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# Analysis of Junior High School Students' Mathematical Creative Thinking Abilities on Plane Shapes Subject

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**Abstract**

This research aims to determine the mathematical creative thinking abilities of class VII students at SMPN 6 Siak Hulu. In this study, four indicators were used, namely fluency indicators, originality indicators, flexibility indicators, and elaboration indicators. In the learning carried out, especially in mathematics learning, students must have the ability to think creatively and mathematically. The ability to think creatively mathematically is the ability to think to find new ideas or thoughts in general or original with the aim of providing definite and precise results. The subjects in this research were 28 class VII students using qualitative descriptive methods. The instrument in this research used four essay questions and interviews on mathematical creative thinking abilities. The results of research on students' mathematical creative thinking abilities at SMPN 6 Siak Hulu obtained meager results. The average percentage for all indicators is 18%.

Keywords: Mathematically; Plane shapes subject; Think creatively.



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## 1. Introduction

Mathematics is one of the subjects taught at all levels of school because it plays an important role involving the use of symbols, numbers, and formulas to solve problems in various contexts (Sinaga et al., 2021). This makes mathematics a fundamental science that has quite an important role, both in everyday life and in the development of science and technology. By studying mathematics,

someone can get used to thinking systematically, scientifically, using logic, and critically, and can increase their creativity (Siagian, 2016).

Mathematics learning in the independent curriculum emphasizes mathematical competencies by strengthening the learning process and authentic assessment to achieve knowledge, attitudes, and skills competencies (Qomariyah & Subekti, 2021). Therefore, teachers must be able to design students to learn as learning subjects, not objects. This aims to ensure that learning mathematics will develop students' mathematical abilities. Based on this description, one of the abilities that needs to be developed is the ability to think creatively and mathematically (Isnaini & Pradipta, 2022).

The problem that students often experience at this time is a lack of creativity in thinking, which can affect their learning outcomes. Low mathematics learning outcomes are, of course, influenced by several factors, both by the students themselves, the teacher as facilitator, and the surrounding environment (Simangunsong, 2021). In the mathematics learning process, teachers place too much emphasis on students' behavioral aspects (doing) but do not emphasize enough on thinking aspects (Maryati & Nurkayati, 2021). Apart from that, students also focus more on the formula used than on other alternative problem-solving options.

The ability to think creatively in mathematics can be interpreted as the ability to solve mathematical problems with more than one solution, and students think fluently and flexibly, carry out elaboration, and have originality in their answers (Dalimunthe & Ariani, 2023). Mathematics was chosen as an elective subject which has special characteristics and characteristics (Purba et al., 2018).

Traits and characteristics are abstract objects. The ability to think and act effectively and creatively is abstract and concrete, according to learning in schools and several other sources (Darwani et al., 2022). From the description above, it can be concluded that skills in creative mathematical thinking are a very important aspect of learning mathematics.

According to Kadir et al. (2022), a problem in mathematics is a question or problem that is mandatory and must be answered or responded to. From the opinion above, a problem is a question where the question is a challenge for the individual, and to be able to answer it requires procedures that cannot be done, so it requires the ability to think creatively in mathematics that is even deeper than what was previously known.

From the results above, it can be concluded that this research aims to analyze how creative mathematical abilities are in working on mathematics problems, especially on geometry material. The subjects in this research were class VII students. The instrument used was a written essay test with four questions, and there were four indicators of mathematical creative thinking ability. Mathematical creative ability is an ability that must be trained or accustomed to from an early age.

## 2. Methods

The author used qualitative descriptive research, which aims to describe the conditions that occur when research takes place on Plane-Shaped Subjects. The subjects in this research were class VII students at SMPN 6 Siak Hulu. This research was carried out in the even semester of the 2023-2024 academic year. The instrument in this research is a description question consisting of 4 questions as the instrument used, where one question contains a different indicator (Widiastuti & Imami, 2022).

