

STUDENTS' CREATIVITY IN SOLVING MATHEMATICAL PROBLEMS OF REFLECTION MATERIAL IN THE CONTEXT OF SONGKET PALEMBANG

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Abstract

Creativity in mathematics is one of the abilities that students in solving a problem must master. With creativity, students can develop their ideas to produce various solutions. However, in reality, the ability to think creatively is still low. This is because teacher-centred learning does not provide opportunities for students to develop their ideas creatively. Therefore, this study aims to describe the emergence of indicators of students' creative thinking abilities in solving mathematical problems on reflection material using the Palembang songket context. This type of research is a qualitative descriptive research subject, namely 3 class IX students. The research was carried out in three stages, namely, the preparation stage, the implementation stage, and the data analysis stage. The data in this study were collected through written tests and interviews. A written test was conducted to measure students' creative thinking skills data reduction, data presentation, and conclusion will be analyzed in three stages. The study found that fluency, flexibility, and elaboration were the most commonly used indicators of students' creative thinking abilities. Meanwhile, for the authenticity indicator, only one subject melts the indicator.

INTRODUCTION

Creativity is one of the abilities that students must have in solving a problem, especially in education. High creativity indicates that students can think creatively (Aini et al, 2020). The term "creativity" is derived from the word "creative" which refers to a person's ability to create new things, such as ideas, honest work, new forms of work, and combinations with things that already exist or have never existed (Nofrialdi, 2022).

Creative thinking is one of the abilities that must be developed in solving math problems. Creative thinking is the ability to express different ideas or ideas to solve a

problem and produces something new or not yet discovered by others (Anditiasari et al., 2021; Putri, 2020). With creativity in mathematics learning, it is hoped that students will dare to solve math problems using their methods so that students can find several alternative answers to solve the problem with the right solution (Febrianingsih, 2022).

However, in reality, students' creative thinking skills are still relatively low. This is shown in the results of research by Siallagan et al (2021), that students' mathematical creative thinking ability with the guided discovery model has 5 high categories, 10 students in the medium category and 13 students in the low category. In reality, shows that students' creative thinking skills are not optimal, because teachers do not try to explore students' creative knowledge and understanding. (Hormadia & Putra, 2021). This is caused by several factors, including teacher-centered learning, which is less creative and innovative in classroom learning (Astuti et al., 2022). Then, one of the consequences of the low attention to creative thinking skills is that students are still accustomed to solving problems only by following the solution given by the teacher and are not allowed to find answers or ways of solving that are different from others (Sara et al., 2018; Siswono, 2018). The students' limited ability to listen, copy, or imitate what the teacher says provides no incentive for them to develop their potential and creativity (Ramdhani, 2020). Therefore, there is a need for learning that can improve students' creative thinking skills.

In fostering and developing students' creative thinking processes, it is necessary to familiarize them with mathematical problems that challenge and stimulate students' creative thinking processes (Jagom et al., 2021). Someone is said to be creative if they consistently produce something new, original, relevant, and as needed (Kulsum et al, 2019). Finding and exploring students' creative thinking abilities can be seen in their ability to solve problems (Ramdhani, 2020). This study focuses on students' creative thinking process in solving problems based on four indicators, namely 1) fluency thinking, 2) flexibility thinking, 3) originality thinking, and 4) elaboration thinking. Students can be said to think creatively when they fulfill the four indicators or characteristic of creative thinking (Rasnawati, et al, 2019).

The realistic mathematics approach can be used to optimize creative thinking skills as a learning process because this realistic mathematics approach is based on practical problems in the context of everyday life that are meaningful to students (Iskandar & Juandi, 2022). The use of context in learning can optimise creative thinking skills as it focuses on practical problems related to everyday life. (Asmara et al, 2022). In the results of research by Sulaiman & Nasir, (2020), it is said that learning mathematics using the Palembang cultural context can be an alternative to learning mathematics that can broaden students' insights about the existence that exists in Palembang cultural elements. In this study, we will use problems in the context of Palembang songket to help students develop creative thinking skills on reflection material. Reflection is one of the materials in the transformation geometry, where the reflected object will produce a shadow of the object caused by a mirror. The reflection result depends on the axis that becomes the mirror in the cartesian plane (Hada, 2021).

