

ANALYSIS OF MATHEMATICAL CREATIVE THINKING ABILITY OF MIDDLE SCHOOL STUDENTS ON DATA PRESENTATION MATERIALS

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Abstract:

This article is the result of research that aims to find out how students' mathematical creative thinking abilities solve questions related to data presentation material. This research uses a quantitative approach with descriptive methods. Data presentation material is one of the mathematical materials contained in the basic competencies that must be mastered by class VII students and is closely related to everyday life. In this study, the population consisted of students of class VII at a state junior high school in the city of Tangerang for the 2022/2023 academic year. Selection of the sample utilizing purposive sampling with 34 students of class VII-D. Data collection techniques by giving creative thinking tests in the form of descriptions that were previously validated. The results of this study showed that the students' mathematical creative thinking test scores were 20.6% in the high category, 67.6% in the medium category, and 11.4% in the low category.

Keywords: Mathematical Creative Thinking, Presentation of Data, Math Learning

ANALISIS KEMAMPUAN BERPIKIR KREATIF MATEMATIS SISWA SMP PADA MATERI PENYAJIAN DATA

Abstrak:

Artikel ini merupakan hasil penelitian yang bertujuan untuk mengetahui bagaimana kemampuan berpikir kreatif matematis siswa dalam menyelesaikan soal-soal yang berkaitan dengan materi penyajian data. Penelitian ini menggunakan pendekatan kuantitatif dengan metode deskriptif. Materi penyajian data merupakan salah satu materi matematika yang terdapat pada kompetensi dasar yang harus dikuasai siswa kelas VII dan erat kaitannya dengan kehidupan sehari-hari. Pada penelitian ini populasinya terdiri atas siswa kelas VII SMP Negeri di kota Tangerang Tahun Pelajaran 2022/2023. Pemilihan sampel dengan cara purposive sampling dengan 34 siswa kelas VII-D. Teknik pengumpulan data dengan pemberian tes berpikir kreatif bentuk uraian yang sebelumnya dilakukan validasi. Hasil penelitian ini menunjukkan nilai hasil tes berpikir kreatif matematis siswa 20,6% pada kategori tinggi, 67,6% pada kategori sedang dan 11,4% pada kategori rendah.

Kata Kunci: Berpikir Kreatif Matematis, Penyajian Data, Pembelajaran Matematika

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INTRODUCTION

Mathematics is a universal science that underlies increasingly sophisticated technological developments, has an important role in various fields, and drives human thought (Chairani, 2016). Mathematics itself is a basic science to study various other sciences (Apriyanti, 2014). Studying mathematics aims to enable students to think critically, reason, understand a concept, represent, and so on (Depdiknas, 2006). Mathematics is also closely related to everyday life and its applications, starting from the basics to the complex ones (Desti, Anggoro, & Suherman, 2018). Thus, studying mathematics has an important role in that students can think critically, creatively, and analytically.

Mathematics learning has a relationship with everyday life, so it will enable students to understand the problems contained in math problems (Hidayati & Munandar, 2021). The purpose of mathematics subjects for students is that students are equipped with the ability to think logically, critically, analytically, systematically, innovatively, creatively, and the ability to understand mathematical concepts and be able to work well together (Permendikbud, 2018). Therefore, in learning mathematics so that students can solve problems in the learning process, the ability to think creatively is needed. According to Guiford Munandar (2004) the ability to think creatively is a thought process that produces various possible answers. The application of creative thinking to problem-solving will generate many useful ideas for finding solutions to problems (Habibi, 2018).

The ability to think creatively mathematically is an important aspect in developing students' mathematical skills and solving mathematical problems or generating new ideas. Creative thinking can also introduce learning to students from the actions and events in the novel, personally meaningful behavior. In addition, creative thinking as a cognitive skill is very important for students to understand that they have processed the results of new ideas or solutions (Sitorus, 2016).