An ability that includes four indicators, namely (1) thinking fluently (fluency) containing various ideas; (2) flexible thinking (flexibility) produces varied ideas, answers, or statements, can see a problem from different points of view; (3) original thinking gives birth to new and unique ideas, expressions; (4) elaboration builds something from other ideas (Rapa' et al., 2023). This research was written to analyze and describe errors in aspects of students' mathematical creative

thinking abilities based on creative thinking indicators. Because this research involves limited subjects in its implementation, the author took sample subjects from 6 class VII students at SMPN 6 Siak Hulu with heterogeneous abilities.

The data collection technique in this research is carried out by carrying out preliminary activities, compiling students' mathematical creative thinking tests, consulting on mathematical creative thinking ability test questions with supervisors, collecting data, analyzing data, and drawing conclusions from the research results. The data collected is in the form of written and verbal answers obtained from written tests and interviews to measure students' mathematical creative thinking abilities. In calculating the percentage score, it will be qualified into five categories, namely, very high, high, medium, low, and very low, based on previous research by Fitriyah & Haerudin (2021), as seen in Table 1, which is a modification of the researcher.

**Table 1 - Category percentage of achievement of thinking ability**

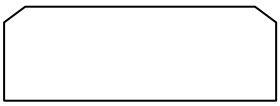
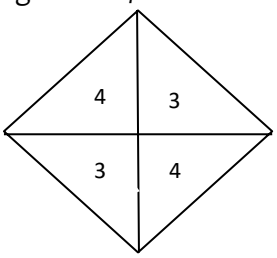
| Criteria Mastery | Level |
|---|---|
| 81%-100% | Excellent |
| 61%-80% | Good |
| 41%-60% | Medium |
| 21%-40% | Low |
| 0%-20% | Very Low |

**Table 2 - Preparation of Creativity Assessment Rubik**

| Criteria | Score | Aspects |
|---|---|---|
| Fluency | 4 | Give more than one correct answer and a complete reason |
| | 3 | Give one more correct answer, but the reason is less precise. |
| | 2 | Give one correct answer, but why not exactly? |
| | 1 | It gives one answer but does not deliver a reason. |
| | 0 | No answer |
| Flexibility | 4 | Give more than varied/different answers accompanied by reasons complete |
| | 3 | Give more than one varied/different answer, but the reason is not quite right. |
| | 2 | He gives one answer, but the reason is not correct. |
| | 1 | It gives one answer but does not give a reason |
| | 0 | No answer |
| Originality | 4 | Give answers in your way according to the concept in question thoroughly and appropriately |
| | 3 | Give answers in your way according to the concept in question but are incomplete and precise. |
| | 2 | Gives answers in his way, but not in accordance with the intended concept or not appropriate |
| | 1 | It gives the answer in its way but does not understand |
| | 0 | No answer |
| Elaboration | 4 | Describe the solution to the problem provided in detail and correctly |
| | 3 | Describe the solution to the problem given in detail but not complete. |
| | 2 | Describe the solution to the problem given, but lacking in detail. |
| | 1 | Describe the solution to the problem given, but not in detail. |
| | 0 | No answer |

(Ramdhani et al., 2020).

**Table 3 - Test questions for students' mathematical creative thinking abilities**

| No | Indicator | Question |
|---|---|---|
| 1 | Fluency | Do you still remember about rectangular shapes and the like? Try looking at the following picture:<br>  <br>From the plane shape image above, draw a rectangular shape that you know! |
| 2 | Flexibility | It is known that there is a quadrangle PQRS with an area of 36 area units.<br>  <br>Give one question related to the PQRS quadrilateral above, and then answer the question! |
| 3 | Originality | Dina has a rhombus-shaped garden, as in the picture below, with diagonal lengths of 6 cm and 8 cm, respectively. Determine the area of Dina's garden using another rectangular shape formula and not using area = 1/2 ×d1+d2.<br>  <br> |
| 4 | Elaboration | A rectangle ABCD is divided into four small rectangular parts of different sizes. The area of the first rectangle is 21 $cm^2$, the second is 12 $cm^2$, and the third is 20 $cm^2$.<br>Is there enough data to calculate the perimeter of rectangle ABCD? If it is enough, try to finish it! Moreover, if not, try completing the data so that the circumference of ABCD can be calculated and solved! |

