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Creative Thinking Profiles of Elementary Students in Solving Mathematical Story Problems: A Descriptive Study

Arum Kusumaningtyas*, & Rahayu Condro Murti

Department of Primary Education, Universitas Negeri Yogyakarta, Indonesia

*Corresponding email: arumkusumaningtyas.2023@student.uny.ac.id

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Abstract: Creative Thinking Profile of Elementary Students in Solving Mathematics Problems. Objective: This research aimed to describe creative thinking profile of elementary school students and identified factors that influence students' creative thinking abilities in solving mathematical story problems. **Methods:** This research used a quantitative descriptive study to analyze students' creative thinking abilities in solving mathematical story problems on the composition and decomposition of whole numbers. The subjects of this research were 25 fifth grade students at SD Negeri Prembulan, Galur, Kulon Progo. The data collection techniques used in this research were tests, interviews, and documentation. Meanwhile, the main instrument used in this study was a creative thinking test. **Findings:** The results of this research showed that the creative thinking ability of fifth grade students at SD Negeri Prembulan is still in the medium category with an average score is 6,12 out of 12 or 51% with the majority students at medium level (36%). The majority of students were still in the low category in the aspects of elaboration, fluency and originality. Meanwhile, in the elaboration aspect, the majority of students were in the medium category. From that, the most prominent aspect of creative thinking among student was the elaboration aspect, while the lowest was the originality aspect. The factors that influence students' creative thinking abilities are lack of effort, lack of confidence on solving math problems, lack of ability, and not being used to working on open-ended questions that explore students' ideas. **Conclusion:** The study concluded that the students' creative thinking ability were still in the medium category. Students' creative thinking abilities still needed to be improved through more creative and innovative learning that is oriented towards fluency, flexibility, originality, and elaboration aspects.

Keywords: creative thinking ability, whole numbers, mathematics, elementary students.

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INTRODUCTION

Mathematics is a subject that teaches basic knowledge that a person must master to support human life. By studying mathematics, students can count money, buy and sell, calculate discounts, calculate area, measure weight, calculate volume, calculate distance, and measure time (Rudyanto et al., 2019). To understand the context of mathematics well, mathematics learning can be integrated with students' daily lives and presented in the form of problem-based story questions. Therefore, students also need supporting abilities to be able to solve problems in story problems correctly.

Apart from problem solving ability, the ability that students must be mastered is the ability to think creatively. Creative thinking skills are needed to combine mathematical concepts into

new ideas, so that students can broaden and deepen their understanding (Schoevers et al., 2019). This creative thinking ability is very useful in solving a problem because its includes the ability to analyze, explain, and describe the information or facts obtained (Syahrin et al., 2019). In general, creative thinking is also one of the most important skills of the 21st century because it is included in the 4C skills that contribute to develop creative solutions (Tang et al., 2020). In mathematics, creativity plays an important role because it can encourage students to innovate, produce original ideas, and discover new mindset (Schindler & Lilienthal, 2020), also it can improve students' ability to think at a higher level (Hidajat, 2021). This may occur because this ability also helps students to have critical thinking skills because the two ability are closely related (Akpur, 2020).

Creative thinking can be measured using four indicators, namely fluency, flexibility, originality, and elaboration (Treffinger et al., 2002). Fluency is a student's ability to develop many ideas. While flexibility is the ability to solve problems using various alternative solutions. Furthermore, originality can be seen in students' ability to develop new ideas. Lastly, elaboration is the ability to solve problems in detail. Therefore, someone with a well-developed creative thinking ability can easily solve problems, produce new and varied ideas, and have many perspectives in looking at things. On the other hand, someone with low creative thinking ability would have difficulty solving problems or questions for lack of trying alternative answers and have difficulty working them out (Madyani et al., 2020).