Piaw's (2014) research shows that students who tend to think and learn with the right brain are more creative or able to express their original ideas (originality), and right-brain learners can further elaborate their ideas in detail (elaboration) abstractly (abstract) and also can be resilient against all forms of premature thinking (resistance to premature closure) compared to students who tend to think and learn with the left brain.

Creative thinking is the ability to produce or develop new ideas or ideas, which are obtained from the results of connecting various ideas, concepts, and knowledge that is in his mind, to find solutions to mathematical problems in a systematic and precise manner so that the goals of learning mathematics can be achieved. well. Gafour and Gafour (2020) suggests that creativity skills are one of the most sought-after life and work skills in the 21st century as an innovative way of approaching and analyzing ideas, problem-solving, or critical thinking, and these skills can be developed and improved by using a variety of techniques and practices. As stated by Wang, Wu, and Horng (2016) the ability to think creatively is an intellectual function that is different from the ability defined by intelligence. The indicators of the ability to think creatively presented by Torrance (in Suparman, 2017) include; Fluency, Dexterity, Originality, and Elaboration.

However, many students experience difficulties in developing creative thinking when facing complex mathematical problems that require innovative solutions. This is following Desti, Anggoro, and Suherman (2018) research that the learning process does not train students' creative thinking abilities so it affects students' ability to solve mathematical problems. Students find it difficult to solve different problems with the examples given by the teacher. When faced with a problem, students are still focused on the formula, and cannot find and solve the problem through other methods apart from the teacher's example. Student creativity has not yet been born, and these problems can only be solved through guidebooks, students' thinking is immature so they easily give up on solving problems (Hu, Wu, & Shieh, 2016).

In line with Ashabulkahfi's research, it shows that students are less creative in handling questions, students tend to get confused and try to see answers from their friends rather than thinking for themselves what the answers to these questions are. Some students also had difficulty answering when given different questions from the teacher's example questions. Meanwhile, Lee's (2005) research suggests that creative thinking abilities are partly related to creative personality and there are differences between

creative thinking abilities and creative personality. Apart from that, habits make students learn concepts by rote without deep understanding, and students are unable to apply them. Things like this make students less able to think creatively and not trained to carry out analysis before making decisions (Lince, 2016).

Although creativity has been proven to be different from intelligence, children who score high on intelligence tests are not necessarily very creative (Anwar, Rasool, & Haq, 2012). On the other hand, the level of complexity of every field in modern life is getting higher, creative thinking is very important in this era of global competition. It is very important to strike a balance between logic and intuition by thinking creatively. If someone can think creatively, they can solve their problems in real life in many ways. In the era of technology and information, the ability to think creatively is one of the important skills to face future challenges.

The low ability of students' creative thinking in mathematics is because in general teachers focus more on problem-solving exercises that are more procedural when studying mathematics, and tend to explain concepts by asking practice questions (Habibi, 2018). Such learning is a feature of conventional learning (Snoopi, 2018). This causes a lack of activity in the learning process of students and a decrease in students' creative thinking abilities it hinders the development of students' mathematical creative thinking abilities (Habibi, 2018). Different from previous research, the variable measured in this research is students' ability to think creatively and the objects of the research carried out are 7th grade students of State Middle Schools in Tangerang City which has only been established for around 7 years. So, further research is needed for this school because it is still relatively new.

Based on the explanation above, the problem in this study focuses on students' ability to think creatively in mathematical questions in the form of descriptions. This study aims to examine and analyze the mathematical creative thinking abilities of junior high school students in the city of Tangerang to solve description questions on data presentation material. Apart from that, for schools, this research can be a reference for improving the quality of learning and graduates who have high competitiveness because they can think creatively.

METHODS

The approach in this observation is a quantitative approach using descriptive methods to identify the ability of class VII students to think creatively and mathematically to solve problem descriptions of data presentation material at a junior high school in the city of Tangerang. The sampling technique in this population is non-probability sampling, namely purposive sampling, which means determining the sample with certain considerations (Sugiyono, 2012). In this observation, there were 34 students in class VII-D as subjects.