(Susanti & Novtiar, 2018)

## 3. Results and Discussion

This research was conducted at SMPN 6 Siak Hulu in class VII, located in Tanah Merah Village, Kampar Regency. The data obtained in this research is in the form of student learning results, whose data collection technique uses a description test instrument consisting of 4 questions. Test data is obtained by analyzing students' answers based on guidelines for assessing mathematical creative thinking abilities. Moreover, it describes students' mathematical creative thinking abilities in solving problems on the Plane Shapes Subject in each problem.

**Table 4 - Description of Indicators Fluency**

| Student code | Total Score |
|---|---|
| 001 | 1 |
| 002 | 1 |
| 003 | 1 |
| 004 | 1 |
| 005 | 1 |
| 006 | 1 |
| Amount | 6 |

| | |
|---|---|
| percentage (%) | 10% |

Table 4 above shows the results of the question scores from 6 student samples on the fluency indicator. All students get a score of 1, so the total score is 6, with a percentage value of 10%. The results of the table above show that students' mathematical creative thinking abilities on the fluency indicator are classified as very low.

**Table 5 - Description of Indicators Originality**

| Student code | Total Score |
|---|---|
| 001 | 4 |
| 002 | 3 |
| 003 | 3 |
| 004 | 3 |
| 005 | 3 |
| 006 | 3 |
| Amount | 19 |
| percentage (%) | 32% |

Table 5 above shows the question scores from 6 student samples on the originality indicator. Almost all students got a score of 3, and 1 student got a score of 4, so the total student score was 19, with a percentage value of 32%. The results of the table above show that students' mathematical creative thinking abilities on the originality indicator are relatively low.

**Table 6 - Description of indicators flexibility**

| Student code | Total Score |
|---|---|
| 001 | 1 |
| 002 | 1 |
| 003 | 1 |
| 004 | 1 |
| 005 | 1 |
| 006 | 1 |
| Amount | 6 |
| percentage (%) | 10% |

Table 6 above shows the results of the question scores from 6 student samples on the flexibility indicator. All students get a score of 1, so the total score is 6, with a percentage value of 10%. The table's results show that students' mathematical creative thinking abilities on the flexibility indicator are classified as very low.

**Table 7 - Description of indicators elaboration**

| Student code | Total Score |
|---|---|
| 001 | 2 |
| 002 | 2 |
| 003 | 2 |
| 004 | 2 |
| 005 | 1 |
| 006 | 2 |
| Amount | 13 |
| percentage (%) | 22% |

Table 7 above shows the results of the question scores from 6 student samples on the elaboration (detail) indicator. Almost all students got a score of 2, and 1 student got a score of 1,

so the total score was 13. Of the total, the percentage score was 22%. This shows that mathematical creative thinking on the elaboration indicator is relatively low.

**Table 8 - Description of mathematical creative thinking abilities based on indicators**

| Indicator | Total Score |
|---|---|
| Fluency | 10% |
| Originality | 32% |
| Flexibility | 22% |
| Elaboration | 10% |
| Average Percentage (%) | 18% |

Based on Table 8 above, students' mathematical creative thinking abilities in all indicators have the highest value, namely the Originality indicator (32%); in second place is the flexibility indicator (22%), and the last order is the fluency and elaboration indicator (10%). From the results, all indicators get an average percentage of 18%.

Based on the explanation regarding the results of students' creative mathematical thinking, they are different. From the average percentage in each indicator or all indicators, none of them exceeds 50%. Based on this statement, it can be said that the average student's mathematical creative thinking ability is still meager. As stated by previous researchers, if several percentage indicators do not exceed 50%, it can be said that students' mathematical creative thinking abilities are still low.

Based on the results of the research conducted, this research is in line with previous research conducted by several researchers, including Nurjamilah & Marlina (2019), who said that each student's creative thinking ability has a different background. This is also in line with Suryadinata's opinion (2015) regarding his research development, which states that students' creative mathematical thinking influences the culture or habits that are instilled in the classroom during the learning process so that students have different potentials with various thought patterns, imaginations, fantasies, and performance.