In practice, the biggest challenge in creative thinking is how someone can think flexibly to find new ways of solving a problem (Ramalingam et al., 2020). In fact, mathematics learning generally does not facilitate students to find answers using alternative solutions that are different from those that have been taught (Yayuk et al., 2020). It is in line with what was explained by the fifth grade teacher at SD Negeri Prembulan during the interview, that currently students are still following on the way of solving problems that have been taught by the teacher, so that there are no new ideas or other methods produced by students. Apart from that, teachers had never carried out tests to see the extent of students' thinking ability.

Researchers have done many researches before towards students' creative thinking profile. The research conducted by Ginting et al. (2024) regarding in-depth analysis of undergraduate students' creative mathematical thinking abilities, so the result can contribute to develop an innovative learning to improve creative thinking ability. Rahayuningsih et al. (2021) also found that the open-ended problem solving test was effective in measuring creative thinking abilities, so it is strongly recommended to stimulate creative thinking ability. From these studies, it can be concluded that to measure creative thinking ability can be done using an open-ended problem-solving test. Then, the analysis of the ability that will be carried out can be used to determine innovative learning and can improve students' creative thinking abilities. However, from the research that has been done before, no one has measured and described students' creative thinking abilities specifically in whole number material in elementary school.

Therefore, this study aims to (1) describe the profile of creative thinking abilities of fifth grade elementary school students in solving mathematical story problems based on the aspects of fluency, flexibility, originality, and elaboration; (2) identify factors that influence students' creative thinking abilities in solving mathematical story problems. The results of this research can be used as a learning evaluation and follow-up related to creative thinking skills. This is because to produce creative thinking skills, teachers also need a creative and innovative learning process (Pujawan et al., 2022).

METHOD

Participants

This research conducted at SD Negeri Prembulan, Galur, Kulon Progo, Special Region of Yogyakarta. The subject of this research were 25 fifth grade students who had studied composition and decomposition of tens of thousands of whole numbers. In addition, the cognitive development stage of fifth grade students (age 10-11 years old) begins to be able to think logically and abstractly. Therefore, it allows students to think creatively in solving mathematical problems.

Research Design and Procedures

This research used quantitative descriptive analysis to analyze students' creative thinking abilities in solving mathematical story problems on the composition and decomposition of tens of thousands of whole numbers. The data collection techniques used in this research are test, interview, and documentation. The test consists of four math story questions which were tested on September 2024 after students learn about whole number. The test refers to four aspects of creative thinking abilities, namely fluency, flexibility, originality, and elaboration showed in table 1. The interviews were conducted to several representative students from each category (low, medium, and high) on each aspect. Meanwhile, documentation takes the form of photos of students' answers when working on story questions to strengthen the data obtained.

After data collection was carried out, the results of the students' work are scored based on the assessment rubric. Then, the scores are analyzed using quantitative descriptive and grouped into three categories based on their score. To deepen the analysis and strengthen the data, documentation of student work representing score 1, score 2, and score 3 on each question is attached along with the results of interviews with students.

Research Instruments

The main instrument of this study is creative thinking test. The question test consists composition and decomposition of tens of thousands of whole numbers as presented in table 1 that have been developed based on creative thinking indicators, namely fluency, flexibility, originality, and elaboration. Fluency refers to mention of solving problems in more than one way. Flexibility refers to mention different problem solving alternatives. Originality refers to present a different idea from other students. And elaboration refers to solve problem using detailed solutions.

Table 1. Test questions

No	Question	Aspect
1.	Ayu and Bani buy school equipment at a stationery store. Ayu paid for the four notebooks she bought with a fifty-thousand bills. The change that Ayu received was a twenty-thousand bills and a ten-thousand bills. Meanwhile, Bani paid for three pens with two ten thousand bills and got four two-thousand bills in return.	
	a. If Citra wants to buy two notebooks and three pens at the same store as Ayu and Bani, how much will Citra have to pay?	Elaboration
	b. If Citra pays with three ten-thousand bills, write various ways the cashier give change to Citra!	Fluency
2.	Pay attention to the menu of the food stall below!	

