Systematic Literature Review: Mathematical Creative Thinking Skills in Treffinger Learning in terms of Self Efficacy

Hasan Fadlurrohman[a*]

[a]*Universitas Negeri Semarang, Sekaran, Gunungpati, Semarang 50229, Indonesia*

**Alamat Surel: hasanfr1212@students.unnes.ac.id*

Abstract
The skill to think creatively is one of the skills that is needed to be skilled in solving a problem. One learning model that can support creative thinking skills is the Treffinger learning model. In addition, the affective aspect of self-efficacy can also help in improving creative thinking skills. This study used the Systematic Literature Review method of 18 articles related to creative thinking abilities, Treffinger learning models, and affective aspects of self-efficacy. The purpose of this research is to analyze the skill to think creatively in the Treffinger learning model in terms of self-efficacy. The results of the research show that, (1) the most research related to creative thinking skills in treffinger in terms of self-efficacy was mostly carried out in 2019, (2) the research method that was mostly carried out was qualitative methods, (3) most were carried out at the junior high school level, and (4) there is a positive influence in increasing the ability to think creatively in treffinger in terms of self-efficacy

Keywords:

. Creative Thinking Skills, Treffinger, Self Efficacy.

1. Introduction

Mathematics is one of the core subjects to be studied at every level of education. In addition, mathematics is also taught at every level of education from elementary school to tertiary institutions to equip students with several abilities, such as logic, analysis, critical and creative, as well as the skill to work together. (Afgani, 2021). The skill to think creatively is one of the abilities in learning mathematics that must be owned by everyone to be skilled in solving a problem (Afnan et al., 2020). Creative thinking is a person's thinking process so as to produce varied and useful ideas in solving problems (Siswono, 2016). In developing an idea or ideas, the creative process can create writing topics in different ways (Armariena & Murniviyanti, 2017). Creativity allows one to generate several possible answers, where the emphasis is on the quantity of ideas, diversity and effectiveness of answers. Cardoso (2011) also said that creativity produces new ideas that are useful and can satisfy certain groups significantly at certain times.

Learning should pay more attention to the attitudes and abilities of students so that they can be developed and able to think creatively in dealing with problems in the future. For this reason, a teacher needs to know several criteria to be able to identify students' creative thinking skills. Munandar (2009) stated that there are four criteria in identifying the skill to think creatively, namely fluency, flexibility, originality, and elaboration. Thinking fluently (fluency) can be shown from students who are able to produce several possible answers that vary and ask several questions that indicate students' understanding of a material, as well as provide some suggestions that might be a solution to a problem. Flexibility is shown from students who are able to see several possible answers to a problem from different perspectives and then be able to find alternative solutions from several of these possibilities. Thinking originality is a person's skill to produce new ideas or thoughts, although the truth remains to be tested. Thinking elaboration is the skill of students to break down and develop existing ideas more clearly so that they become more detailed thoughts.

Based on research results from The Global Creativity Index 2015, which assesses that Indonesian people are still relatively low in terms of the skill to think creatively (*Martin Prosperity Institute*, 2015). In 2015, Indonesia was ranked 115th out of 139 countries that were sampled with an index of 0.202. (Florida et al., 2015).

In addition, based on the 2015 TIMSS (Trend in International Mathematics and Science Study) report, Indonesia ranks 45th out of 50 countries with a score of 397. The score obtained by Indonesia is still relatively low compared to the average scores of other sample countries. research that is equal to 500. Strengthened by a survey of test results and evaluation from PISA in 2015, which stated that the average score of Indonesian Mathematics attainment was ranked 63 out of 69 countries evaluated with a score of 386 in the field of mathematics. In fact, followed by the results of PISA in 2018, Indonesia ranked lowest from the previous order, namely 72nd out of 77 countries with a score of 379. This shows that the level of mathematical creative thinking in students in Indonesia is still lacking.