Question number 1

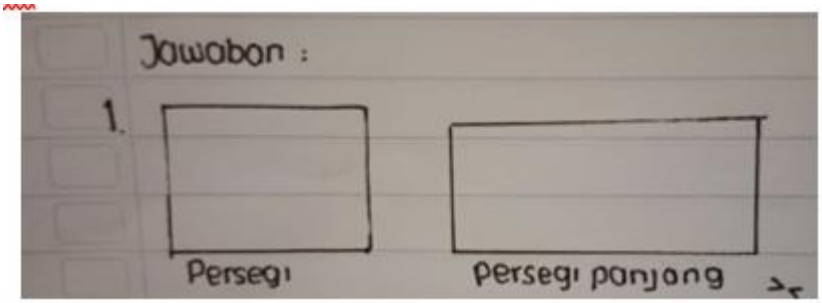



**Figure 1** Student answers to question number 1

From the results of the student's answer in Figure 1, it is still wrong because from the question command, draw a rectangular shape in the picture of the plane shape in the question. Meanwhile, students answer questions by describing the subject of the new plane shapes. In this question indicator (fluency), the average percentage score of students reached 10%; this indicates that they have not fully mastered the ability to think creatively mathematically. This is because students still experience difficulties in creative thinking (Pratiwi et al., 2019). Based on the results of the interviews conducted, students did not understand and thoroughly understood the question instructions given.

Question number 2

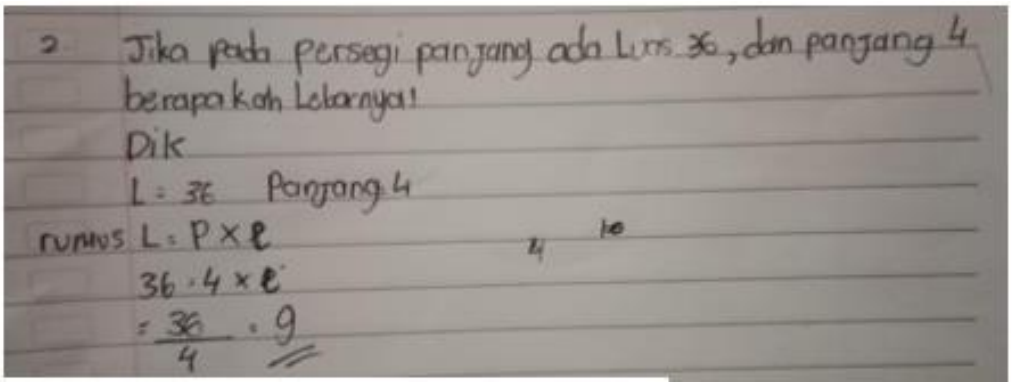



**Figure 2** Student answers to question number 2

From picture 2, the student's answer to question number 2 is correct, but there is a slight error in writing the formula for the area of a rectangle. The question indicator (originality) has an average percentage of 32%, which indicates that some students already understand and are able to solve the given problems. Judging from the results of the work carried out, it was appropriate so that it got the desired score. This statement is in line with Widiastuti & Imami (2022), who stated that this originality indicator got the highest percentage of results. Based on the results of the interview, the student already understood the problems in the question but was less careful in writing the formula.

