The 2nd International Conference on Mathematics Education and Technology (ICOMET) 2023
ISSN 2986-8513 | pp. 350-360 (2023)
Publisher: University of Islam Malang

MATHEMATICAL CREATIVE THINKING ABILITY OF CLASS VIII JUNIOR HIGH SCHOOL STUDENTS ON LINES AND SERIES

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ABSTRACT

This research aims to determine the mathematical creative thinking abilities of students at SMPN 1 Maron class VIII in dealing with sequences and series material. The ability to think creatively in mathematics plays an important role in developing a deeper understanding of mathematical concepts and problem solving. This research method uses a quantitative approach with a survey research design. Data was collected through a creative mathematical thinking ability test specifically designed for sequence and series material. This test is to determine students' abilities in formulating problems, finding creative solutions, and presenting new ideas in a mathematical context. The research sample consisted of 25 students of SMPN 1 Maron class VIII. The results of this research indicate that the mathematical creative thinking abilities of students at SMPN 1 Maron class VIII in sequence and sequence material still need to be improved. Because most students tend to face difficulties in formulating more complex problems and finding creative solutions. Although they have an understanding of basic concepts, the ability to apply these concepts in different mathematical situations still needs to be improved. These findings have an important role for mathematics education in junior high schools. Mathematics teachers need to design learning strategies that encourage students to think creatively in solving mathematical problems, especially in sequence and series material. In addition, schools can consider developing extracurricular programs or activities that focus on developing students' creative mathematical thinking abilities to improve the quality of mathematics learning at the junior high school level.

Keywords: Creative Thinking, Lines and Series

1. Introduction

Mathematics has an important role in the world of education(Yudha, 2019). However, many people still find it difficult to understand mathematics subjects. One of the problems that often arises and is considered to be the cause of difficulties in learning mathematics is students' lack of ability to think creatively during the learning process(Werdiningsih, 2019). In accordance with conditions in the field where students still have difficulty solving questions in the form of contextual problems. This condition is caused by students not being trained to think creatively, especially in connecting mathematical concepts with everyday life. If the perception that mathematics is difficult continues, it will have a negative impact on students' ability to think creatively(Pratama & Lestari, 2017). The ability to think creatively in mathematics is an important aspect that needs to be developed in education(Erni et al., 2022).

Students' creative thinking abilities seem to be still lacking, as stated by Fatimah, Fardah, and Prianggono in their research(Widiastuti et al., 2018). The results of this research indicate that the level of students' ability to think creatively in Indonesian secondary schools still has considerable room for improvement. Previous studies also noted that when measuring students' creative mathematical thinking abilities, the majority of them, namely 31 out

of 37 students, were classified as less creative.(Laksono & Effendi, 2021). These students' abilities seem to be hampered because they have not been able to fully understand the problems given, so that most of the answers given by students seem random and some are not filled in at all.

Based on the previous explanation, it can be concluded that the majority of students face difficulties in solving mathematical problems that require aspects of creativity, which indicates that their mathematical creative thinking skills still need to be improved because creative thinking skills are an important aspect for describing views from various angles and providing solutions. in various challenges in everyday life and communicate them effectively(Qadri et al., 2019). Other research also supports this view by stating that one very important element in learning mathematics so that mathematics can develop better in the realm of science is the ability to think creatively.(Mulyaningsih & Ratu, 2018). Based on these points, it can be concluded that one of the reasons why students in Indonesia experience difficulties in understanding mathematics is due to a lack of development of creative thinking abilities.

In an effort to improve students' creative thinking abilities, a forum is needed that allows them to express their ideas and opinions according to their level of creativity(Surya et al., 2018). In line with this thought,(Chin & Fu, 2021)suggests that educators need to look for ways to support students and provide them with equal opportunities to learn mathematics. This means we need to explore a variety of diverse solutions to improve students' creative mathematical thinking abilities.

