateral problems. This research is a qualitative descriptive study. The population in this study were all seventh-grade junior high school students in the city of Bandung whose sample was randomly selected at Paulus Middle School as many as 32 people. Students can be classified based on their creative thinking abilities based on (1) the Ability creative thinking of students with the high category is fulfilling 3 indicators of creative thinking namely fluency, flexibility, and novelty, so students with the high category is said to be creative. (2) Students' ability to think creatively with the medium category is fulfilling 2 indicators of creative thinking, namely fluency and flexibility, so students in the medium category are said to be not creative. (3) The creative thinking ability of students in the low category is fulfilling 1 indicators of creative thinking are fluency and students in the moderate category said students who are not creative. Data is obtained by testing creative thinking test questions as many as 4 questions that contain indicators. The results showed that there were 2 people with high ability, 4 people with moderate ability, and 26 people with low ability with various errors including conceptual errors, principal errors, and data operation errors. Based on this, it can be concluded that the creative thinking skills of junior high school students are still relatively low.

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INTRODUCTION

Mathematics is one of the most important subjects for students to master. Learning mathematics can link concepts and train students' thinking to be more creative in solving problems logically. A person's success in studying mathematics can unlock knowledge and creative thinking skills reliably (National Research Council, 1989). Learning mathematics at the elementary, junior high school levels can influence good creative thinking processes if the concepts are applied correctly, so that when high school students already can think creatively.

Ulandari et al., (2019) say that the ability to think creatively is the ability to produce something that is actual and divergent from others, overcome problems, and determine solutions and reform designs by reviewing problems that might occur and determine rules for handling them so that when it can be implemented properly. In the Indonesian Dictionary, creative is defined as something new or creating, while mathematical is certain or precise. Thus, the ability to think creatively mathematically is the ability to think to create new and different things that produce definite and precise answers. The ability to think creatively is needed in today's era which requires everyone to be more creative, especially in terms of mathematical creative thinking. This is in accordance with ministerial regulation no 22 of 2006 so that students, through school learning can have the ability to think creatively (BNSP, 2006). This explains that the importance of the ability to think creatively in all fields, including in the field of mathematics. Because mathematics is a fundamental science that is very important to learn because every science must contain mathematics in it (Lesi and Nuraeni, 2021).

Tability to think creatively mathematically is very important for students and there must be habituation so that students can easily create creative ideas in teaching mathematics (Faturohman, I and Afriansyah A E, 2020). Then creative thinking must be developed through education in schools, one of which is learning mathematics (Dalilan and Sofyan, 2022).

Torrance (1981) states that there are four creative abilities that can lead to a creative attitude. These abilities consist of fluency, flexibility, originality, and elaboration. These abilities can be learned and practiced by everyone regardless of age.

The ability to think creatively mathematically which is considered so important in fact this ability is still very minimally owned by students as evidenced by the results of research conducted (Dalilan and Sofyan, 2022) mentioning the low ability of students to think creatively mathematically in solving the problems presented, lack of emergence creative ideas, new ideas and alternative answers or other ways. Creative thinking is a mental activity to increase purity (originality), and sharpness of understanding (insight) in developing something (generating), (Sukmadinata, 2012). From some of the descriptions, it can be seen thinking Creatively is a skill that is honed from an ability to manage, process information, and solve problems through various ideas. Often individuals who are considered creative are synthetic thinkers good at building connections between different things and unconsciously other people. A creative attitude is at least as important as a skill in creative thinking (Sternberg, 2013). Based on the meanings put forward by the experts above. Mathematical creative thinking is the ability to find and solve math problems that include the components:

of fluency, flexibility, elaboration, and originality. Assessment of students' creative abilities in mathematics is important to do. Submission of problems that require students to problem-solving is often used in the assessment of creativity math. Tasks are given to students who are facing students in problem and its solution is used by researchers to identify creative individuals.

Based on the previous description, the writer feels the need to analyze the mathematical creative thinking abilities of junior high school students in quadrilateral material. It aims to analyze the extent to which students' mathematical creative thinking skills in quadrilateral material in the city of Bandung, with the indicators used are fluency, flexibility, originality, and elaboration.

METHOD

This study uses a qualitative approach with descriptive methods to obtain an overview of students' mathematical creative thinking abilities. The research subjects were 32 students including planning, implementing, and observing. Activities at the planning stage are compiling instruments and conducting validation. Activities at the implementation stage are giving students a test of mathematical creative thinking skills regarding quadrilateral material. Activities at the observation stage are analyzing student errors in solving mathematical creative thinking skills questions. Students have good creative thinking skills if they can solve the questions correctly according to Putra (2016). The results of the research were then carried out by a scoring process for each question based on the rubric, so that the total score of each sample was known. Furthermore, the calculation of the average is carried out with the aim of knowing the average percentage of the ability of the sample.