In improving the skill to think creatively in students can be done by choosing the right learning model. Choosing the right learning model is very important because it has a big influence on the implementation of the mathematics learning process. The Treffinger learning model is one model that can be applied to improve students' creative thinking skills (Isnaini et al., 2016). The Treffinger learning model is a learning model that can directly address student creativity problems and provide suggestions for achieving cohesiveness (Munandar, 2014). The Treffinger learning model involves aspects of cognitive and affective skills, which show a dependency relationship between the two in encouraging creativity in student learning processes. The Treffinger learning model describes cognitive and effective aspects through three levels, namely basic tools, practice with process, and working with real problems.

Treffinger (2003) developing a learning model by modifying Osborn's six stages into three components, namely understanding the problem, generating ideas, and preparing for action. Treffinger (2003) put forward in the step of understanding the problem can involve the stage of finding goals, opportunities, formulating or setting the main direction in learning. Generating ideas is a step in exploring and generating several possible solutions to problems. In the step of preparing the action is the step in analyzing the several possibilities generated to be turned into the best solution to the problem.

In addition to the learning model, another thing that has an influence on improving the skill to think creatively is the affective aspect that must be possessed by students. One of these important aspects is self-efficacy because in it there are several indicators that can support the achievement of goals in achieving the skill to think creatively. Self efficacy refers to belief in one's own skill to produce the actions necessary to achieve one's goals (Mercer & Williams, 2014). Whereas in mathematics, self-efficacy means a person's confidence in doing the tasks given, from understanding concepts to solving problem solving (Cheema & Skultety, 2017). Sayekti et al (2020) revealed that a high level of self-efficacy encourages students to work on questions in detail and completely. Conversely, someone with low self-efficacy results in students answering questions incompletely. The difference between the two levels also shows a different level of student creativity. Based on the background above, this study aims to describe the ability to think creatively in the treffinger model in terms of self-efficacy and to determine the influence on the ability to think creatively in the treffinger learning model in terms of self-efficacy.

2. Research Methods

This research uses the research method of Systematic Literature Review (SLR). Systematic Literature Review is a research method by identifying, reviewing, evaluating, and interpreting all existing research. This study uses a method by reviewing and analyzing several journals and articles in a structured manner following predetermined steps (Triandini et al., 2019). The stages of research that have been carried out to compile this article include data collection, data analysis, and drawing conclusions (Juandi & Tamur, 2020). In compiling this article, researchers have collected several articles published nationally and internationally which were obtained from the Google Scholar electronic database. Then, analyze several articles that have been collected to be extracted into several relevant articles and meet the inclusion criteria. Inclusion and exclusion criteria in article collection can be seen in the following table.

Table 2. 1 Inclusion and exclusion criteria

Inclusion	Exclusion
Articles of previous research results from mathematics education.	Previous research articles apart from mathematics education.
National or international articles related to creative thinking skill in the Treffinger learning model in terms of self-efficacy.	National or international articles are not related to creative thinking skill in the Treffinger learning model in terms of self-efficacy.
Articles published from 2016 – 2023.	Articles published before 2016.
Articles must contain a research focus related to creative thinking abilities in the Treffinger learning model in terms of self-efficacy.	Articles do not contain a research focus on creative thinking skills in the Treffinger learning model in terms of self-efficacy.
Articles must contain research methods.	Articles do not contain research methods.
Articles must include elementary, middle, high school.	Articles do not include elementary, middle, high school.

The research instrument used relates to the inclusion and exclusion criteria. These criteria are based on the year of publication, research focus, type of research method, and level of education. The population and sample used in this study include 19 articles related to the skill to think creatively in the Treffinger learning model in terms of self-efficacy.

3. Result and Discussion

The results of the research are in the form of analysis and summary of several articles related to the skill to think creatively in the Treffinger learning model in terms of self-efficacy. After applying the inclusion and exclusion criteria, 19 relevant articles were obtained. Then some of these articles are categorized into several study characteristics or moderator variables. The variables of this research include the year of publication, research focus, type of research method, and level of education. A summary of the research variables is presented in the following table.