Based on the results of previous observations, currently there is no appropriate solution regarding students' mathematical creative thinking abilities at SMPN 1 Maron, especially in Lines and Series material. Therefore, this research was conducted to overcome this problem by formulating a research question, namely how students' mathematical creative thinking abilities at SMPN 1 Maron relate to sequences and series.

2. Research Methods

In this research, the research method used is qualitative descriptive research to assess and analyze students' creative mathematical thinking abilities based on Lines and Series material. The research subjects consisted of 25 students from class VIII at SMPN 1 Maron. The research tool used is an instrument in the form of test questions in the form of descriptions that have been validated by the validator.

The instrument used in this research is a collection of questions specifically designed to measure students' creative mathematical thinking abilities in the context of Sequences and Series material. The research aims to measure students' mathematical creative thinking abilities in sequence and series material for class VIII SMP. The method used in this research involves testing students' abilities, where students are tested first and given scores according to certain scoring procedures. Next, these values are adjusted using a certain formula to get the final value.

$$Nilai\ Akhir = \frac{skor\ yang\ didapat}{skor\ maksimal} \times 100$$

After getting the final score from each student, the next action is to classify the students' mathematical creative thinking abilities into three groups, namely high, medium and low. This grouping process refers to the method suggested by Arikunto, which uses the standard deviation and final average scores of students listed in Table 1, as explained in research by(Nurazhaar et al., 2021)

Table 1. Category of ability level

Category	Value Range
Tall	$Nilai \geq \bar{x} + SD$
Currently	$\bar{x} - SD \leq Nilai < \bar{x} + SD$
Low	$Nilai < \bar{x} - SD$

The data analysis method applied in this research includes three main stages, namely

data reduction, data display, and drawing conclusions. This concept is in accordance with the approach described by(Lotto et al., 1986). In the data reduction stage, researchers focus on the process of collecting data until all relevant information has been collected. Then, at the data display stage, the data is presented visually through various methods such as brief explanations, tables, graphs, and the like, making it easier to understand the information that has been collected. Next, in the conclusion drawing stage, the researcher tries to conclude the findings from the data that has been presented so that they can form a conclusion that is relevant to the research objectives, as explained by(Wiwin Yuliani, 2018).

In this research, the formal test method was used as a measurement tool. This formal test method refers to giving a test after the completion of learning the relevant material, with the time for carrying out the test separate from the time of learning activities, in accordance with the definition given by(Purnomo, 2011).

3. Results and Discussion

This research aims to determine the level of creative thinking abilities of class VIII students at SMPN I Maron. The focus of this research is to measure students' fluency, flexibility, originality and elaboration in the context of mathematical creative thinking abilities. To achieve this goal, research was conducted by analyzing the results of the assignments given to students. This assignment consists of four questions in the form of descriptions specifically designed to measure students' mathematical creative thinking abilities. The results of this research will provide students with a better understanding of the extent of students' mathematical creative thinking abilities in studying sequences and series material.

According to (Putra et al., 2018)preparation of criteria for creative thinking abilities, both high and low categories, based on the data in the following table:

Table 1. Criteria for creative thinking abilities

Percentage	Criteria
68-100	High Category
33-67	Medium Category
0-33	Low Category

Students' mathematical creative thinking abilities consist of four indicators, namely fluency indicators, originality indicators, elaboration indicators and flexibility indicators.

1. The percentage results of fluency indicators are as follows:

Table 3. Fluency indicators

Student responses to questions	**Score**	**The total number of students who achieved a certain grade**
Givemore than one relevant idea the solution is complete and clear	4	4
Provides more than one relevant idea but the solution is unclear	3	9
Provide a relevant idea with a complete and clear solution	2	5
Provides a relevant idea but the solution is unclear	1	6
Doesn't give an answer or gives an irrelevant idea	0	3
Amount		59
Percentage		59%

Based on table 3, it shows that in the fluency indicators there are student responses to questions with certain criteria. There were 4 students achieving a score of 4, 9 students achieving a score of 3, 5 students achieving a score of 2, 6 students achieving a score of 1, and 3 students achieving a score of 0. Therefore, table 3 reflects the ability to think fluently (fluency) in answering question number 1 with a percentage level reaching 59%.

