The creative mathematical thinking ability of junior high school students on the material of rectangular quadrilateral shapes

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Abstract
This study aims to describe students' mathematical creative thinking skills in solving problems on the material of rectangular plane shapes in grade VII junior high school students in Kp. Simpang Rt.05/Rw.04 The research method used is descriptive qualitative. The research subjects consisted of 2 people who were taken randomly, the research instrument in this study was the researcher himself, assisted by supporting instruments in the form of test questions, interviews and research notes. The instrument technique used is the triangulation test. Data analysis techniques used include creative thinking ability tests, interview results, and research notes. From the results of the study, it can be seen that the mathematical creative thinking skills of students in Simpang Village on the material of rectangular plane shapes are still relatively low.
Keywords: creative thinking skills; rectangular quadrilateral shapes; junior high school

Abstrak
Penelitian ini bertujuan untuk mendeskripsikan kemampuan berpikir kreatif matematis siswa dalam menyelesaikan masalah pada materi bangun datar segi empat pada siswa SMP kelas VII di Kp. Simpang Rt.05/Rw.04 Metode penelitian yang dilakukan adalah deskriftif kualitatif. Subjek penelitian terdiri dari 2 orang yang diambil secara acak, Instrumen penelitian dalam penelitian ini adalah peneliti sendiri dan dibantu oleh instrumen pendukung berupa soal tes, wawancara dan catatan penelitian. Teknik instrumen yang digunakan adalah uji triangulasi. Teknik analisis data yang digunakan mencakup tes kemampuan berpikir kreatif ,hasil wawancara, dan catatan penelitian. Dari hasil studi memperlihatkan bahwa kemampuan berpikir kreatif matematis siswa yang berada di desa simpang pada materi bangun datar segi empat masih tergolong rendah.
Kata Kunci: kemampuan berpikir kreatif; bangun datar segi empat; smp

Introduction

Mathematics is one of the important subjects in education, so mathematics subjects are given to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as the ability to work together based on the Content Standards in Permendiknas Number 22 of 2006 (Depdiknas, 2006). These abilities are needed by students to be able to obtain, manage, and utilize existing information so that each student has the ability to think creatively to solve math problems (Febriani & Ratu, 2019; Apriansyah & Ramdani, 2019).

According to Munandar, creative thinking is an activity to see or think about extraordinary things, unusual things, combining seemingly unrelated information and generating new solutions or ideas that show fluency, flexibility, originality in thinking and elaboration (Irawan, 2015: 14). This is clarified by the opinion of (Eftafiyana, Nurjanah, Armania, Sugandi, & Fitriani, 2018) explaining that fluency refers to students' ability to provide various answers, flexibility refers to students' ability to solve problems not in one way but can provide other ways, originality refers to students' ability to produce new and unique expressions, and elaboration refers to students' ability to be able to enrich or develop an idea (Eviliasani, Hendriana, & Senjayawati, 2018; Lisliana, Hartoyo, & Bistari, 2016).

Meanwhile, mathematical creative thinking skills are very necessary for students to have, because students who have mathematical creative thinking skills can provide broad thinking to obtain new ideas or new ways to solve mathematical problems. Mathematical creative thinking skills are thinking skills that aim to create or find new ideas and understand mathematical ideas (Susanto dkk., 2023; Faturohman & Afriansyah, 2020; Andiyana, Maya, & Hidayat, 2018). Therefore, mathematical creative thinking skills are important for students to have and need to be trained in each student.

However, the current condition of creative thinking ability given how important mathematical creative thinking is for students (Rohmah dkk., 2023), in reality the creativity of generations in thinking is still relatively low, this is based on the opinion of (Febriani1 & Ratu, 2018) from the results of research by Ika Humaeroh (2016) which states that the level of creative thinking ability of 28 students as a whole was achieved by 1 student in the sufficient category, 17 students in the less category and 10 students in the very less category. If converted into a percentage, the sufficient category reaches 3.57%, the less category reaches 60.71% and the very less category is achieved with a percentage of 35.71% (Ika, 2016). This is caused by the mathematical learning process of students which is still monotonous and too forcing the way of thinking of their teachers. As a result of this learning, students are passive, because generally teachers are busy explaining the material with students also busy receiving good information, so that students only imitate what the

teacher does and consider it sufficient to solve the problems explained by the teacher. So, students cannot find other ways to solve the problem (Faturohman & Afriansyah, 2020; Febriani & Ratu, Winarsih, Masfufah & Kadarisma, 2018).