Table 3. 1 Number of Studies Based on Characteristics

Characteristics	Description	Frequency
Year of Publication	2016	1
	2017	1
	2018	2
	2019	6
	2020	5
	2021	1
	2022	1
	2023	2
Research Focus	Treffinger and creative thinking skill	14

	Self efficacy and creative thinking skill	4
	Treffinger and self efficacy	1
Research Method	Quantitative	4
	Qualitative	6
	Mixed Method	5
	Quasi experimental	4
Education Level	Elementary School	1
	Junior High School	14
	Senior High School	4

Table 3. 2 Research results related to the Skill to Think Creatively in the Treffinger Learning Model in terms of Self Efficacy

No.	Writer, Year	Source	Participant	Research Focuses
1.	(Sara et al., 2018)	JIMPMat	JHS	Creative thinking skills and Treffinger
2.	(Septiani et al., 2018)	JPMI	JHS	Self efficacy and creative thinking skill
3.	(Isnaini et al., 2016)	Jurnal DIdaktik Matematika	JHS	Creative thinking skill and Treffinger
4.	(Suciawati, 2019)	Jurnal Didaktik Matematika	JHS	Self efficacy and creative thinking skill
5.	(Ratnasari et al., 2020)	Journal of Primary Education	JHS	Creative thinking skill and Treffinger
6.	(Afnan et al., 2020)	Jurnal Numeracy	JHS	Creative thinking skill and Treffinger
7.	(Johar et al., 2019	Journal of Physics: Conference Series	SHS	Creative thinking skill and Treffinger
8.	(Jumroh et al., 2019)	Prosiding Seminar Universitas PGRI Palembang	JHS	Creative thinking skill and Treffinger

9.	(Nugraheni et al., 2019)	Unnes Physics Education Journal	SHS	Creative thinking skill and treffinger
10.	(Amanoe, 2020)	Skripsi UNNES	JHS	Creative thinking skill and treffinger
11.	(Sulhani et al., 2023)	Hipotenusa	SHS	Creative thinking skill and treffinger
12.	(Astuti et al., 2022)	Journal on Mathematics Education Research	JHS	Self efficacy and creative thinking skill
13.	(Rifai et al., 2020)	Jurnal Analisa	SHS	Creative thinking skill and treffinger
14.	(Ndiung, et al., 2020)	PRISMA	ES	Creative thinking skill and treffinger
15.	(Virliani & Sukmawati, 2019)	Jurnal Didactical Mathematics	JHS	Self efficacy and creative thinking skill
16.	(Kurniati et al., 2021)	Suska Journal of Mathematic Education	JHS	Treffinger dan self efficacy
17.	(Auningsih & Dwijayani, 2019)	KREANO	JHS	Treffinger and self efficacy
18.	(Nursela et al., 2023)	Jurnal Penelitian, Pendidikan, dan Pembelajaran	JHS	Creative thinking skill and treffinger
19.	(Triwibowo et al., 2017)	Unnes Journal of Mathematics Education	JHS	Creative thinking skill and treffinger

Next, each study will be described based on predetermined criteria.

Year of Publication

The articles that are the research sample are articles published from 2016 to 2023. The following is a diagram of the distribution of studies based on the year of publication from 2016 to 2023.