2. **The percentage of authenticity indicators is as follows:**

Table 4. Indicators of authenticity (originality)

Student responses to questions	Score	The total number of students who achieved a certain grade
Give answers in your own way and the results are correct	4	2
Gives answers in his own way, the calculations are correct but the information is unclear	3	3
Giving answers in his own way, the calculation process can be understood, but the information is not clear enough	2	4
Gives answers in his own way but cannot be understood	1	14
Doesn't give an answer or gives an incorrect answer	0	4
Amount		39
Percentage		39%

Based on table 4, it shows that the authenticity indicator contains student responses to questions with certain criteria. There were 2 students achieving a score of 4, 3 students achieving a score of 3, 4 students achieving a score of 2, 14 students achieving a score of 1, and 4 students achieving a score of 0. Therefore, table 4 reflects the ability to think originality in answering question number 2 with a percentage level reaching 39%.

3. **The percentage of elaboration indicators is as follows:**

Table 5. Elaboration Indicators

Student responses to questions	Score	The total number of students who achieved a certain grade
Provide correct and detailed answers	4	14
There are errors in the answers but they include detailed details	3	0
There are errors in the answers but they are accompanied by less detailed details	2	1
There are errors in the answers and there are no details	1	7
Doesn't give an answer or gives the wrong answer	0	5
Amount		65
Percentage		65%

Based on table 5, it shows that in the elaboration indicator there are student responses to questions with certain criteria. There were 14 students who achieved a

score of 4, no students achieved a score of 3, 1 student achieved a score of 2, 7 students achieved a score of 1 and 5 students received a score of 0. Therefore, table 5 reflects the ability to think elaboration (elaboration) in answering question number 3 with a percentage level reaching 65%.

4. The percentage of flexibility indicators is as follows:

Table 6. Flexibility Indicators

Student responses to questions	Score	The total number of students who achieved a certain grade
Provide answers in more than one way (various), the calculation process and results are correct	4	2
Giving answers in more than one way (various) but the results are wrong because there are errors due to the calculation process	3	4
Provide answers in one or more ways, the calculation process and results are correct	2	5
Gives an answer one or more ways but the answer is wrong	1	11
It doesn't give an answer one way or another but they are all wrong	0	5
Amount		41
Percentage		41%

Based on table 6, it shows that in the flexibility indicator there are student responses to questions with certain criteria. There were 2 students who got a score of 4, 4 students who got a score of 3, 5 students who got a score of 2, 11 students who got a score of 1, and 5 students who got a score of 0. Therefore, table 6 reflects the ability to think flexibly (flexibility) in answering question number 4 with a percentage level reaching 41%.

The percentages obtained by students from all indicators of mathematical creative thinking abilities are all below 70%. The fluency indicator reached 59%, the originality indicator reached 39%, the elaboration indicator reached 65%, and the flexibility indicator reached 41%. Thus, it can be interpreted that class VIII students at SMPN 1 Maron are included in the category of students who have a sufficient level of creativity. The results of students' work in answering questions to measure their level of creativity can be seen below.

Question number 1

Given an arithmetic sequence 2, 5, 8, 11, ... determine the 12th term?

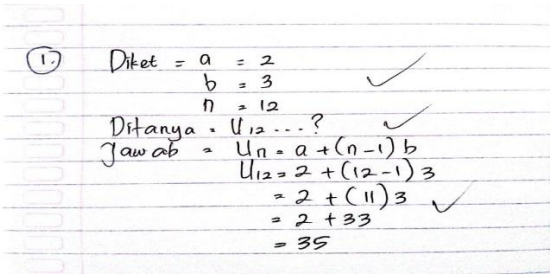

Figure 1. High ability students' answers to question number 1

In Figure 1, it can be seen that students have put forward several relevant ideas and presented their solutions in a comprehensive and structured manner. When looking at fluency indicators, it can be seen that the average student reached a level of 55%, indicating that a number of students were able to answer questions correctly and fluently.