Menu	Price
Chicken soup	Rp7.000,00
Meatball	Rp8.000,00
Beef soup	Rp10.000,00

	Mineral water Rp1.000.00 Iced tea Rp2.000.00 Orange juice Rp2.500.00 Iced lemon tea Rp3.000.00 Diana was asked by her mother to buy 4 portions of food and 4 portions of drink at the food stall. She was given two twenty-thousand bills by her mother.	
a.	If Diana does not receive a change, what food and drink might Diana buy?	Flexibility
b.	If Diana buys two portions of chicken soup, two portions of meatballs and four portions of iced tea, she will receive two-thousand-rupiah bills in return. Is this statement true? Explain your opinion!	Originality

The test instrument has been assessed by expert judgment to ensure that the test questions meet the creative thinking indicators. Then, the test instrument has been tested to determine its validity and reliability. The results of the validity test are shown in the table 2 below.

Table 2. Validity test results

Item	r_{value}	r_{table}	Description
1A	0.807	0.312	Valid
1B	0.756	0.312	Valid
2A	0.456	0.312	Valid
2B	0.856	0.312	Valid

Furthermore, to determine the reliability of the question items, the test was tested using the Cronbach's Alpha method. The result of the reliability are shown in table 3 below.

Table 3. Reliability test result

Cronbach's Alpha	N of Item
0.704	4

Based on the results of the reliability test, the Cronbach's Alpha value was 0.704, which is included in the acceptable category.

Table 4. Creative thinking assessment rubric

Aspect	Indicator	Score
Fluency	Students can only determine one correct answer.	1
	Students can determine several possible correct answer.	2
	Students can determine all possible correct answer.	3
Flexibility	Students are unable to solve the problems with any problem solving strategy.	1
	Students are able to determine problem solving strategies even if the results are not quite right.	2
	Students are able to solve problems with any solving strategy and produce the correct solution	3
Originality	There are 5% or more students who answer the question right with the same solution.	1
	There are 2% to 4.99% of students who answer the question right with the same solution.	2
	There are less than 2% of students who answer the question right with the same solution.	3
Elaboration	Students are unable to elaborate the problem solving in detail and coherence and do not use the correct mathematical concepts, representations, terms, or notations.	1

	Students can only elaborate problem solving in detail and coherence but not using the correct mathematical concepts, representations, terms, or notations.	2
	Students are able to elaborate problem solving in detail and coherence and use the correct mathematical concepts, representations, terms, or notations.	3

Next, students' answers were scored using a creative thinking assessment rubric instrument adapted from the assessment rubric developed by Munahefi et al. (2021) that presented in table 4. The rubric is translated to Indonesian and matched with conditions encountered.

In addition, this study also used a non-directive interview and documentation to strengthen the data on students' work results in solving math problems. The student work results are selected randomly representing each score (score 1, 2, and 3) of each question number. Meanwhile, the non-directive interview used in this study was asked to students whose work results were documented. The questions asked by the author aim to verify the results of their work.

Data Analysis

The test score is calculated by adding up the scores obtained based on the assessment rubric shown in table 4. From the scores obtained, a descriptive analysis was carried out by calculating the mean and standard deviation to determine the categories of low, medium, and high students. High category are obtained if the score obtained is more than $\bar{x} + \frac{1}{2}$ SD, low category if the score obtained is less than $\bar{x} - \frac{1}{2}$ SD, and medium category if the score is between the high and low criteria (Purnomo et al., 2019). The score categories for classifying students into low, medium, and high abilities can be seen in the results and discussion section in table 5.

■ RESULT AND DISCUSSION

Based on the results of student test scores, it has been obtained on an average (mean) of 6,12 and a standard deviation of 1,56. Meanwhile, the maximum score is 12 and the minimum score is 3. Using the category criteria explained in the method section, the table 5 shows the score categories based on students' answers.