This study was conducted with the aim of determining the extent of the mathematical creative thinking abilities of junior high school students in Simpang Village on the material of rectangular spatial structures because according to Sumarmo, Hidayat, Zukarnaen, Hamidah, & Sariningsih, (2012) in the article (Andiyan, Maya, & Hidayat, 2018) stated that in order to become a creative thinker as follows:

a. Working with high ability, with strong self-confidence, and feeling challenged to solve problems even though they have not mastered them well.

b. Considering one's own ideas from other perspectives so that better ideas are found.

c. Doing all tasks based on internal motives and not external motives, being proactive, and not being a reactive individual.

d. Thinking divergently, being able to consider something from different perspectives, proposing various alternative solutions, being open and flexible.

e. Thinking laterally, imaginatively, not only from the visible but also from the invisible, and thinking vertically. Lateral thinking is seeing problems from several new angles, as if jumping from one ladder to another. However, with lateral thinking, one will be able to think generatively and provocatively, and get better ideas. Vertical thinking is a process of moving step by step towards a goal, as if climbing a ladder. Through vertical thinking, individuals can think jumping, but with lateral thinking.

The process of students' creative thinking skills must be creative and active (Safitra, Mulyono, & Susanti, 2023), such as in communicating ideas and concepts. So that the state of mathematics learning objectives. Learning objectives will be achieved if the planning and methods used can influence the potential and abilities of students and this success will be achieved if students are involved in their creative thinking process.

In solving problems related to creative thinking skills, some errors require analysis of creative thinking skills as seen from the level of student confidence. Students' creative thinking skills can also be identified by giving questions with quadrilateral material (Mathematics, 1997; Handayani, 2023). Because the quadrilateral material in junior high school class VII discusses the types of quadrilaterals, namely squares, rectangles, trapezoids, rhombuses and kites that allow students to generate new ideas.

Based on the review above, the author will conduct an analysis of the creative mathematical learning abilities of junior high school students as seen from the students' answers to the questions given, namely the questions that will be tested, and for the creative mathematical thinking content used, namely space and shape in the material on flat rectangular geometric shapes in the form of story questions or questions in the form of text or ideas.

Method

This study uses a descriptive qualitative research type that aims to analyze students in completing the students' mathematical creative thinking ability test. The subjects in this study were 2 junior high school students in grade VII in Simpang Village, Cikajang District, Garut Regency with the material of rectangular solid shapes. The time of this study was carried out on December 22 to January 1. For data collection that will be taken by triangulation or combination, and for data analysis is inductive / qualitative, which will emphasize meaning rather than generalization. The tests used in the study were in the form of written test questions, interviews, and Research Notes.

The research data were in the form of test results, interview results and research note results. The results of the student's test were used as material for student interviews. While the results of the research notes were used to analyze qualitative data. The research data in the form of test results, interviews and research notes were analyzed based on 4 stages of Wallas' creative thinking process, namely: 1) preparation stage; 2) incubation stage; 3) illumination stage; 4) verification stage.

Result

The results of the study were conducted on 3 students of grade VII in Simpang Village, Cikajnag District, Garut Regency. The data from the results of this study are in the form of student learning outcomes whose data collection uses test result instruments, interview results and research note results. The results of the test instrument are in the form of descriptive questions. To obtain descriptive test result data, scoring is carried out on student answers for each question item. The scoring criteria for the mathematical creative thinking ability test used in this study refer to the rubric score as presented in Table 1 below.

Table 1. Scoring Guidelines for the Mathematical Creative Thinking Ability Test.