**Question number 3**

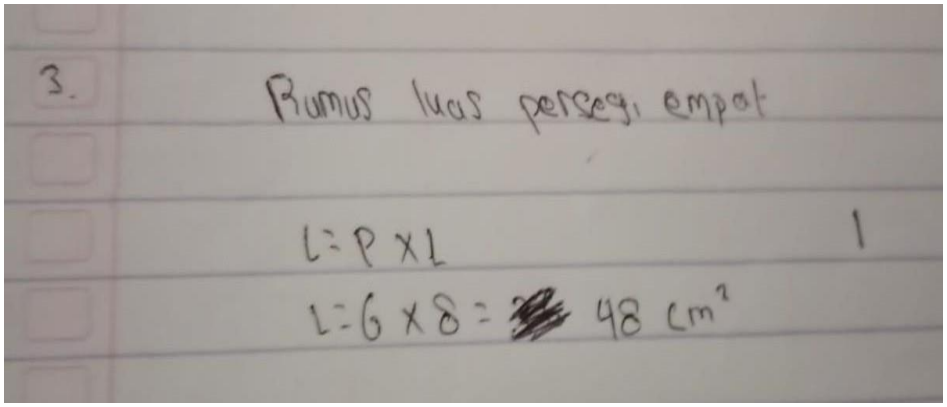



**Figure 3** Student answers to question number 3

From picture 3, the results of the student's answer to question number 3 are still wrong, but the student's answer is correct; the formula for the area of a quadrilateral is used in the solution, and the student uses the formula for the area of a rectangle. In this question indicator (flexibility), the average percentage value reaches 10%. This indicates that students cannot solve the problems given correctly, and there is a lack of conclusions at the end of the solution. This is in line with previous research by Yenti et al. (2023), which stated that creative thinking skills must be instilled during the mathematics learning process. From the results of the interviews, students already understood the instructions for the questions given but were not careful in solving the problems given.

**Question number 3**

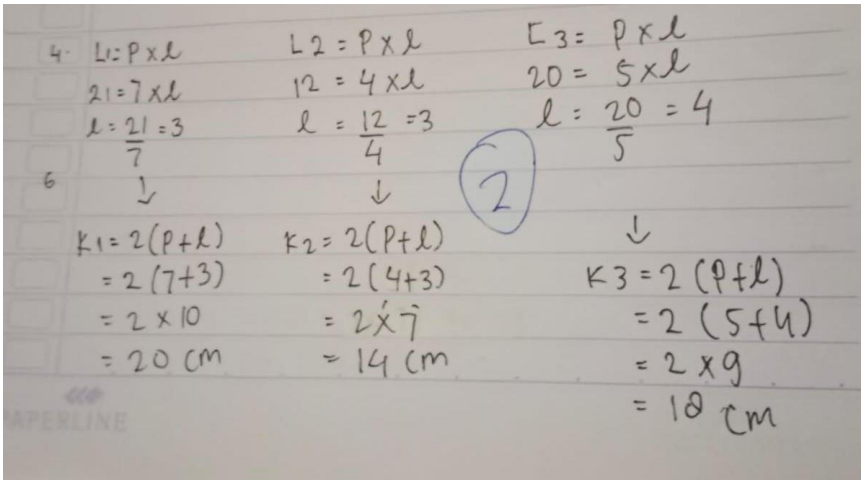



**Figure 4** Student answers to question number 4

In picture 4, the student's answer to question number 4 is still not correct because the student's answer to the question is incomplete, and the flow of the solution is not clear. On this indicator (elaboration) question, students got an average percentage score of 22%; this indicates that students still do not understand the question and how to solve it. Based on the results of the data tested, there is a picture of the creative thinking process during the process of working on mathematical problems (Erwiati, 2022). From the results of the interview, students already understood the meaning of the problem. However, the student was confused about the flow of the solution and what kind of formula to use for the problem.

## 4. Conclusions

Based on the research that has been carried out and based on the data obtained, it can be concluded that the mathematical creative thinking abilities of class VII students at SMPN 6 Siak Hulu in the plane shapes subject are classified as very low. This can be seen from the results of the average percentage of all indicators being 18%. Of the 4 indicators, the originality indicator is the indicator that gets the highest average percentage, namely 32%. This indicates that some students can work on questions by thinking about originality. Furthermore, the elaboration indicator is 22%, and the lowest is the fluency indicator, 10%, and the flexibility indicator, 10%. In the fluency and flexibility indicators, students were unable to answer the questions given according to the researcher's wishes because they did not understand the difference between the formula for the area of a square and the formula for the area of a rectangle.

## Conflict of Interest

The authors declare no conflicts of interest.

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