Table 5. Score's category based on student's answer

Range	Category	Frequency	Percentage
$x > 6.9$	High	8	32%
$5.34 < x \leq 6.9$	Medium	9	36%
$x < 5.34$	Low	8	32%

Based on table 5, it can be seen that students' creative thinking abilities are quite evenly distributed in the low, medium, and high categories. Then, to find out students' creative thinking abilities in each aspect, the following table is a frequency table of students who got scores of 1, 2, and 3.

Based on the data from table 6, it can be seen that the frequency of students who got 1 score (minimum score) was mostly obtained in the originality aspect, there are 24 students or 96%. This shows that almost all students still do not show the authenticity of the ideas conveyed. Meanwhile, the highest frequency of students who got 3 score (maximum score) was in the flexibility aspect, there are 10 students or 40%. Even though the student frequencies get the most high scores on that aspect, it still does not reflect their mastery of the flexibility aspect because most of them still get scores of 1 and 2.

Table 6. Student's score frequency on each aspect

Aspect	Score		
	1	2	3
Fluency	18	5	2
Flexibility	3	12	10
Originality	24	1	0
Elaboration	15	9	1

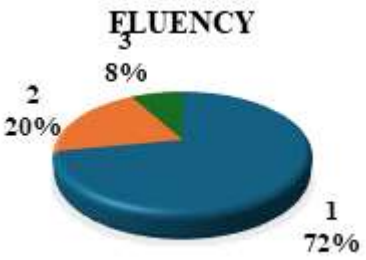


Figure 1. Distribution of students' scores on fluency aspect

Fluency Aspect Based on figure 1, we can see that there are 72% of students got a score of 1, 20% of students got a score of 2, and 8% of students got a score of 3. So in general, it can be concluded that the fluency aspect is still dominated by students in the low category. The scoring refers to the assessment rubric, that students who only write 1 correct way get a score of 1, write 2 correct ways get a score of 2, and write at least 3 correct ways get a score of 3. The following are examples of student work results that received a score of 1 with one correct answer (by S1), score 2 with two correct answers (by S2), and score 3 with three correct answers (by S3).


kembalian nya 4 lembar 2000 jadi 2000x4=8000

Figure 2. Question's answer by S1

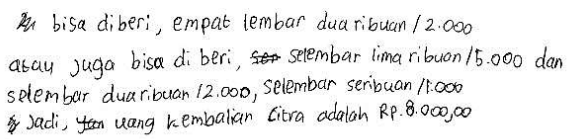

bisa diberi, empat lembar dua ribuan / 2.000
atau juga bisa di beri, ~~dan~~ selembar lima ribuan / 5.000 dan
selembar dua ribuan / 2.000, selembar seribuan / 1.000
jadi, ~~yan~~ uang kembalian Citra adalah Rp. 8.000,00

Figure 3. Question's answer by S2

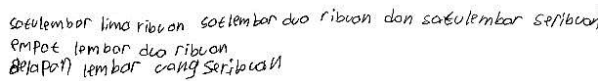

selelembar lima ribuan selembar dua ribuan dan selelembar seribuan
empat lembar dua ribuan
delapan lembar uang seribuan

Figure 4. Question's answer by S3

Based on S1's answer, it can be seen that S1 only answered in 1 correct answer. Meanwhile S2 answered with 2 different correct ways. Then, S3 answered in 3 different correct ways.

Q: *"Why do you only answer question 1B in that way? While in the question it is written that answer using various ways."*
S1: *"I was too lazy to look for more than one way to do question number 1B because I had found one correct way, even though what was asked was more than one correct answer."*
S2: *"I can only think of answering in two different ways."*

From the interview, it can indicate that students are still not fluent in working on math story problems with various alternative answers. Apart from that, students' lack of effort in finding different correct ways is also one of the reasons students do not write down other ways of solving story problems.

A person's view of their own lack of fluency in the process of working on this question is divided into two, namely students who think that their lack of fluency is defined as a lack of effort in working on the questions, and there are also those who think that this is due to their lack of ability so they give up easily (Jia et al., 2019). Students who think that the lack of fluency they face is a lack of effort in seeing their own potential, will usually use their experience to develop and try to be better next time. Meanwhile, students who see that their lack of fluency in working on questions is caused by their own limitations or lack of ability make them easily give

up on doing something. This is also in line with research by (Gunawan et al., 2022), that students' lack of self-confidence in their abilities can prevent students from trying other or more complicated methods.