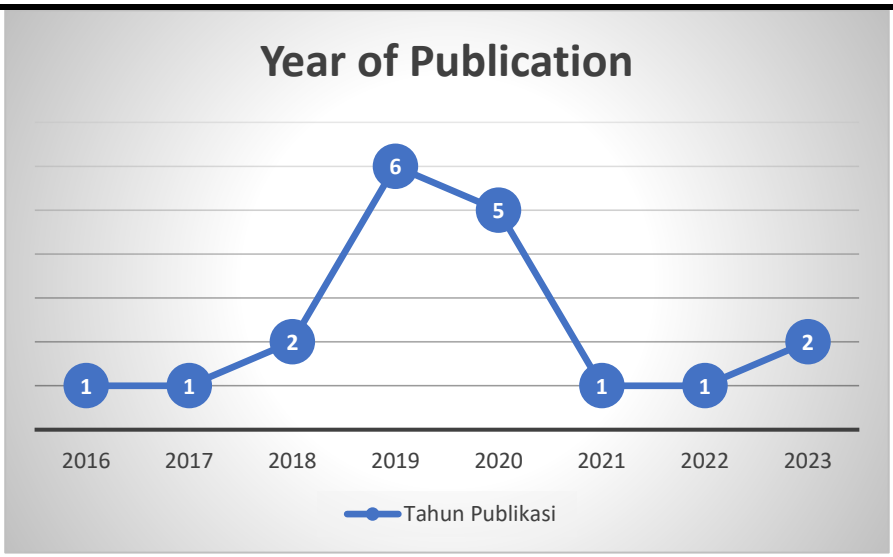

Figure 3. 1 Publication Year

From Figure 1. It can be observed that the frequency of studies related to creative thinking abilities in the Treffinger learning model in terms of self-efficacy has relatively increased from 2017 to 2019. The frequency of the most published studies was in 2019.

Research Focus

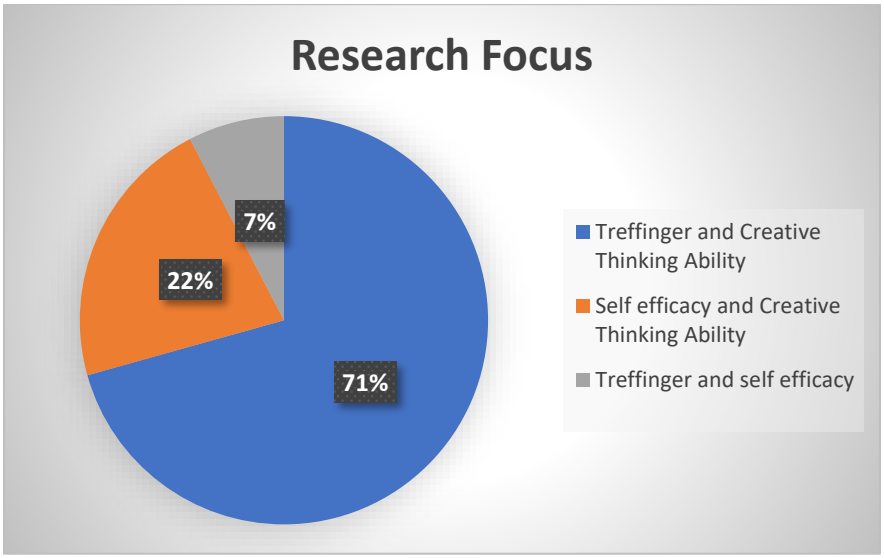

Figure 3. 2 Research Focus

Figure 2 shows that the analyzed articles contain a research focus related to the Treffinger learning model, creative thinking abilities, and self-efficacy. Articles that contain Treffinger's research focus and creative thinking ability have a percentage of 71%, self efficacy and creative thinking ability are 22%, and treffinger and self efficacy are 7%. This shows that the articles studied mostly contain research focus on the relationship between treffinger and the ability to think creatively.