Indicator	Score	Student responses to questions or problems
Fluency thinking	4	Provide more than one idea/answer that is relevant to solving the problem and the disclosure is complete and clear.
	3	Provides more than one idea/answer that is relevant to solving the problem but the solution is not clear.
	2	Providing an idea that is relevant to solving the problem but the problem solving and disclosure are complete or clear.
	1	Provides an idea that is relevant to solving the problem but the expression is unclear or incorrect.

Indicator	Score	Student responses to questions or problems
	0	Not answering or providing relevant answers.
Thinking flexibility	4	Providing answers in more than one way (various), the calculation process of the results is correct.
	3	Providing answers in more than one way (various) but some of the results are wrong because there is an error in the calculation process.
	2	Providing answers in one way, the calculation process and the results are correct.
	1	Providing answers in only one way and there is an error in the calculation process so the results are wrong.
	0	Not answering or giving an answer in one or more ways but all of them are wrong.
Thinking Originality	4	Giving answers in his own way (different from the answer key by more than 80%, with the calculation process and the results are correct.)
	3	Providing answers in his own way (different from the answer key by 70%-80%, but there are errors in the calculation process.)
	2	Providing answers in his own way (different from the answer key of 60%-70% where the calculation process is directed but not finished.)
	1	Giving answers in his own way (different from the answer key by 60%-50% but the answers cannot be understood.)
	0	Not giving an answer or giving a wrong answer.
Elaboration Thinking	4	Expand the situation properly and detail it in detail.
	3	Expanding on the situation properly and going into less detail.
	2	There was an error in expanding the situation and providing insufficient details.
	1	There is a mistake in expanding on the situation without providing details.
	0	Not answering or giving the wrong answer.

Table 2. Presentation Acquisition Category Description.

Percentage Gain	Category
0,00 < r < 0,20	Very Low
0,20 ≤ r < 0,40	Low
0,40 ≤ r < 0,60	Moderate/Sufficient
0,60 ≤ r < 0,80	Good
0,80 ≤ r < 1,00	Very Good

In the mathematical creative thinking ability test, students consist of five questions, each of which represents one aspect of creative thinking ability, namely fluency, flexibility, originality and elaboration, with a maximum score of 4 for each. This mathematical creative thinking ability test was given to 2 students in grade VII. The results.

Table 3. Results of the Mathematical Creative Thinking Ability Written Test.

Aspects of Creative Thinking Ability	Total Score	Average	Percentage	Category
Fluency	11	3,66	91%	Very Good
Flexibility	8	2,66	66%	Good
Originality	6	2	5 %	Moderate
Elaboration	4	1,33	33%	Very Low

In Table 3, it is obtained that students' mathematical creative thinking ability in the aspect of fluency thinking is included in the very good category with an average score of 3.66 and a percentage of 91%. Students' mathematical creative thinking ability in the aspect of flexibility thinking is included in the Good category with an average score of 2.66 and a percentage of 66%. Students' mathematical creative thinking ability in the aspect of originality thinking is included in the Sufficient category with an average score of 2 and a percentage of 5%. And students' mathematical creative thinking ability in the aspect of elaboration thinking is included in the very low category with an average score of 1.33 or 33%.

Based on the results of the interview with the students, it shows that students have not been able to think creatively mathematically on the problem of rectangular plane shapes. Students are only able to answer some creative thinking test questions that have been explained by the researcher (Salsabila & Delyana, 2023), students are not able to think based on aspects of fluency, flexibility, originality, and elaboration. Furthermore, the researcher uses the research note stage at this stage the researcher sees the attitude of students when answering the test results carried out by 3 students, the students are still less able when filling in the test questions so 2 students focus more on asking their friends.

Discussion

Analysis of students' thinking results shows that students' creative thinking in Simpang Cikajang village is mostly in the very good criteria, because most students are able

to get the maximum score. Students' mathematical creative thinking abilities in this study were measured using rectangular flat building questions consisting of 5 essay questions.