Research related to the use of context in fostering students' creative abilities has been carried out. As in the results of research by Artika et al (2023), it is said that the use of the PJBL model has a significant effect in improving creative thinking skills in students, the most visible aspect is the indicator of fluent and flexible thinking. In addition, to improve

creative thinking skills, Umam et al (2021) have also researched, where the results show that the application of problem-based learning can improve students' creative thinking skills. On the purpose of Rahmatina's research (2019), she said that her research aims to determine the level of creative thinking of students in solving open ended mathematics problems based on reflective and impulsive cognitive styles. Based on previous research, no one has examined creative thinking skills using context on reflection material. Therefore, this research aims to describe students' creative thinking skills in solving mathematical problems on reflection using the context of Palembang songket.

RESEARCH METHOD

The descriptive quantitative research design was used to investigate students' creative thinking ability in analyzing mathematical calculus on reflection material in the context of Palembang songket. The level of creative thinking of students can be measured through indicators. According to Munandar (1999) in Nufus, et al (2018), indicators of students' creative thinking ability on the aspects measured are as follows:

Table 1:
Indicators of Creative Thinking Ability

No.	Indicator	Aspect
1.	<i>Fluency</i>	Students' ability to express ideas fluently
2.	<i>Flexibility</i>	Students' ability to give various interpretations of a picture, story, or problem
3.	<i>Originality</i>	Using old ways and trying to think of new ways
4.	<i>Elaboration</i>	Adding or elaborating details of an object, idea, or situation so that it becomes more interesting

The subjects of this study were three students of class IX with high, medium, and low abilities, selected through purposive sampling. Prior consultation with the advisor was conducted to determine the school for the research, followed by discussions with the school principal to request a recommended class. In this study, test questions in the form of descriptions were used to collect data. The test questions were given to see if any indicators of students' creative thinking skills emerged. Meanwhile, interviews were conducted to supplement the data from the test results. This study was carried out in three stages. The first stage is preparation, the second is implementation, and the last is data analysis.

In the preparation stage, the researchers began by conducting a literature review on creative thinking abilities, then formulated the problems to be discussed and determined the indicators to be achieved. The next stage is the implementation stage. In this stage, the researchers gave two test questions about reflection material using the Palembang songket context. Researchers used the written test results to describe students' creative thinking skills. The last stage was data analysis. In this stage, researchers processed and analyzed data from written tests and interviews of students who are research subjects. The data was

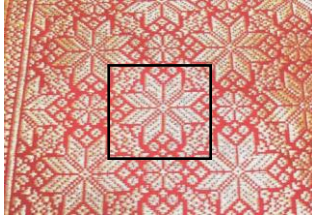
analyzed by comparing the results of tests and interviews. Following that, the resulting data would be described and concluded related to students' creative abilities in solving mathematical problems of reflection material with the context of Palembang songket.

RESEARCH RESULTS AND DISCUSSION

Research Results

In the results and discussion, researchers described the results obtained when researching student creativity in solving mathematical problems of reflection material with the context of Palembang songket. The table below shows the emergence of indicators of students' creative thinking skills after the written test.

Table 2.

Occurrence of Indicators of Creative Thinking Ability				
Problem	Indicator	Subject		
		VG	TR	TFN
Look at the picture below!	Fluency	√	√	√
	Flexibility	√	√	√
The picture above is a piece of Palembang songket fabric, it can be seen that the fabric has a star motif. From one of the star motifs, if the x-axis and y-axis are made right in the middle, it can be seen that the left side and the right side, as well as the top and bottom sides of the star look the same.	Originality	√	–	–
<ol style="list-style-type: none"> 1. Redraw the sketch of the star and determine the pairs of coordinate points of reflection about the x-axis and about the y-axis! 2. Find the coordinate points of reflection with respect to $y = x$ and $y = -x$! 	Elaboration	√	√	√

Description:

√ : Appeared

– : Does Not Appear

Subject VG solved the problem with the correct and appropriate answer. It can be seen that all indicators of creative thinking ability have been met. Based on the results of the answers, subject VG has been able to express ideas smoothly, marked by subject VG writing down all the answers that might be the solution. Subject VG can interpret an image. This is indicated by subject VG redrawing the image of the intended motif from the songket cloth in the problem.