Students who lack self-confidence must be encouraged and motivated so that they are confident in their abilities. Based on previous research, increasing self-confidence can be done using a contextual learning model and learning media that can make students active, confident,

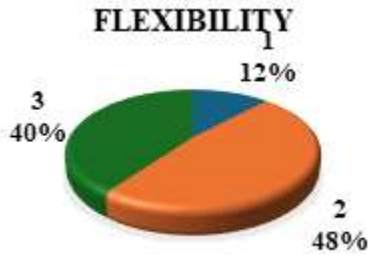


Figure 5. Distribution of students' scores on flexibility aspect

Flexibility Aspect In the flexibility aspect, 12% of students got a score of 1, 48% of students got a score of 2, and 40% of students got a score of 3. The following are examples of the work of students who got a score of 1 (by S4), a score of 2 (by S5), and score 3 (by S6).

Figure 6. Question's answer by S4

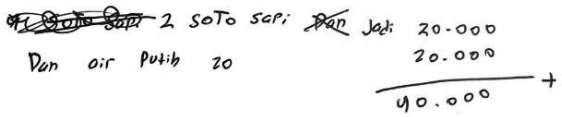


Figure 7. Question's answer by S5

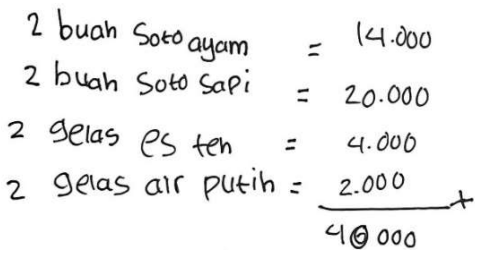


Figure 8. Question's answer by S6

Based on S4's answer, it can be seen that S4 did not pay attention to the instructions in the question in detail. In the question, they are asked to write a combination of four portions of food and four portions of drink. Meanwhile, S4 only wrote about the food. Then, based on the results of S5's answer, the answer given is in accordance with the combination of food and drink correctly. However, what was requested was 4 servings of drinks, while what S4 wrote was 20 servings of drinks. Furthermore, the answer from S6 with the maximum score showed that the answer is exactly what is asked in the question, namely 4 portions of food and 4 portions of drinks for Rp40.000.

Judging from the students' answers, there are still students who haven't found any problems when they're working on story problems. In fact, the ability to think creatively begins with the student's ability to find problems and not just the problem solving (Leasa et al., 2021). For example on students' answers on figure 6 and 7, when students are asked to write down the 4 food and 4 drinks that can be purchased for the amount of money, there are still students who write only food, even 20 servings of drink. It is one of the evidences that students still have not found and understood what kind of problems they will solve. Hence, the solution to their problems is not in line with the problem described.

Meanwhile, on this aspect, more students get medium and high scores, than students who score low. This encouraged the author to conduct an interview with S6 who got a score of 3.

Q: *"How can you answer this question easily?"*

S6: "*I can answer easily according to information and questions because the same problems are often faced in my everyday life."*

The process of completion based on this real problem can indeed encourage students to think creatively, especially on the outward aspect because it begins at the concrete stage (Ndiung et al., 2019). That way, students can put theirselves in the same tangible situation as the

everyday students' lives. Therefore, using contextual learning and questions with students' daily lives can help students in solving mathematical problems.

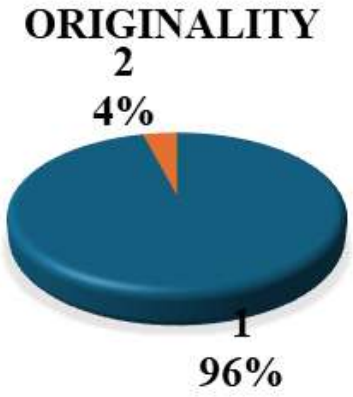


Figure 9. Distribution of students' scores on originality aspect

Originality Aspect on the originality aspect, there are 96% of students who score 1 and 4% who score 2. Meanwhile, no student answered with an original answer that scored 3. The following are examples of answers to S7 and S8.