This study uses a test instrument consisting of a test of students' mathematical creative thinking ability. The instrument used is a matter of describing the material presented in the data to determine students' ability to think creatively and mathematically. The research results obtained will be processed according to the workmanship scores of students who are classified as high, medium, and low. This category is converted by converting scores by Arikunto (in Effendi 2017). The mean and standard deviation of the research results can be used to categorize high, medium, and low. The following is a category of creative thinking abilities.

Table 1. Creative Thinking Ability Category

Category	Value Criteria
High	$X > (\bar{X} + s)$
Medium	$(\bar{X} - s) \leq X \leq (\bar{X} + s)$
Low	$X < (\bar{X} - s)$

Information :

X : student grades

\bar{X} : the average value of students

s : standard deviation

From table 1 it can be seen that the range of values that is greater than the difference in the mean value with the standard deviation is classified as a low category in creative thinking. The value criterion between the difference and the sum between the average value and the standard deviation belongs to the medium category in creative thinking. The criterion value that is smaller than the difference between the student's average score and the standard deviation belongs to the high category of students in creative thinking.

The aspects measured through the ability to think creatively in mathematics consist of fluency, namely producing many relevant ideas/answers, smooth flow of thought, which provides many ways or suggestions for doing various things and always thinking of more than one answer, flexibility, namely generating ideas. diverse or varied, looking for many alternatives or different directions and being able to change the approach or way of thinking, originality, namely being able to give birth to new and unique expressions, providing methods or answers that are unusual from others, which most people rarely give and elaboration, namely developing, adding and enriching an idea or product, detailing the details of an object, idea or situation, looking for a deeper meaning in the answer or solving a problem by carrying out detailed steps.

RESULTS AND DISCUSSION

The research results based on the flexibility indicator in question number 1 show that students can fulfill the flexibility indicator where students produce different or varied answers in their solutions. For the fluency indicators in working on questions number 2 and 3, students can meet the fluency indicators where students can provide alternative solutions to problems smoothly. Furthermore, on the authenticity indicator, namely question number 4, students have fulfilled this indicator because they can use different strategies or their way of solving problems. Lastly, for the elaboration indicator in question number 5, students met the elaboration indicator because they were able to develop an idea for solving the problem.

The results of the students' mathematical creative thinking ability tests were analyzed using IBM SPSS.25. A summary of the descriptive statistics for the test data is shown in table 2.

Table 2. Descriptive Statistics of Creative Thinking Ability

Number of Students	Maximum	Minimum	Mean	Standard Deviation
34	100	50	77,9	14,1

Based on table 2, the average score of the 34 students' mathematical creative thinking ability test was 77.9. The minimum value is 50 and the maximum value is 100. Then the standard deviation is 14.1. Furthermore, in categorizing high, medium, and low creative thinking using the method stated by Arikunto (in Effendi, 2017).

Table 3. Level of Students' Mathematical Creative Thinking

Value Intervals	Category	Number of Students	Percentage
$X > 92$	High	7	20,6%
$92 \leq X \leq 63$	Medium	23	67,6%
$X < 63$	Low	4	11,8%

Table 3 shows the level of students' mathematical creative thinking when solving problem descriptions of data presentation material. In the high category in mathematical creative thinking was 20.6% with 7 students who scored more than 92. The largest percentage was in the medium category with a percentage gain of 67.6% consisting of 23 students with student scores between 63 and 92. Meanwhile, the low category has a percentage of 11.8% with 4 students who score less than 63.

This categorization shows that only students in the high category have mastered mathematical creative thinking regarding the questions given. However, some students in the moderate category have scores that are less than the KKM. This indicates that students with a mastery of mathematical creative thinking about the description of the material for presenting data are still not optimal. This categorization only applies to that class as the subject of this study. Comparison of the percentage of students' level in thinking creatively mathematically on the description of the material presentation of the data is as follows.