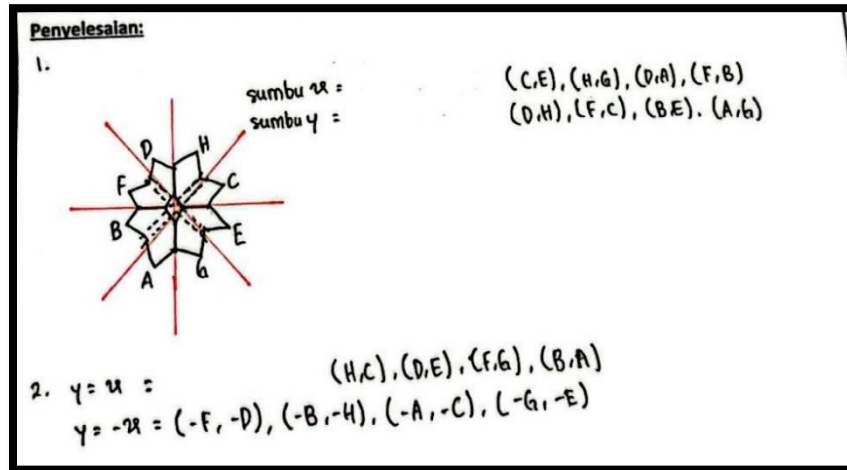


Figure 1. Subject VG's Answer

For the novelty indicator, subject VG has a different way of thinking from the others. This can be seen in how the VG subject wrote the pair of coordinate points requested in the problem. Subject VG correctly wrote the pair of coordinate points using parentheses, such as {(C, E), (H, G), (D, A), (F, B)}. Subject VG has also been able to add lines and colors to the drawing to meet the elaboration indicator. During the interview, subject VG explained which lines $y=x$ and $y=-x$ were meant because the answer was not given an explanation related to the lines. Here's an excerpt from the interview:

P : Can you show me which one is the line $y=x$ and which one is the line $y=-x$?

VG : Yes miss.. (the student points to the lines during the interview)

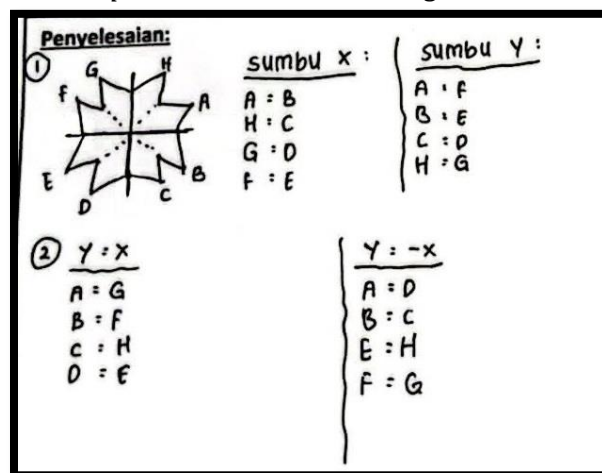


Figure 2. Subject TR's answer

Based on Subject TR's answers, fluency, flexibility, and elaboration are several indicators of creative thinking abilities.. Subject TR has been able to express ideas fluently. This can be seen from subject TR writing down all the answers to the problems given. Then, subject TR has also been able to redraw the songket motif image referred to in the problem to fulfill the flexibility indicator. Subject TR did not fulfill the originality indicator because subject TR's answer was the same as the other subjects, so subject TR did no novelty. Subject TR added lines to the picture to help answer the problem, but subject TR did not provide colors as subject VG did. However, this can already be said that subject TR met the elaboration indicator. To ensure that the TR subject had fulfilled the elaboration indicator, the researcher asked about it during the interview. Here is a little snippet of the interview:

P : Can you explain which line shows the x-axis and y-axis? Because there is no explanation in the picture.

TR : Yes miss, the x-axis is horizontal and the y-axis is vertical.

Based on the results of the TFN subject's answers below, the TFN subject fulfills the fluency indicator because the TFN subject has written all the answers smoothly even though there are still mistakes in his answers. TFN subject has also redrawn the motifs in the songket. However, the TFN subject did not write down which line $y = x$ and $y = -x$ referred to in the question. This was also confirmed during the interview, as shown in the following excerpt:

P : In question number 2, it is asked for the lines $y = x$ and $y = -x$, why weren't the lines marked or named?

TFN: Oh, I see, I didn't give a name to the lines.

P : Can you show me which lines you meant in your answer?

TFN: Yes, Miss... (The student explains their drawing).