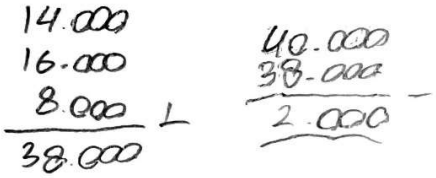


Figure 10. Question's answer by S7

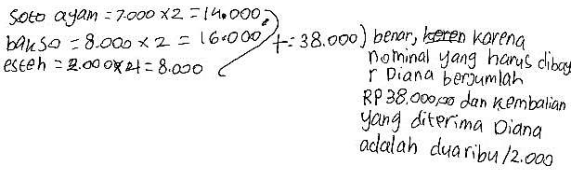


Figure 11. Question's answer by S8

Almost all students respond like the S7 answer, which write down the number without being given an opinion. Meanwhile, for a student who scores 2, the S8 is given an accurate and detailed opinion so that we read the answers, we will immediately understand it.

Based on S7's answer, it is seen that they wrote down only the numbers and the proof, without counting them according to the instructions provided in the question. An interview occured to clarify S7's answer who only write down the the calculation result without opinion.

Q: *"Why don't you write an opinion that supports your calculation?"*

S7: *"Because I am confused about what opinion that could strengthen my answer because it has never been taught before."*

According to Kulsum et al. (2019), students are usually just inclined to give general information without resolving the problem because they do not understand the instructions on the question. Referring to the results of the interview conducted on S7, this could have happened because they had never been taught to give opinions that supported the results of their calculations. So, it would be better if in the future, students are trained to give their opinions so that they get used to expressing opinions that different from their friends (originality). Considering that students with originality aspects are rarely seen because the scale used is increasingly rare and unique in students' answers, the score they get will increase, and vice versa (Kozlowski et al., 2019).

Figure 12. Distribution of students' scores on elaboration aspect

Elaboration Aspect last, on the elaboration aspect, 60% of the students scored 1, 36% of the students scored 2, and 4% of the students scored 3. The following figures are

examples of students' answers who scored 1, 2, and 3. S9 got score 1 because they can not write the answer in detail, S10 who scored 2 because they do not use the mathematical notation, and S11 got scored 3 because they can use the correct mathematical concept.

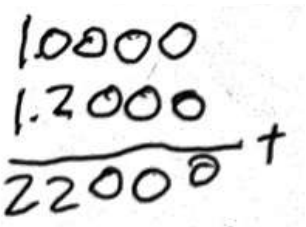
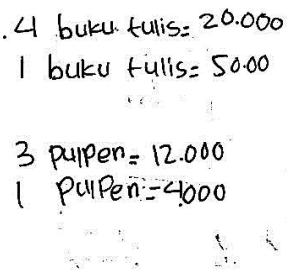