Research Methods

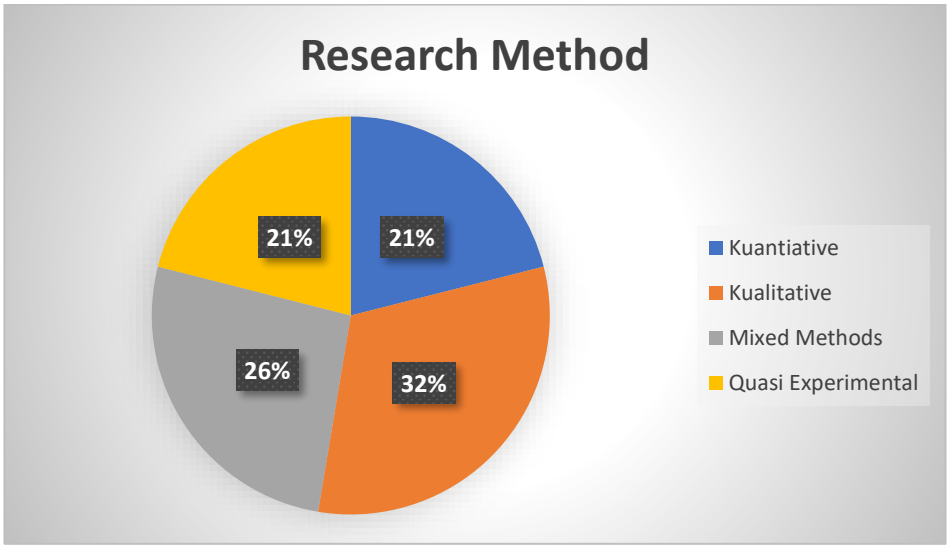

Figure 3. 3 Research Method

Figure 3 shows that the articles were analyzed using several research methods, including quantitative, qualitative, mixed methods, and quasi-experimental. Articles with quantitative research methods have a percentage of 21%, qualitative 32%, mixed methods 26%, and quasi-experimental 21%. It can be concluded that the percentage of the most widely used research method in the articles analyzed is the qualitative research method.

Education Level

Studies related to the ability to think creatively in the Treffinger learning model in terms of self-efficacy which is used as data in this study are carried out from elementary to high school levels with the distribution details in the following figure.

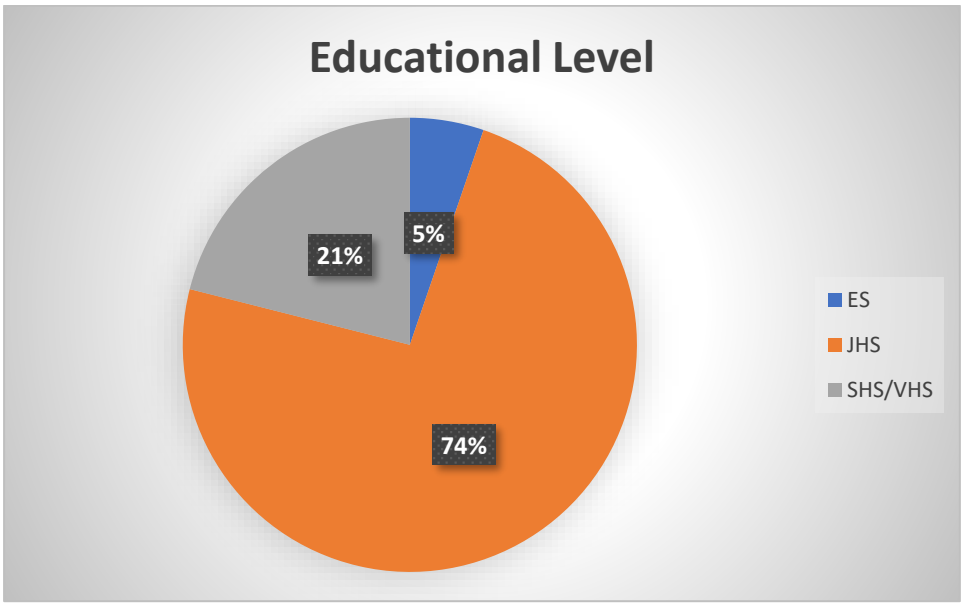

Figure 3. 4 Education Level

Figure 4 shows that the article related to creative thinking skills in the Treffinger learning model in terms of sepf efficacy analyzed was carried out at several levels of education, namely, elementary, junior high and high school. Research conducted at the elementary school level showed a percentage of 5%, at the junior high school level it was 74%, and at the high school level it was 21%. Then, it can be concluded that the most percentages are carried out at the junior high school level and the least at the elementary level.

Based 19 articles that have been analyzed related to the ability to think creatively in learning models in terms of self-efficacy, they have shown good results. The Treffinger learning model is more effective than conventional learning in improving students' creative thinking skills (Triwibowo et al., 2017; Jumroh et al., 2019; Afnan et al., 2020; Amanoe, 2020; Ndiung et al., 2020; Rifai et al., 2020; Panuntun et al., 2021; Nursela et al., 2022; Sulhani et al., 2023). The treffinger learning model encourages students to think creatively so that students are more happy, active and feel confident in solving math problems in several ways (Nursela et al., 2022). Students can achieve learning mastery in learning with the treffinger model (Amanoe, 2020). Apart from the treffinger learning model, self-efficacy also has an influence in improving students' creative thinking abilities (Septiani et al., 2018; Suciawati, 2019; Astuti et al., 2022). Jumroh et al. (2019) also said that the treffinger learning model can improve creative thinking skills in terms of student self-efficacy.