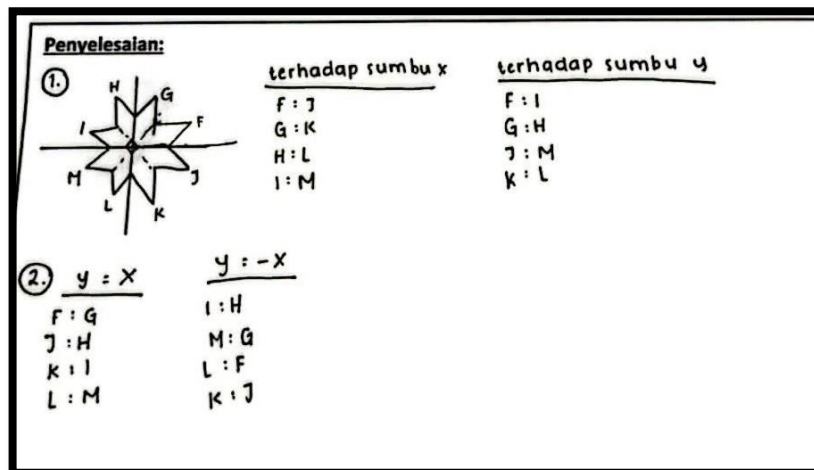


Figure 3. Subject TFN's answer

However, the TFN subject fulfills the elaboration indicator. This is indicated by the TFN subject adding lines on the desired points of the problem, although the TFN subject does not give colors to distinguish the lines. Like subject TR, subject TFN has not fulfilled the originality indicator because there is nothing that distinguishes subject TFN's answer from other subjects.

Discussion

Based on the explanation above, The ability of students to express ideas fluently, provide various interpretations of a picture, story, or problem, question old ways, and try to think of new ways to add or detail the details of an object, idea, or situation so that it becomes more interesting is the creative thinking ability of students in solving mathematical problems of reflection material using the Palembang songket context. In this study, several indicators of creative thinking skills, namely fluency, flexibility, and elaboration, dominate. This is because, in the fluency indicator, students have written answers or ideas smoothly to answer all the problems given. Students can interpret the problems given in a sketch drawing to make them easier to solve for the flexibility indicator. Similarly, using the elaboration indicator, students have added details to the drawing, such as coloring the lines to make it more interesting. A person's creative ability is said to be good, namely those with the criteria for fluency, flexibility, and elaboration (Citroesmi et al, 2022).

Meanwhile, only one of the three students met the originality indicator because they wrote answers that were different from the others. In Sari & Afriansyah's research (2022), they found the same thing, namely that the indicator of originality was in the very low category because out of seven students only one student fulfilled this indicator. This is due to the fact that students only work on these problems using the available formulas without applying principles. (Nuranggraeni et al., 2020). Thus, the indicator of originality appears minor because the answers given by students do not vary. Originality will appear if the teacher develops fluency and flexibility to the maximum in discussion activities on the learning process (Candra et al, 2019).

CONCLUSIONS

Based on the study results, The following are the most commonly used indicators of students' creative thinking skills in solving mathematical problems of reflection material in the context of Palembang songket: fluency, flexibility, and elaboration. Meanwhile, the indicator of uniqueness only appeared on one subject. This is because the subject provides a different way of solving with other subjects. Therefore, the indicator of authenticity appeared little in this study.

REFERENCE

- Aini, A. N., et al. (2020). Creative Thinking Level of Visual-Spatial Students on Geometry HOTS Problems. *In Journal of Physics: Conference Series* (Vol. 1465, No. 1, p. 012054). IOP Publishing.
- Anditiasari, N, et al. (2021). *Systematic Literature Review: Pengaruh Motivasi Terhadap Kemampuan Berpikir Kreatif Matematis Siswa. AKSIOMA: Jurnal Matematika dan Pendidikan Matematika Vol 12 (2), 236 – 246.*
- Anggraini, E & Zulkardi. (2020). Kemampuan Berpikir Kreatif Siswa dalam Mem-posing Masalah menggunakan Pendekatan Pendidikan Matematika Realistik Indonesia. *Jurnal Elemen, 6(2).*

