

Systematic Literature Review: Students' Mathematical Creative Thinking Ability in Terms of Self-Efficacy in Problem-Based Learning Model

Aulia Syifa Annisa *, Stevanus Budi Waluya
Universitas Negeri Semarang, Jawa Tengah, Indonesia

*Corresponding Author e-mail: auliasyifaannisa@students.unnes.ac.id

Abstract

This research aims to examine students' mathematical creative thinking abilities in terms of self-efficacy using a problem-based learning model. The method that used in this research is a systematic literature review. Data sources were obtained from articles, research journals, expert theories, and books. Data collection was carried out by documenting and reviewing articles related to creative mathematical thinking abilities, self-efficacy, and problem-based learning models published in the 2013-2023 period. Based on a study of 8 articles, national and international, the implementation of the problem-based learning model is the most widely used learning model and has an influence on mathematical creative thinking abilities. The research results show that self-efficacy has a positive effect on creative thinking abilities and the problem-based learning model can improve students' mathematical creative thinking abilities.

Keywords: *Creative Thinking Ability, Self-efficacy, Problem-Based Learning*

1. Introduction

Mathematics is one of the branches of science and technology that acts as a tool in the application of other fields of science or in the development of mathematics itself. The 21st century requires students to have 4 specific skills, namely collaboration skills, creative thinking, critical thinking skills, and communication skills (Salim Nahdi, 2019). To be able to solve mathematics problems, students do not just memorize, but also need the creative thinking ability to construct their own understanding with the steps of formulating, interpreting, solving models or planning problem solving.

Creative thinking is a person's ability to analyze new information, and combine unique ideas or ideas to solve a problem (Moma, 2015). Creative thinking is able to create new ideas and real work done by someone, which will then produce results in the form of a work that is relatively different from what has previously existed. According to Dewi et. al., (2019) the creative thinking ability can be known from the expertise in analyzing data, as well as providing varied problem-solving responses.

In its implementation, current learning does not stimulate students to think creatively so it is necessary to make efforts to improve the learning system. One of the factors that cause creative thinking to be underdeveloped is the existence of an educational curriculum that has a broad scope, so that educators are more focused on achieving targets than thinking about learning methods that can make creative thinking abilities increase (Panjaitan & Surya, 2017). The rarity of directing students to improve higher order thinking skills is one of the mathematics problems in schools that needs attention. Facts in the field show that students' creative thinking abilities in Indonesia are still low. Research conducted by Apriansyah & Ramdani (2018)

concluded that the creative thinking ability of Indonesian students only reached a percentage of 50%, so it was categorized as still low. The results of other studies that show that creative thinking abilities in Indonesia are still low are in research conducted by (Rasnawati et al., 2019) with an average percentage of 39% for all indicators in creative thinking abilities.

To improve creative thinking abilities, teachers must take part in motivating and striving for students to be creative. An interesting learning model is needed to be effective in improving students' creative thinking abilities and can explore students' creative thinking abilities. In addition, there are also internal student factors that influence problem solving, namely the psychological aspects that make a person successful in completing tasks well Handayani et. al. (2021). Self-efficacy is a belief that students must have in order to succeed in the learning process. Individual thoughts on self-efficacy determine how much effort will be devoted and how long individuals will persist in the face of obstacles or unpleasant experiences. The higher the self-efficacy, the greater and more persistent the effort made when faced with difficulties, individuals who have high self-efficacy will be better able to think logically, analytically, systematically, critically and creatively (Suciawati, 2019). Students with low self-efficacy tend to avoid the task because they consider it difficult and unable to complete. In contrast, students with high self-efficacy will continue to try to complete the task no matter how difficult it is (Sunaryo, 2017).

2. Methodology

The method used in this research is the Systematic Literature Review (SLR) method. Through this method, identification, study, evaluation, and interpretation of available previous studies are carried out. Research using this method must systematically review and identify journals in each process following predetermined steps.

Based on the above stages, journal articles were collected from Google Scholar and Scopus databases with the help of the Publish or Perish application with the keywords mathematical creative thinking ability, self-efficacy, problem-based learning model, and their combination. This research consists of several stages, namely formulating research questions, literature search, determining inclusion and exclusion criteria, presenting data, processing data, and make conclusions.

Table 1. Inclusion and Exclusion Criteria

Inclusion	Exclusion
Articles published from 2013 to 2023	Articles published outside the range of 2013 to 2023
Has population Junior and Senior High School	Population is not junior and senior high school students'
Problem-based learning as a learning model	Non-PBL learning model

From various articles, 283 articles were obtained which were then identified, reviewed, evaluated, and interpreted so that 8 articles were selected that met the criteria for the articles needed.

3. Result and Discussion

The results of the research data included in this literature review are tabulated data of documented articles related to mathematical creative thinking ability, self-efficacy, and Problem-Based Learning model as many as 8 articles with determining by inclusion and exclusion. For more details see Table 2.

Table 2. Articles related to creative thinking abilities, self-efficacy, and problem-based learning.