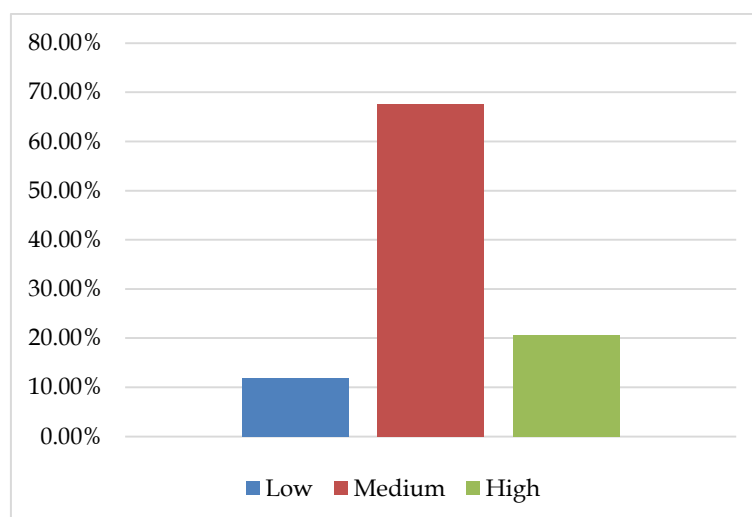


Figure 1. Comparison of the percentage of students' creative thinking levels

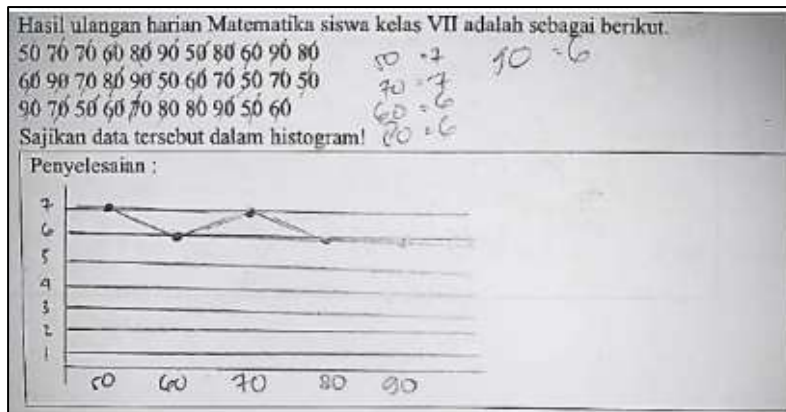


Figure 3. High Category Student-2 Answers

Based on figure 3, shows that students can use procedures correctly, this is shown by students correctly representing data using line charts. So, students have been able to fulfill the indicators of creative thinking, namely fluency, namely providing alternative solutions to problems smoothly. In line with the opinion of Febrianti et al. (2016) that students who have fluent thinking skills are students who can ask several questions, are proficient at conveying ideas or ideas, and have the ability to think quickly than students in general.