The results of the study on subjects with very good abilities are that on question number 1 the subject managed to work on the question well. At the preparation stage, students already understand the meaning of the question. Students can work on question number 1 correctly, namely to work on question 1, students must know the formulas for rectangular plane shapes. However, in the interview, students were asked whether their answers were correct or not. Students said that they were sure of their answers and had rechecked them. However, after being examined by the researcher, on question number 1, only 1 student's correct answer was seen who did not understand the calculation. On question number 2, the subject managed to work on the question well, at this stage the student was able to determine the area of the plane shape given based on its size, then the student was asked about what was known and what was asked in the question and the student answered the question correctly, all the student's answers were correct. The first student's answer calculated the area of the pool. Then the student calculated the area of the yard and then obtained the total area with the area of the yard in the area of 71 $m2$ on question number 2, only 2 students had correct answers (See Figure 1 & 2).

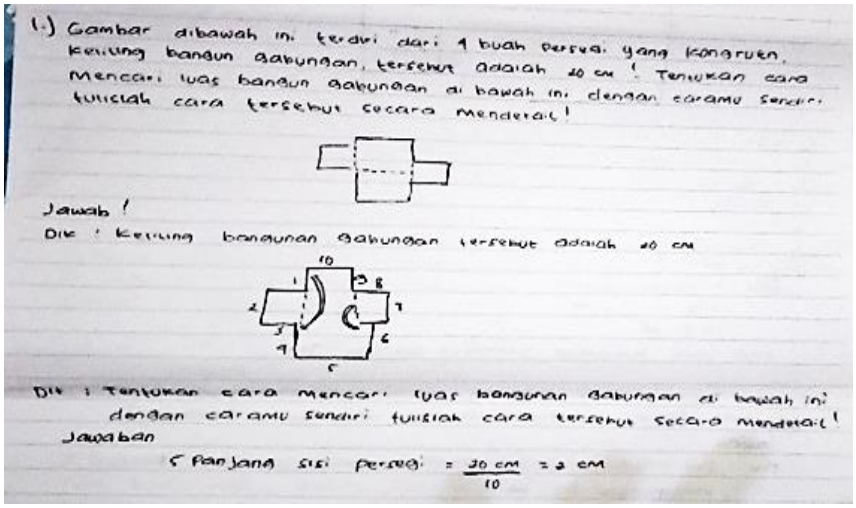
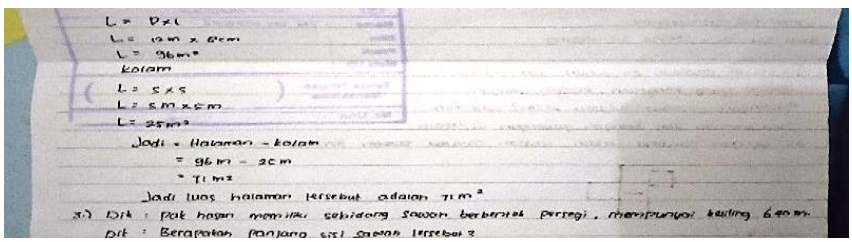


Figure 1. Question Number 1



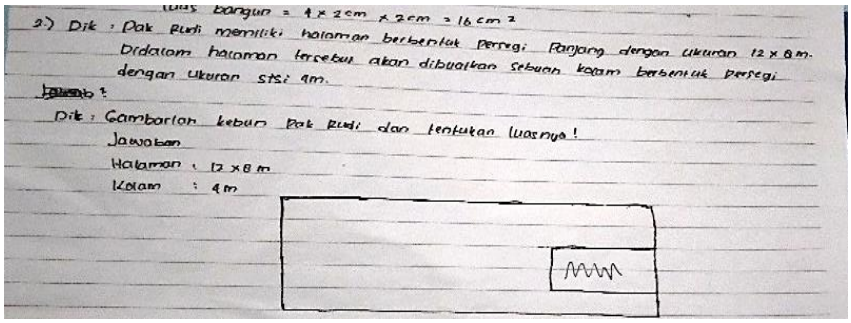


Figure 2. Question Number 2

This means that questions 1 and 2 have very good mathematical creative thinking analysis skills. Because he is able to fulfill the indicators of this creative thinking ability very well. The results of student interviews with the Very Good criteria are as follows:

P: "Hello, your name is euis?