4. Conclusion

Based on the results and discussion that have been presented regarding the 19 articles published in 2016 – 2023 several conclusions have been obtained. First, research related to the ability to think creatively in the treffinger learning model in terms of self-efficacy tends to be carried out in 2019 – 2020 and is mostly done on junior high school students. Research related to the ability to think creatively in treffinger learning models mostly uses quantitative research methods. Second, treffinger learning models are more effective than conventional models in improving students' creative thinking skills. This study shows that with the Treffinger learning model, students are more happy, active, and feel confident in solving math problems in several ways.

Bibliography

Afgani, M. W., & Paradesa, R. (2021). Kemampuan Guru Matematika SMA dalam Merancang Media Pembelajaran Berbasis Komputer. Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan, 6(10), 1558-1562.

Afnan, A., Ikhsan, M., & Duskri, M. (2020). KEMAMPUAN BERPIKIR KREATIF DAN KEMANDIRIAN BELAJAR MELALUI PENERAPAN MODEL PEMBELAJARAN TREFFINGER. Numeracy, 7(1), 123-136.

Ayuningsih, N. P. M., & Dwijayani, N. M. (2019). Pengaruh Model Pembelajaran Treffinger Berorientasi Kearifan Lokal Berbantuan Tugas Berjenjang Terhadap Self Efficacy Dan Kompetensi Strategis Matematika Siswa Sekolah Menengah Pertama (SMP). Kreano, Jurnal Matematika Kreatif-Inovatif, 10(1), 105-111.

Dewi, N. S., & Dasari, D. (2023). Systematic Literature Review: Kemampuan Pembuktian Matematis. Jurnal Cendekia: Jurnal Pendidikan Matematika, 7(1), 240-254.

Dewi, S. H. (2020, November). Pengaruh Model Pembelajaran Treffinger Terhadap Kemampuan Berpikir Kreatif Matematis Siswa. In Prosiding Seminar Nasional Pendidikan (Vol. 2, pp. 251-261).

Elvita, A., Johar, R., & Abidin, T. F. (2020, February). The development of learning tools using treffinger model assisted by geogebra to enhance students' creativity. In Journal of Physics: Conference Series (Vol. 1460, No. 1, p. 012045). IOP Publishing.

Hsm, S. A. A. P., Asikin, M., Waluya, B., & Zaenuri, Z. (2021). Kemampuan Berpikir Kreatif Ditinjau dari Self Regulated Learning dengan Pendekatan Open-Ended Pada Model Pembelajaran Creative Problem Solving. QALAMUNA: Jurnal Pendidikan, Sosial, dan Agama, 13(1), 11-22.

Irbah, D. A., Kusumaningsih, W., & Sutrisno, S. (2018). Analisis Kemampuan Berpikir Kreatif Matematis Ditinjau dari Gaya Belajar Siswa. Media Penelitian Pendidikan: Jurnal Penelitian dalam Bidang Pendidikan dan Pengajaran, 12(2), 115-127.

Isnaini, I., Duskri, M., & Munzir, S. (2016). Upaya Meningkatkan Kreativitas dan Kemampuan Pemecahan Masalah Matematika Siswa Sekolah Menengah Pertama melalui Model Pembelajaran Treffinger. Jurnal Didaktik Matematika, 3(1), 15-25.

Juandi, D., & Tamur, M. (2020). Pengantar Analisis Meta.

Jumroh, J., Sartika, S., & Andinasari, A. (2019, December). PENGARUH MODEL PEMBELAJARAN TREFFINGER TERHADAP KEMAMPUAN BERPIKIR KREATIF MATEMATIS BERDASARKAN TINGKAT SELF EFFICACY. In SEMINAR NASIONAL PENDIDIKAN DASAR (Vol. 1, No. 01).

Kurniati, A., Marliny, D., & Rahmi, D. Pengaruh Penerapan Model Pembelajaran Treffinger terhadap Kemampuan Pemahaman Konsep Matematis Berdasarkan Self Efficacy Siswa Mts Al-Muttaqin Pekanbaru. Suska Journal of Mathematics Education, 7(1), 67-74.