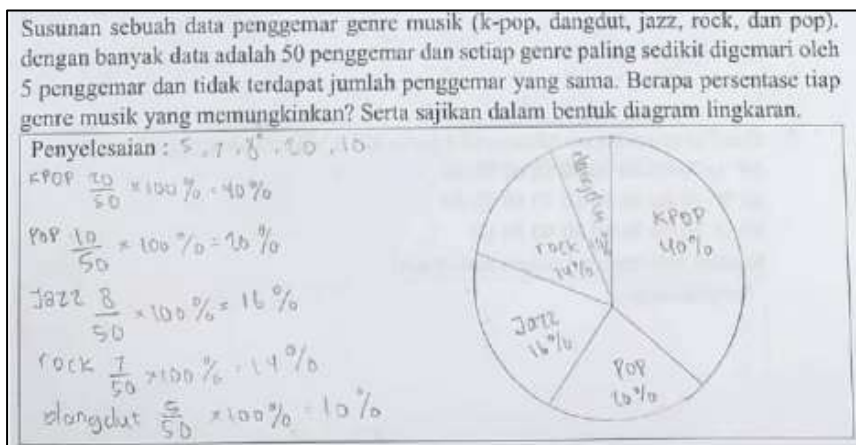


Figure 4. High Category Student-3 Answers

Based on figure 4 shows that students can use procedures or operations correctly, this is indicated by students correctly interpreting data and presenting it in the form of a pie chart. So, students have been able to fulfill indicators of creative thinking, namely elaboration, namely presenting data in a pie chart using percentages with a developing idea. Skills can be identified from the way students answer a question in detail and can expand an idea (Febrianti, Djahir, & Fatimah, 2016).

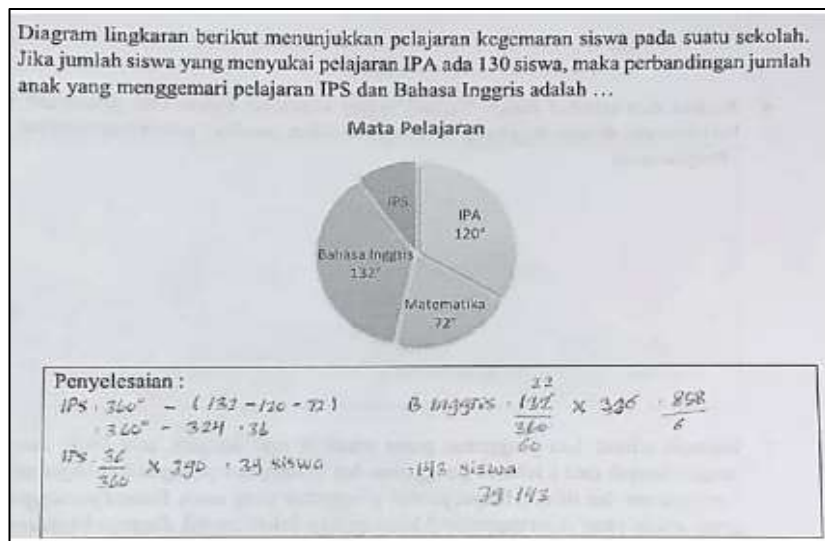


Figure 5. Medium Category Student Answers

The test results of moderately capable students in the class totaled 23 students. Figure 5 shows that students can use procedures or operations correctly but do not write down how to get all students in the data presented and the comparisons written are not simplified. Even though some students answered incorrectly, they still met the indicators of fluency. So it shows that these students are indeed able to meet the indicators of mathematical creative thinking but still make mistakes.

Based on the test results, there were 4 low-ability students in the class. The mathematical creative thinking ability of students with low abilities in this class in solving problems is classified as not good. This is shown from the answer sheets of students with low abilities in fulfilling the indicators of mathematical creative thinking ability, there are still many errors.

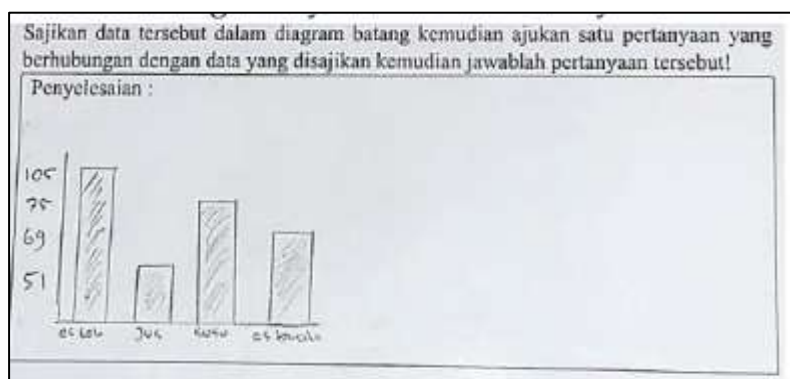


Figure 6. Low-Category Student Answers

Based on figure 6 shows that students can use the procedure but it is not precise, this is shown by students correctly interpreting data and presenting it in the form of bar charts but not asking questions and answering them. So, students have not been able to fulfill the indicators of creative thinking, namely originality, namely devising ways to present data in the form of bar charts but not asking questions accompanied by answers, according to Samura's opinion (2019) that authenticity is a student's skill in solving problems in his way or in other words ways that are not thought of by ordinary people.