S: "Hello, sis.

P: Then, sis, can I just ask you questions?"

S: "Yes, sis.

P: "euis, for questions 1 and 2, are there any difficulties in doing them?"

S: no, sis, but I'm a little doubtful about the answer

P: "Why is it difficult? Do you think your answer is correct?"

S: "I'm doubtful, sis,

P: "Which side do you think is wrong?"

S: "This shows the answer that she thinks is a little wrong, namely in the calculation"

P: "Oh, this one, okay.

P: "Then, let's end it. Thank you very much for helping sis with this little research."

So, it can be concluded from the results of the interview above with students, students are able to get questions with a story problem model that is conceptualized in daily activities, so that the ability to reason and interpret in this mathematical sentence is very good. Judging from the answers, this student is able to do numbers 1 and 2.

In question number 3, the subject successfully completed the question. In the preparation stage, the student already understood the meaning of the question. The student was able to complete question number 3 by determining the area and perimeter of the given flat shape based on its size. However, the student had difficulty understanding the question, but the student was able to express his opinion in his own language. In the incubation stage, the student was asked about what was known and what was asked in the question and the student was able to answer the question correctly. In question number 3, the student answered the question with 2 answers. The student's first answer correctly answered the question. By determining the formula for the perimeter of a square The student's second answer had problems entering the perimeter and side values, which

should have been the perimeter value entered but what was entered was the side of the rectangular flat shape, even though the results were actually the same (see Figure 3).

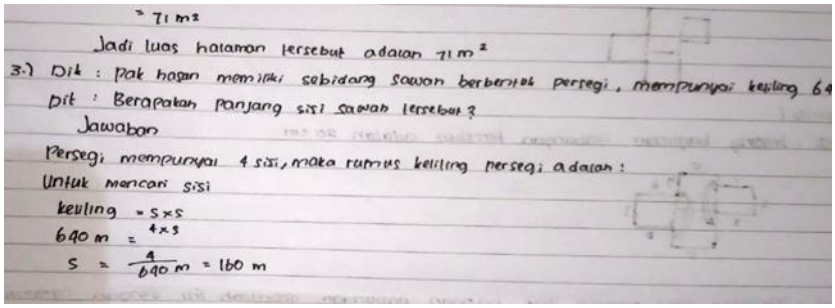


Figure 3. Question Number 3

This means that question 3 has a very moderate mathematical creative thinking analysis ability. Because he is able to fulfill the indicators of this creative thinking ability very well. The results of student interviews with the criteria of sufficient ability are as follows:

P: "Hi Iyul, just call me S, okay?
S: "Yes, sis."
P: "Just go straight to the point, it's okay."
S: "Yes, sis."
P: "In question number 3, are you used to answering questions in 2 ways?"
S: "Silence" (while smiling)
P: "Where, do you think this is difficult, and now you're not sure about your answer?"
S: "Yes, it's difficult, sis, the right one is determining the circumference in the length of a rice field"
P: "But you know the formula for the circumference of a rectangle, right?"
S: "I know, sis." But I'm not sure about my answer"
P: "Okay, then. Have you never been taught story problems like this at school?"
S2: "Yes, that's right. At school I was only taught questions like this once. Usually the questions are that direct, sis, not like this."
P: "Oh, I see. Thank you, S., for your good answer."

So, it can be concluded from the results of the interview above with students only occasionally get questions with a story problem model that is conceptualized in daily activities, so that the student is almost right but there is an error in solving so that students are included in the fairly creative category. In line with the findings of Putra, Putri, Lathifah, & Mustika (2018) that students' ability to identify data sufficiency in questions is still low so that they cannot solve the questions.

In question number 4, the subject has not succeeded in working on the question properly. In the preparation stage, the student does not understand the meaning of the question. The student cannot state the requirements for working on question number 1 properly. However, in the interview stage, the student can answer the question properly.