Table 1. Classification of The Average Ability Students

Persentage	Classification
$0\ \% \leq p < 20\ \%$	Very low
$20\ \% \leq p < 40\ \%$	Low
$40\ \% \leq p < 60\ \%$	Avarage
$60\ \% \leq p < 80\ \%$	High
$80\ \% \leq p < 100\ \%$	Very high

(Romika & Amalia, 2014)

Table 2. Scoring Creative Thinking ability

Creative Thinking Indicator	Answers	Score
Fluency	No answer	0
	Identify several ways of solving different problems	0-2
	Determine how to solve the selected problem along with reasons	0-2
	Solve problems in a predetermined way	0-2
	Solve the problem with another alternative	0-2

	Sub-total (one test item)	0-8
Flexibility	No answer	0
	Identify data/information provided and asked	0-2
	Linking the data/information provided and those asked and constructing a mathematical model of the problem	0-3
	Identify several different ways to solve the problem	0-2
	Solving the mathematical model of the problem in a predefined different way	0-3
	Compare and explain the best way from several alternative answers accompanied by relevant reasons	0-2
	Sub-total (one test item)	0-12
Authenticity	No answer	0
	Changing the problem form into another simpler problem form / Modifying the problem	0-2
	Develop a modified mathematical model of the problem in the form of images and or mathematical expressions	0-2
	Identify (non-standard) strategies for solving problems	0-3
	Complete the mathematical model with the selected non-standard strategy	0-3
	Define relevant solutions	0-2
	Sub-total (one test item)	0-12
Elaboration	No answer	0
	Identify the known and asked elements/data of a problem	0-2
	Identify the adequacy of elements/data and/or complete them	0-2
	Associating elements/data and being asked and compiling a mathematical model of the main problem (images and or mathematical expressions)	0-3
	Breaking down mathematical problems/models into mathematical sub-problems/sub-models	0-3
	Complete the main problem mathematical model accompanied by reasons/explanations of the concepts/processes used at each step	0-3
	Check the correctness of the solution accompanied by reasons	0-2

The scoring guidelines were used by researchers to group students into three categories, namely students with high abilities($X \geq 80$), avarage abilities ($65 < X < 80$), and low abilities ($X \leq 65$) (Kurniawan & Setiawan, 2019)

RESULTS AND DISCUSSION

Result

The results of this study are based on the recapitulation of students' creative thinking abilities as follows.

Table 3. Recapitulation of Students' Creative Thinking Ability Test Results

Value range	Total of students	Category	Percentage
$X \geq 80$	2	Tinggi	6,25 %
$65 < X < 80$	4	Sedang	12,5 %
$X \leq 65$	26	Rendah	81,25 %
Percentage of Average Ability			30.55 %

Table 3 shows that the students' results on working on questions on the Quadrilateral material and obtained 2 students in the low category with a percentage of 6.25%, obtained 4 students in the medium category with a percentage of 12.5% while 26 students in the low category in student ability with a percentage of 81.25% with an average of 30.55% which means it is still classified as low ability. The student's difficulties will be analyzed in the process.

Discussion

Based on Table 3, the questions to be used are questions to measure the ability to think creatively with the Dexterity indicator. The questions to be used are questions to measure the ability to think creatively with the Dexterity indicator. Students' creative thinking abilities for the high category in aspects thinking fluently are very good because high students are able to bring up more than one idea in solving math problems so that the aspect of thinking fluently for students is not experienced difficulty. For aspects of flexible thinking, students are in good criteria meaning that they are generally able to determine one way of solving math problems. Student in category high for the aspect of authenticity is also in good criteria with words other though the way used in solving problems with a common way but leads to a solution. Ability on the aspect elaborative thinking in high-category students is very good, meaning students can explain the solution in detail and precisely so that in this aspect generally haven't troubled.

Students' creative thinking abilities for the medium category are in aspects think well smoothly because students in the middle category are able to bring up one idea in solving math problems so on aspects of fluent thinking for students in the moderate category do not experience difficulties. For aspects of flexible thinking, students in the medium category are also in good criteria, meaning that they are generally able to determine one way to solve math problems. Students in the medium category for aspects of authenticity, in general, are in good criteria meaning students in using the method of solving minimal problems use a common way and lead to a solution. Ability on the aspect of elaborative thinking in students of the same category as the high category is the very good criterion, meaning that students can precise explanation. Students' creative thinking ability for the low category overall is in the unfavorable criteria. On the aspect of smooth thinking results in analysis on students in the low category is only able to bring up a maximum of one idea in solving open math problems so aspects of fluent thinking for the low category have difficulty. For aspects of flexible thinking, students in the low category are generally only able to determine one way to solve a math problem. The form of the question is as follows

"You know a rectangle with a side ratio of 3: 2. If the length is reduced by 2 cm and the width is increased by 3 cm, the rectangle becomes a square. Write down some questions from the data and then solve them?"