Based on the descriptions of some of these pictures, the students' ability when solve the description of the material presentation of the data has not been maximized. Because some students working on questions are not by assessment indicators based on mathematical creative thinking in solving problems in the form of descriptions of data presentation. Therefore, realizing optimal learning requires strategies in learning that are adapted to the conditions that are happening (Rachmawati, Kusnadi, & Sugilar, 2021).

CONCLUSION

Based on the results of the research and discussion described earlier regarding the mathematical creative thinking of class VII students in the data presentation material, it shows that some indicators of creative thinking have not been fulfilled optimally by all students. The level of mathematical creative thinking of 34 students in class VII based on the scores obtained by students as a whole there are 7 students in the high category with a percentage of 20.6%, 23 students in the medium category with a percentage of 67.6% and 4 students in the low category with a percentage of 11.8%.

REFERENCES

- Anwar, M. N., Rasool, S. S., & Haq, R. (2012). A comparison of creative thinking abilities of high and low achievers secondary school students. *International Interdisciplinary Journal of Education*, 1(1). Retrieved from https://ijoe.org/v1/IIJE_04_v1_i1_2012.pdf.
- Apriyanti, H. (2014). Implementasi pendekatan pembelajaran saintifik untuk meningkatkan hasil belajar siswa pada mata pelajaran matematika. [Skripsi]. Universitas Pendidikan Indonesia.
- Ashabulkahfi, Y. C. (2020). Deskripsi kemampuan berpikir kreatif dalam

menyelesaikan soal bangun datar pada siswa kelas VIII SMP Negeri 3 Sungguminasa. [Thesis]. Universitas Muhammadiyah Makassar.

Chairani, Z. (2016). *Metakognisi siswa dalam pemecahan masalah matematika*. Yogyakarta: Deepublish.

Depdiknas. (2006). Permendiknas No. 22 Th. 2006 tentang standar isi untuk satuan pendidikan dasar dan menengah. *La Sociedad de La Sociedad*, 1-175. Retrieved from <https://asefts63.files.wordpress.com/2011/01/permendiknas-no-22-tahun2006-standar-isi.pdf>.

Desti, E., Anggoro, B. S., & Suherman. (2018). Pengaruh berpikir kreatif terhadap kemampuan memecahkan masalah matematika. *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika UIN Raden Intan Lampung*, 1(2), 1-8. Retrieved from <https://ejournal.radenintan.ac.id/index.php/pspm/article/view/2504>.

Effendi, K. N. S. (2017). Pemahaman Konsep Siswa Kelas VIII Pada Materi Kubus Dan Balok. *Symmetry: Pasundan Journal of Research in Mathematics Learning and Education*, 2(4), 87-94. <https://doi.org/10.23969/symmetry.v2i2.552>.

Fajriah, N., & Asiskawati, E. (2015). Kemampuan Berpikir kreatif siswa dalam pembelajaran matematika menggunakan pendekatan pendidikan matematika realistik di SMP. *EDU-MAT: Jurnal Pendidikan Matematika*, 3(2), 157-165. <https://doi.org/10.20527/edumat.v3i2.643>.

Febrianti, Y., Djahir, Y., & Fatimah, S. (2016). Analisis kemampuan berpikir kreatif peserta didik dengan memanfaatkan lingkungan pada mata pelajaran ekonomi di SMA Negeri 6 Palembang. *Jurnal Profit*, 3(1), 121-127. Retrieved from <https://ejournal.unsri.ac.id/index.php/jp/issue/view/591>.