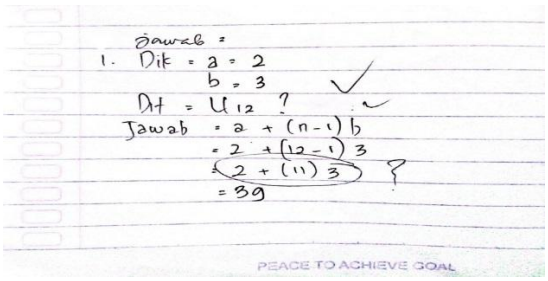

Figure 2. Medium ability students' answers to question number 1

Based on Figure 2, it can be seen that students have proposed several suitable ideas, although the solutions are less detailed. When looking at fluency indicators, it can be seen that the average student's mathematical creative thinking ability reaches 55%, indicating that some students have succeeded in developing creative thinking skills and are able to speak fluently.

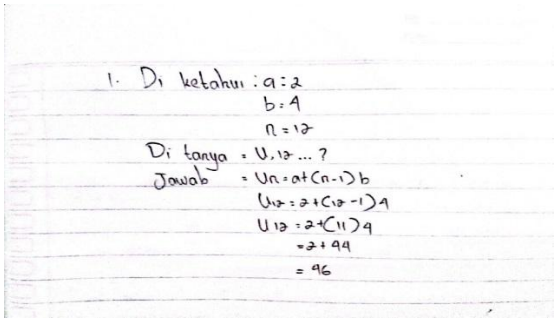

Figure 3. Low ability students' answers to question number 1

Based on Figure 3, it reflects that the students have put forward a relevant idea, but the explanation is still not precise. In terms of fluency indicators, the average student's mathematical creative thinking ability reaches 55%, illustrating that some students have succeeded in developing fluent thinking skills but are still wrong in determining the difference.

Question number 2

In the theater the chairs are arranged with the front row consisting of 18, the second row containing 20, the third row 22 and so on always increasing by 2. The number of seats in the 15th row is...

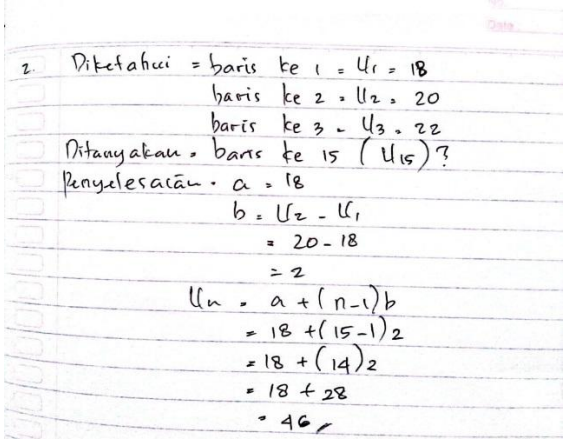

Figure 4. High ability students' answers to question number 2

Based on Figure 4, it can be seen that the students have provided answers with a unique approach, and their calculations are correct. However, the information is still lacking in detail in terms of originality. Data shows that the average student only achieved 36% in the originality aspect, indicating that students' ability to think original is still not optimal.

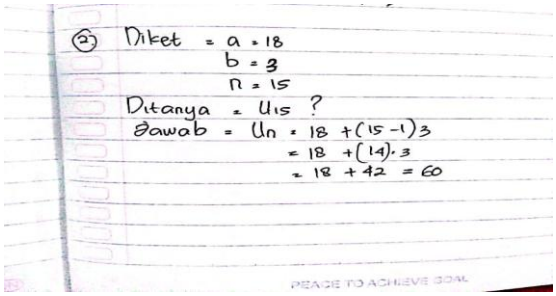

Figure 5. Medium ability students' answers to question number 2

Based on Figure 5, it can be seen that students have presented answers using their own methods. Although the calculation process is understandable, the

information is still lacking in detail and the answers are wrong. In the aspect of originality, the data shows that only around 36% of students succeeded in demonstrating adequate original thinking abilities.