Ndiung, S., Sennen, E., Helmon, A., & Jediut, M. (2020). Efektivitas model pembelajaran treffinger dalam menumbuhkan keterampilan berpikir kreatif peserta didik sekolah dasar. Prisma, 9(2), 167-178.

Nugraheni, S., Sugianto, S., & Rusilowati, A. (2019). Implementasi Model Pembelajaran Treffinger untuk Meningkatkan Kreativitas dan Kemampuan Pemecahan Masalah Siswa SMA. UPEJ Unnes Physics Education Journal, 8(2), 162-169.

Nursela, E., Surahmat, S., & Khairunnisa, G. F. (2023). PENERAPAN MODEL PEMBELAJARAN KOOPERATIF TIPE TREFFINGER UNTUK MENINGKATKAN KEMAMPUAN BERPIKIR KREATIF PADA MATERI RELASI DAN FUNGSI SISWA KELAS VIII-E SMPN 1 KADEMANGAN. Jurnal Penelitian, Pendidikan, dan Pembelajaran, 17(31).

Priatna, N., & Juandi, D. PROFIL KEMAMPUAN BERPIKIR KREATIF MATEMATIS SISWA SMP DALAM MENYELESAIKAN PERMASALAHAN MATEMATIKA

DITINJAU DARI SELF-EFFICACY. Journal on Mathematics Education Research, 3(1), 32-39.

Ratnasari, D. I. R., Mariani, S., & Mulyono, M. (2020). Mathematics Creative Thinking Skills Reviewed from the Studentsâ€™ Self-Confidence by Implementing the Treffinger Learning Model Assisted by Geogebra. Journal of Primary Education, 9(4), 377-386.

Rifa'i, R., Sujana, A., & Romdonah, I. (2020). Penerapan model pembelajaran treffinger untuk meningkatkan kemampuan berpikir kreatif matematis siswa. Jurnal Analisa, 6(1), 1-9.

Sara, S., Johar, R., & Zubainur, C. M. (2018). Kemampuan Berpikir Kreatif Siswa melalui Pembelajaran dengan Model Treffinger pada Materi Segiempat. Jurnal Ilmiah Mahasiswa Pendidikan Matematika, 3(2).

Septiani, T., Hudanagara, M. A., Hendriana, H., & wahyu Anita, I. (2018). Pengaruh Self Confidence dan Self Efficacy Terhadap Kemampuan Berpikir Kreatif Matematis Siswa SMP. JPMI (Jurnal Pembelajaran Matematika Inovatif), 1(2), 185-192.

Siswono, T. Y. E. (2016, October). Berpikir kritis dan berpikir kreatif sebagai fokus pembelajaran matematika. In Seminar Nasional Matematika dan Pendidikan Matematika (Vol. 5, No. 1, pp. 11-26).

Suciawati, V. (2019). Pengaruh self efficacy terhadap kemampuan berpikir kreatif matematik siswa. Jurnal Didactical Mathematics, 2(1), 17-22.

Sulhani, I., Andriani, S., & Fadila, A. (2023). DAMPAK TREFFINGER MODELS DENGAN PENDEKATAN ETNOMATEMATIKA TERHADAP KEMAMPUAN BERPIKIR KRITIS DAN BERPIKIR KREATIF. Hipotenusa Journal of Research Mathematics Education (HJRME), 6(1), 47-64.

Triandini, E., Jayanatha, S., Indrawan, A., Putra, G. W., & Iswara, B. (2019). Metode systematic literature review untuk identifikasi platform dan metode pengembangan sistem informasi di Indonesia. *Indonesian Journal of Information Systems*, *1*(2), 63-77.

Triwibowo, Z., Dwidayati, N. K., & Sugiman, S. (2017). Analysis of mathematical creative thinking skill viewed from students learning styles in seventh grader through treffinger learning model with open-ended approach. Unnes Journal of Mathematics Education, 6(3), 391-399.

Virliani, V., & Sukmawati, R. (2019). Upaya peningkatan kemampuan berpikir kreatif matematis siswa SMP dengan model Treffinger. Prima: Jurnal Pendidikan Matematika, 3(1), 17-23.