When asked what is known and what is asked in the question, the student answers the question correctly. The student can also explain the circumference that he will use to work on the question. In question number 4, the student said he could answer the question with an unfinished answer. In the verification stage, the student was asked whether he was sure his answer was correct or not. The student said he was not sure about his answer. After being examined by the researcher, in question number 4, the student's answer to determining the rectangular yard is the same as determining the circumference of the yard. but the student entered the formula incorrectly into the value, and the student had not completed the question and only wrote the formula. Overall, the student could understand the question well, but could not do it correctly, perhaps because the student did not memorize the area formula for other rectangular flat shapes.

In question number 5, the subject has not done the question well. In the preparation stage, students also do not understand the meaning of the question. mentions the steps to work on question number 5, namely by understanding the picture. In fact, to be able to work on question number 5, you must know the ratio formula and the area of the flat shape in the question. When asked about the method that will be used to work on the question, students only answer "don't know", which means that students can understand the question but do not know how to work on the question (see Figure 4 & 5).

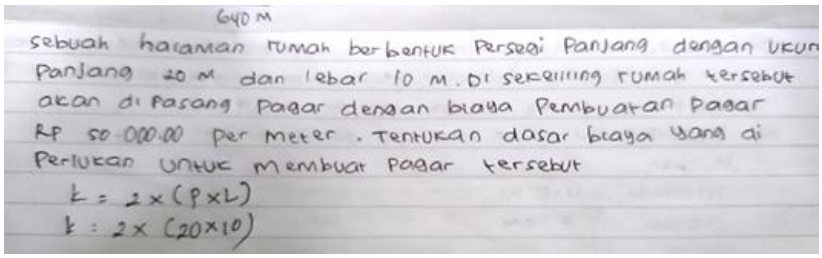


Figure 4. Question Number 4

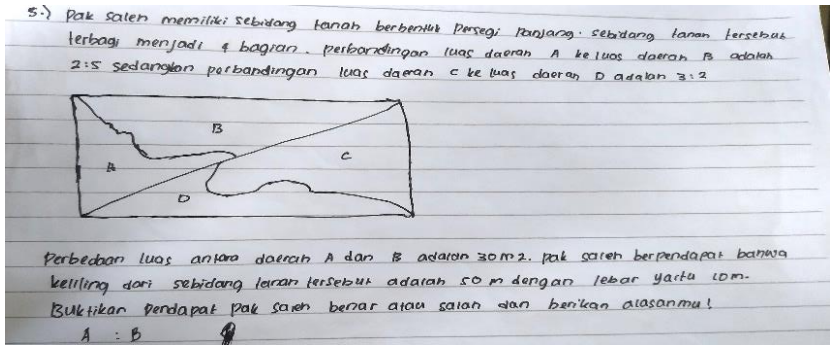


Figure 5. Question Number 5

In the results of student interviews on numbers 4 and 5, students did not answer anything so it can be said that the student did not understand the problem presented in the question and the student did not understand questions 4 and 5. Based on the results

obtained, most students still have difficulty in generating initial ideas in solving problems. The obstacles faced by students are not able to solve story questions in creative thinking skills because students On this question indicator, students are able to answer with an average percentage of 33%, this indicates that students' ability to answer questions on this indicator is very low. The student also explained that questions 4 and 5 were very difficult so I was unable to answer the questions.

Conclusion

Based on the results of research and discussion that have been carried out by researchers regarding the mathematical creative thinking abilities of grade VII students in Simpang Village in solving problems on the material of rectangular flat shapes, it can be concluded that students' mathematical creative thinking in the aspect of fluency thinking is included in the very good category with an average score of 3.66 and a percentage of 91%. Students' mathematical creative thinking abilities in the aspect of flexibility thinking are included in the Good category with an average score of 2.66 and a percentage of 66%. Students' mathematical creative thinking abilities in the aspect of originality thinking are included in the Sufficient category with an average score of 2 and a percentage of 5%. And students' mathematical creative thinking abilities in the aspect of elaboration thinking are included in the very low category with an average score of 1.33 or 33%.

Conflict of Interest

The authors declare that no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely by the authors.

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