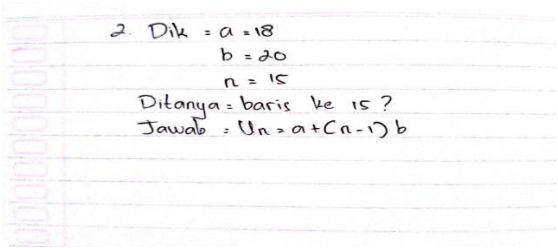

Figure 6. Low ability students' answers to question number 2

Based on Figure 6, it can be seen that students do not provide clear responses or answers. In terms of indicators of originality, the data shows that the average percentage of students only reaches 36%, indicating that students have not been able to develop the ability to think originaly well.

Question number 3

In a building materials store there are piles of bricks. The number of bricks in the top pile is 12 and there is always an increase of 2 in the pile below. If there are 40 piles of bricks from top to bottom and the price of each brick is IDR 600.00, then the amount that must be spent to buy all of them is...

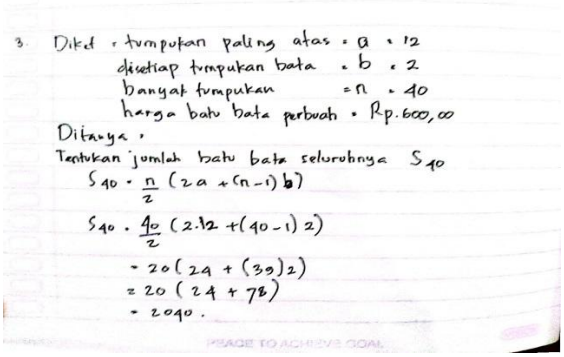

Figure 7. High ability students' answers to question number 3

Based on Figure 7, it shows that the majority of students have given correct and in-depth answers. In the context of the Elaboration indicator, we can see that an average of 60% of students have reached a deeper level of understanding, while some other students still need to develop their ability to think in detail.

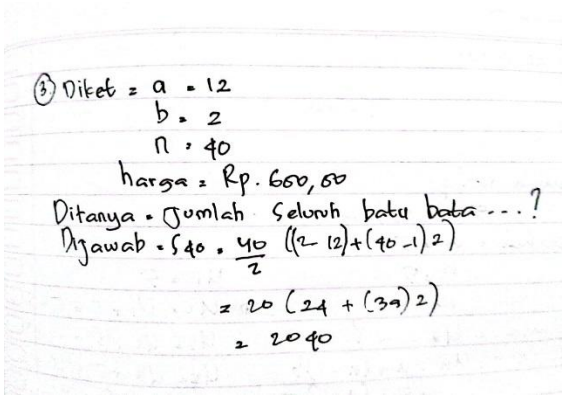

Figure 8. Medium ability students' answers to question number 3

Based on Figure 8, it shows that students have given a clear response. In the Elaboration aspect, it can be seen that overall, around 60% of students managed to reach a deeper level of understanding, while some other students still need to improve their ability to think in detail.

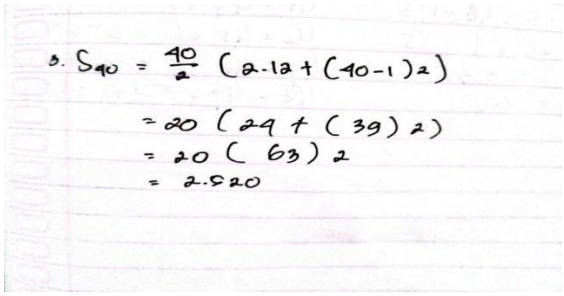

Figure 9. Low ability students' answers to question number 3

Based on Figure 9, it indicates that there are deficiencies in students' responses which are not equipped with details and are also incorrect in their addition and multiplication operations. When looking at the Elaboration indicator, we see that the average percentage of students reaches 60%, which shows that a number of students have not succeeded in developing the ability to think in detail well.

Question number 4

Given a number sequence 5, 10, 15, 20, ... What is the 8th term of the number sequence?