- Artika, L. Y., Uyun, M., & Isnaini, M. (2023). Keterampilan Berpikir Kreatif Melalui Project Based Learning. *Raudhah Proud To Be Professionals: Jurnal Tarbiyah Islamiyah*, 8(1), 299-311.
- Asmara, A. S., Fitri, A., Anwar, A. S., & Muhtarulloh, F. (2022). Peningkatan Kemampuan Berpikir Kreatif dengan Konteks Budaya Lokal Karawang Menggunakan Realistic Mathematics Education Pada Masa Pandemi. *SJME (Supremum Journal of Mathematics Education)*, 6(1), 85-92.
- Astuti, N., Efendi, U., & Haya, F. F. (2022). The Impact of Project Based Learning Model on Creative Thinking Ability of Forth Grade Students. *International Journal of Elementary Education*, 6(3).
- Candra, R. A., Prasetya, A. T., & Hartati, R. (2019). Analisis kemampuan berpikir kreatif peserta didik melalui penerapan blended project based learning. *Jurnal Inovasi Pendidikan Kimia*, 13(2), 2437-2446.
- Citroresmi, P. N., et al. (2022). Means Ends Analysis Learning Model on Studesnts' Problem-Solving Ability and Creative Thinking Ability. *Learning Technology for education Challenges*, 216 – 226.
- Febrianingsih, F. (2022). Kemampuan Berpikir Kreatif Siswa dalam Memecahkan Masalah Matematis. *Mosharafa: Jurnal Pendidikan Matematika Vol 11 (1)*, 119 – 130.
- Hada, K. L. (2021). Pengembangan Media Pembelajaran Blabak Trarerodi pada Materi Geometri Transformasi: Tahap Expert Review. *Jurnal Pendidikan Matematika (Kudus) Vol 4 (2)*, 155 – 178.
- Hormadia, I., & Putra, A. (2021). Systematic Literature Review: Kemampuan Berpikir Kreatif Pada Pembelajaran Matematika. *Didactical Mathematics*, 3(1), 1-7.
- Iskandar, R. S. F., & Juandi, D. (2022). Study Literature Review: Realistic Mathematics Education Learning on Students' Mathematical Creative Thinking Ability. *SJME (Supremum Journal of Mathematics Education)*, 6(1), 35-42.
- Jagom, Y. O, et al. (2021). Proses Berpikir Kreatif Siswa SMP dalam Menyelesaikan Masalah Matematika Berdasarkan Gaya Belajar. *Jurnal Cendekia : Jurnal Pendidikan Matematika Vol 5 (1)*, 682 – 691.
- Kulsum, S. I., et al. (2019). Analysis on High School Students' Mathematical Creative Thinking Skills on the Topic of Sets. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 3(2), 431 – 436.
- Nofrialdi, R. (2022). the Effect of Student'S Creativity and Learning Interest on Learning Achievement in Economic Students Class XI IPS SMA Ekasakti Padang. *Journal International on Global Education*, 1(1), 37-46.
- Nufus, H., et al. (2018). Mathematical Creative Thinking and Student Self-Confidence in the Challenge-Based Learning Approach. *Journal of Research and Advances in Mathematics Education*, 3(2), 57-68.

- Nuranggraeni, E, et al. (2020). Analisis Kemampuan Berpikir Kreatif Matematis ditinjau dari Kesulitan Belajar Siswa. *Jurnal Penelitian Pendidikan dan Pengajaran Matematika Vol 6 (2)*, 107 – 114.
- Putri, H, E, et al. (2020). *Kemampuan-kemampuan Matematis dan Pengembangan Instrumennya*. Jawa Barat: UPI Sumedang Press.
- Ramdhani, L, et al. (2020). Analisis Berpikir Kreatif Siswa dalam Pemecahan Masalah Geometri Ruang. *Jurnal Ilmiah Mandala Education Vol 6 (2)*, 33 – 42.
- Rasnawati, A, Rahmawati, W., Akbar, P., & Putra, H. D. (2019). Analisis kemampuan berfikir kreatif matematis siswa SMK pada materi sistem persamaan linier dua variabel (SPLDV) di kota Cimahi. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 3(1), 164-177.
- Sara, S, et al. (2018). Kemampuan Berpikir Kreatif Siswa Melalui Pembelajaran dengan Model *Treffinger* pada Materi Segiempat. *Jurnal Ilmiah Mahasiswa Pendidikan Matematika 3 (2)*, 64 – 74.
- Sari, R. F., & Afriansyah, E. A. (2022). Kemampuan berpikir kreatif matematis dan belief siswa pada materi persamaan dan pertidaksamaan linear. *Plusminus: Jurnal Pendidikan Matematika*, 2(2), 275-288.
- Siallagan, F. Y. B., Sinaga, B., & Rajagukguk, W. (2021). Analisis Kemampuan Penalaran dan Berpikir Kreatif Matematis Siswa Dalam Pembelajaran Penemuan Terbimbing. *Paradikma: Jurnal Pendidikan Matematika*, 14(1), 68-74.
- Siswono, T. (2018). *Pembelajaran Matematika Berbasis Pengajaran dan Pemecahan Masalah*. Bandung: PT Remaja Rosdakarya.
- Sulaiman, H., & Nasir, F. (2020). Ethnomathematics: Mathematical Aspects of Panjalin Traditional House and its Relation to Learning in Schools. *Al-Jabar: Jurnal Pendidikan Matematika*, 11(2), 247 – 260.
- Umam, K., Suryawati, S., Suhartati, S., & Hasbi, M. (2021). The Effects of Problem-Based Learning on Creative Thinking Skills and Mathematical Communication Abilities of Senior High School Students. *Al Khawarizmi: Jurnal Pendidikan dan Pembelajaran Matematika*, 5(1), 1-11.