Gafour, O. W. A., & Gafour, W. A. S. (2020). *Creative Thinking skills-A Review article*. Retrieved from <https://www.boostskills.eu/files/5-creative-thinkings-kills-analysis-article.pdf>.

Habibi, M. (2018). Pengaruh model pembelajaran reciprocal teaching terhadap kemampuan berpikir kreatif siswa di sekolah menengah pertama swasta muslimat yayasan pendidikan wanita islam kota Jambi. [Thesis]. Universitas Islam Negeri Sulthan Thaha Saifuddin.

Hidayati, H. A., & Munandar, D. R. (2021). Analisis kemampuan pemecahan masalah matematis siswa kelas VIII dalam menyelesaikan soal cerita

- pola bilangan. *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika*, 469–477. Retrieved from <http://conference.unsika.ac.id/index.php/sesiomadika/Sesiomadika2021>.
- Hu, R., Wu, Y. Y., & Shieh, C. J. (2016). Effects of virtual reality integrated creative thinking instruction on students' creative thinking abilities. *Eurasia Journal of Mathematics, Science and Technology Education*, 12(3), 477–486. <https://doi.org/10.12973/eurasia.2016.1226a>.
- Lee, K.-H. (2005). The relationship between creative thinking ability and creative personality of preschoolers. *International Education Journal*, 6(2), 194–199. Retrieved from <http://iej.cjb.net>.
- Lince, R. (2016). Strategi peningkatan profesionalisme guru dalam menghadapi tantangan di era digital. *Prosiding Temu Ilmiah Nasional Guru (Ting) VIII, November*, 164-179.
- Munandar. (2004). *Mengembangkan bakat dan kreativitas anak sekolah petunjuk bagi orang tua dan guru*. Jakarta: Grasindo.
- Permendikbud. (2018). *Peraturan menteri pendidikan dan kebudayaan republik indonesia nomor 58*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Piaw, C. Y. (2014). Effects of gender and thinking style on student's creative thinking ability. *Procedia - Social and Behavioral Sciences*, 116, 5135–5139. <https://doi.org/10.1016/j.sbspro.2014.01.1087>.
- Rachmawati, T. K., Kusnadi, F. N., & Sugilar, H. (2021). Kemampuan pemahaman matematis siswa pada materi trigonometri. *SJME (Supremum Journal of Mathematics Education)*, 5(2), 170–178. <https://doi.org/10.35706/sjme.v5i2.5140>.
- Samura, A. ode. (2019). Kemampuan berpikir kritis dan kreatif matematis melalui pembelajaran berbasis masalah. *Journal of Mathematics and Science*, 5(1), 20–28.
- Sitorus, J. (2016). Students' creative thinking process stages: Implementation of realistic mathematics education. *Thinking Skills and Creativity*, 22.
- Snoopi, L. (2018). Pengaruh pendekatan contextual teaching and learning (CTL) terhadap kemampuan berpikir kritis matematis siswa kelas IX SMP Negeri 1 Sanga Desa (MUBA). [Thesis]. Universitas Islam Negeri Raden Fatah.

Sugiyono. (2012). *Metode penelitian kuantitatif kualitatif dan R&D*. Bandung: Alfabeta.

Suparman. (2017). Pengembangan bahan ajar berbasis pendekatan matematika realistik indonesia dalam memfasilitasi kemampuan berfikir kreatif siswa pada pokok bahasan bentuk-bentuk aljabar kelas VII MTs Madani Pao-pao Kabupaten Gowa. [Thesis]. UIN Alaudin Makassar.

Wang, C.-W., Wu, J.-J., & Horng, R.-Y. (1999). Creative thinking ability, cognitive type, and R&D performance. *Blackwell Publisher Ltd*, 29(3), 247-254. <https://doi.org/10.1111/1467-9310.00134>.