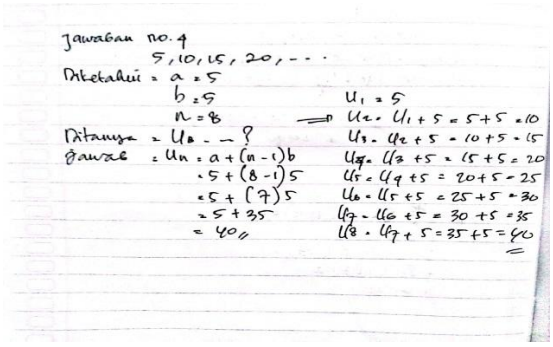

Figure 10. High ability students' answers to question number 4

Based on Figure 10, it shows that students have given more than one answer, while the calculation process and results remain accurate. In terms of the Flexibility indicator, students' mathematical creative thinking abilities averaged 38%, which indicates that the majority of students were able to achieve the expected creative thinking abilities, especially if we look at it in terms of the Flexibility indicator.

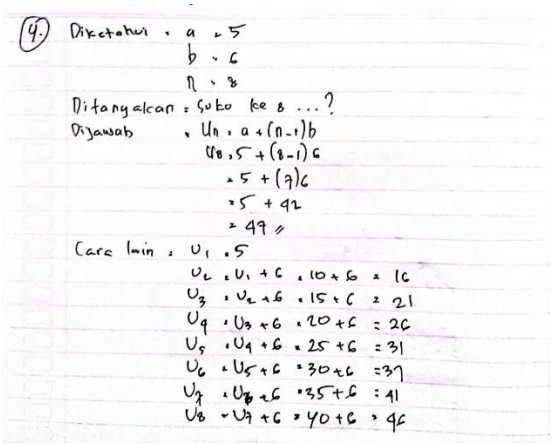

Figure 11. Medium ability students' answers to question number 4

Based on Figure 11, it illustrates that students have tried to give answers with two different approaches, but the answers are not correct. In terms of the Dexterity indicator, students' mathematical creative thinking abilities on average only reached 38%, indicating that most students still need to develop creative thinking abilities, especially when looking at the Dexterity indicator.

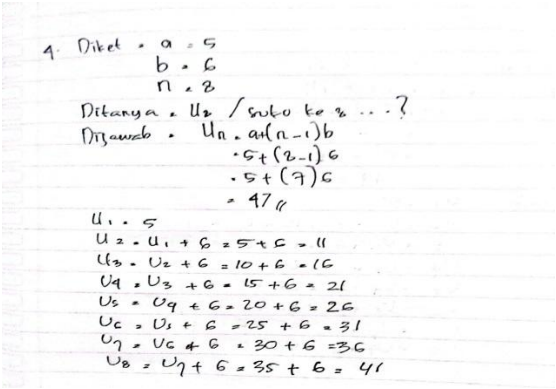

Figure 3. Low ability students' answers to question number 4

Based on Figure 12, it reflects that students tried to give answers using two different methods, but unfortunately the answers were not correct. When looking at the Dexterity indicator, it can be seen that the average student's mathematical creative thinking ability only reaches 38%. This indicates that the majority of students still need to develop creative thinking skills, especially when assessed in terms of the Dexterity indicator.

4. Conclusion

Based on the results of research conducted, most of the students at SMPN 1 Maron showed a fairly good level of mathematical creativity when studying Lines and Series material, with the average percentage of all indicators, namely the fluency indicator, reaching 59%, indicating that students are able to express ideas. -their ideas smoothly. Meanwhile, the originality indicator reached 39%, the elaboration indicator reached 65%, and the flexibility indicator only reached 41%. In this case, elaboration is the highest strength, while originality is the point that needs to be improved.

To improve students' mathematical creative thinking abilities, it is recommended

that teachers provide exercises that contain indicators of mathematical creative thinking more often. In addition, further research needs to be carried out to determine the most effective learning methods in improving students' mathematical creative thinking abilities. In this way, we can help students develop their creative potential in this subject.

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