The students' answers to these questions are as follows:

Analysis of errors in student answers on quadrilateral material.

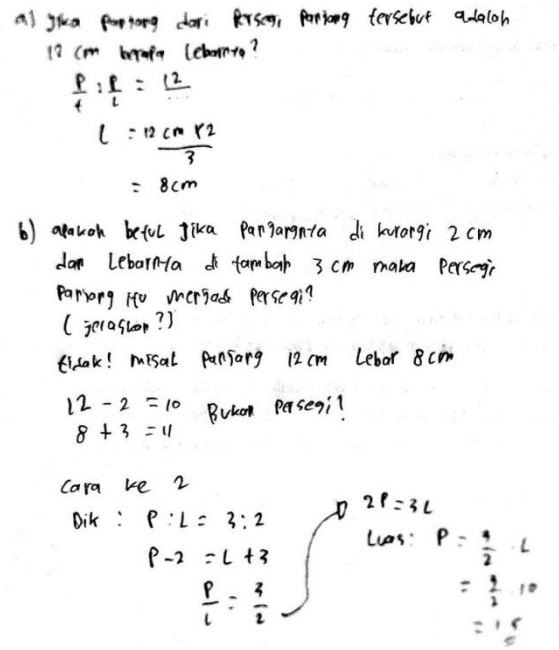

Image 1. Answers of high ability students

Image 1 is the answers of high-achieving students on the problem of creative thinking ability on the flexibility indicator. Students have been able to understand the problem by writing down or listing all the information contained in the questions using their own language without being affected by the language of the questions. Then students can make completion strategies and carry out these strategies correctly when students calculate the length and area of students work on problems systematically and do calculations correctly. This means that students have understood the concept of quadrilateral material correctly, but students in determining calculations are not explained in detail and are not precise. In this case students fail to understand the concept of calculating the area. Students in calculating the area of the same. This is in line with (Rozi & Afriansyah, 2022) that students' difficulties in understanding quadrilateral problems lie in conceptual errors.

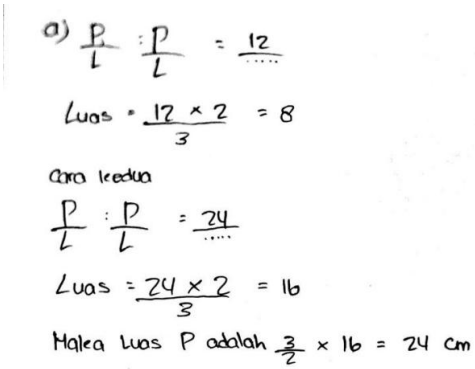

Image 2. Answers of students with moderate abilities

Based on Image 2, which is the answer of moderately capable students, students have understood the problem because they have written down the information contained in the questions using their own language. Students are also able to calculate correctly but fail to understand the concept of a square. In this case the student makes a principal error, the student immediately adds to calculate the area. The principal error is also one of the mistakes made by students in solving quadrilateral problems (Kamalia & Ruli, 2022). However, students can make conclusions by writing conclusions based on calculating the length and area correctly.

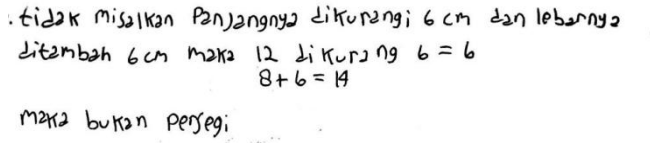

Image 3. Answers of students with low abilities

Based on the picture, students do not understand the problem, students rewrite the language of the questions without summarizing sentences. This means that students do not use their own language in gathering information. In addition, students also paid less attention to the important things contained in the information about the questions. It is proven that when students do calculations, students do not understand the commands and concepts in quadrilateral material in word problems, this is in line with the statement (Alifa and Amir 2022) that one of the student mistakes in working on story-shaped questions is that students do not pay attention to details in information. And have an impact on the results of student workmanship that is wrong.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the ability to think creatively mathematically in grade VII students of Paulus Middle School is still relatively low. This can be seen from the number of students who experience difficulties and errors in solving quadrilateral problems. The forms of errors are quite varied, starting from errors in understanding material concepts, errors in formulating solutions or principal errors, errors in applying formulas, and some students do not pay attention to details in solving problems. As a result, students cannot solve problems correctly and the results are unsatisfactory.

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