Figure 13. Question's answer by S9



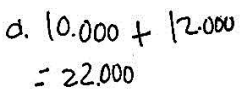


Figure 14. Question's answer by S10

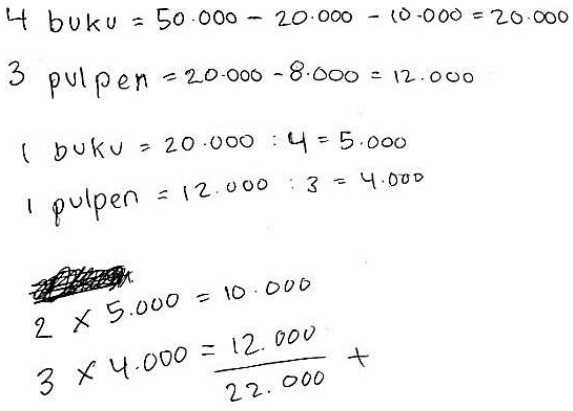


Figure 15. Question's answer by S11

Based on S9's answers, it can be seen that there is no detailed in finding answers. In the meantime, students with high creative thinking ability in the aspect of elaboration should be able to write down detailed explanations in their answers (Dwikoranto et al., 2024). Then, on the S10's answer, there was a detailed solution, but there were several ways that they did not using mathematical notation, for example when calculating the distribution of each book and pen price. In answer to S11 for the score of 3, there is a complete and detailed solution using correct mathematical notation and coherent answer.

Q: *"Why did you answer without using detailed methods?"*

S9: "*I know the answer to the problem, but I had trouble in writing the detailed of the correct steps with mathematical notation."*

Referring to the interview with S9, they knew that 4 books worth Rp20.000, so one book for Rp5.000, and yet they did not understand the correct mathematical notation to describe it. Students' lack of understanding of the problem and the steps in answering this question can result in the completion of the problem becoming irregular, unsystematic, and indetailed (Yayuk et al., 2020).

Based on the four aspects already discussed, creative thinking ability generally relates to a person's behavior and habits in producing creative processes, ideas, and products (Jumadi et al., 2021). It's like the results of the students' answers that have been given earlier, that the creative processes and ideas of students are in different categories with medium and low categories and could represent that students still lack creative behavior and habits. However, a small number of students have represent a highly creative ability that is demonstrated by using various ways to solve the story problem.

The student's ability to solve the problem using these methods has a good effect on the learning outcomes. It is in line with the research conducted by Siburian et al. (2019), that the better student's creative thinking ability, the better the learning outcomes. Students with creative

thinking ability will solve the problem easily using variety ways they can use to get high score. Meanwhile, students with low creative thinking ability will find difficulty on solving the story problem so they will get low score. In addition, Ginting et al. (2024) stated that students with high creative thinking ability tend to show better concepts and are able to solve more effective math problems. Considering that creative thinking ability can also develop a new solution and idea of a problem from a different point of view (Hulinggato et al., 2024).

Hence, this creative thinking ability needs to be impoved in order for students to have optimal study results and can also develop problem solutions using new ideas from different perspectives. In this regard, teachers take an important role in improving students' creative thinking ability because creative thinking ability must be endowed with the quality of the teacher (Leasa et al., 2021). In addition, learning activities that enable students to learn independently such as observation, experiment, and field trips can also enable students to readily understand the lesson and to develop their creativity (Sumarni & Kadarwati, 2020). Furthermore, discussions in groups to solve problems can also foster creativity in students because they can encourage students to think independently and express what is in students' minds (Khalid et al., 2020).

CONCLUSION

Based on research and discussion, it may be concluded that the creative ability of the fifth grade students of SD Negeri Prembulan is still in a moderate category with average score 6,12 out of 12 or 51%. From four indicators of creative thinking ability, it is known that the most many students are still in low categories on the aspect of elaboration, fluency, and originality. In the meantime, the majority of the students are in medium categories on flexibility aspects. The factors that influence students' creative thinking abilities are lack of effort, lack of confidence on solving math problems, lack of ability, and not being used to working on open-ended questions that explore students' ideas.

Hence, more creative and innovative learning processes are needed to facilitate students in developing creative thinking ability, such as using learning model and learning media that can make students discuss, active, confident, independent, and fun when learning mathematics. Apart from that, giving contextual open-ended questions is also very necessary so that students get used to exploring ideas in answering questions. That way, students gain greater opportunities to practice the creative thinking ability of mathematical learning.

However, this research had its own limitations. The subjects of this research were only fifth grade students at SD Negeri Prembulan, so the results of this research cannot be generalized to all elementary school students. Moreover, the aspect of creative thinking that is assessed is only in learning mathematics regarding whole numbers. So, further research on creative thinking with broader subjects and on different materials and learning subjects needs to be carried out in the future.

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