Research and Year	Title	Research Result
Vici Suciawati, 2019	The Effect of Self Efficacy on Students' Mathematical Creative Thinking Ability	There is a positive influence between self-efficacy and students' mathematical creative thinking ability. The higher the students' self-efficacy, the higher the students' mathematical creative thinking ability.
Dadang dan Ramdani, 2018	Analysis of Mathematics Comprehension and Creative Thinking Ability of MTs Students on the Mathematics of Flat-Sided Spaces	Students' mathematical understanding and creative thinking abilities on flat-sided space building material are still relatively low.
Arfan, et. al., 2018	Analysis of Mathematical Creative Thinking Ability of Junior High School Students on the Mathematics of Geometry	Mathematical creative thinking abilities of junior high school students in Ngamprah Village are still very low.
Sunaryo, 2017	Measurement of Students' Self-Efficacy in Learning Mathematics at MTs N 2 Ciamis	Students' self-efficacy in mathematics learning overall is at a moderate and positive level.
Muthaharah, Yhana Alfianadevi, 2018	Analysis of Mathematical Creative Thinking Ability of Junior High School Students in Solving Problems of Geometry	There are differences in the mathematical creative thinking abilities of students in the same educational level.
Afin Nur Latifa, 2022	Application of Problem Based Learning Model to Improve Creative Thinking Ability on the Material of Sine and Cosine Rules of Students of Class X MIPA 6 SMA N 1 Magetan	The application of problem-based learning model can improve the mathematical creative thinking ability of students of class X MIPA 6 on the material of sine and cosine rules.

Research and Year	Title	Research Result
Izaak Hendrik et. al., 2021	The Effect of Problem Based Learning Model on Creative and Critical Thinking Skills in Static Fluid Topics	The PBL model is proven to be able to improve creative thinking and critical thinking abilities; the creative thinking and critical thinking abilities of students given the PBL model are higher than those of students given the conventional learning model.
Ardeniyansah and Rosnawati, 2018	Implementation of Problem-Based Learning in term of Student Mathematical Creative Thinking	The PBL model provides advantages in creative thinking and can improve students' creative thinking abilities.

3.1. Mathematical Creative Thinking

Creative thinking is the ability to find something new, and different from what already exists (Muthaharah et al., 2018). Creative thinking is a person's proficiency in analyzing new information, and combining unique ideas or ideas to solve a problem (Moma, 2015). Creative thinking is able to create new ideas and real work done by someone, which will then produce results in the form of a work that is relatively different from what has previously existed. Based on previous research, it is stated that the ability to think creatively is to provide various possible answers based on the information provided with an emphasis on diversity in number and suitability (Suciawati, 2019).

According to Munandar (Ardeniyansah & Rosnawati, 2018), indicators of creative thinking ability with characteristics of creative thinking are in Table 3.

Table 3. Characteristics of creative thinking

Creative Thinking Indicators	Characteristics
<i>Fluency</i>	1) triggering many ideas, answers, problem solving, fluency in answering; 2) providing ways or suggestions for doing things; 3) always thinking of more than one answer.
<i>Flexibility</i>	1) generate ideas, answers, or alternative answers, can see the problem from different points of view; 2) find many alternatives or answers that are different in direction; 3) able to change the way of approach or way of thinking.
<i>Originality</i>	1) able to produce new and unique phrases; 2) think unusually to express themselves; 3) able to create walk-in k combinations from common parts or elements.
<i>Elaboration</i>	1) develop or enrich the ideas of others; 2) add, organize or detail an idea so as to improve the quality of the idea.

3.2. Self-Efficacy

One of the most important motivations that influence beliefs about oneself to be able to generate new ideas is self-efficacy. According to Albert Bandura, self-efficacy

is "*beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations*", which means that self-efficacy is a person's assessment of his ability to organize, control, and carry out a series of behaviors to achieve a desired result (Sözbilir, 2018). The higher the self-efficacy, the greater and more persistent the effort made when faced with difficulties, individuals who have high self-efficacy will be better able to think logically, analytically, systematically, critically and creatively (Suciawati, 2019). Students with low self-efficacy tend to avoid the task because they consider it difficult and unable to complete. In contrast, students with high self-efficacy will continue to try to complete the task no matter how difficult it is (Sunaryo, 2017).

3.3. Problem-Based Learning

To be able to improve creative thinking abilities, a learning model is needed that encourages students to explore and solve problems in various ways. Problem-Based Learning can help students develop problem-solving skills, increase understanding and knowledge, and activeness in gaining knowledge (A. Handayani & Koeswanti, 2021). According to Purmaningrum (A. Handayani & Koeswanti, 2021), the Problem-Based Learning model is used by presenting real problems or in everyday life, so that students can build new knowledge by finding solutions to solve a problem presented and encourage students to think creatively. PBL can help students explore the causes of problems, formulate problems, and provide solutions to these problems. This encourages students to dare to work together in groups to solve concrete problems with their group members and present their ideas in front of the class then defend their opinions in front of many people.

The learning steps of the problem-based learning model are: (1) orient students to the problem, (2) organize students to learn, (3) guide individual and group investigations, (4) develop and present work, and (5) analyze and evaluate the problem-solving process. Therefore, the PBL model is considered capable of encouraging students to express ideas and information obtained to get alternative ways and the right answers. Therefore, it is believed that the problem-based learning model has a positive influence on students' creative thinking abilities.

In a study conducted by Handayani et. al. (2021), the researchers conducted a meta-analysis of several articles related to problem-based learning in improving creative thinking abilities. From this study, the average pretest rate was 49.34% and the average posttest rate was 61.22%. The results showed an increase in creative thinking abilities using the PBL model. Then, research conducted by Latifa (2022) who also conducted research related to the application of problem-based learning models to improve creative thinking abilities. From the results of this study in cycle I, the average mathematical creative thinking ability of students was 63.1% in the "good enough" category. Then in cycle II, the average value of quizzes and final tests reached 71.6% in the "good" category. Thus, the ability to think creatively increased after applying the problem-based learning model. Similar research was conducted by Wenno et. al. (2021), namely the effect of the problem-based learning model on creative thinking abilities and critical thinking skills. From the results of the study, it was found that students' creative thinking ability and critical thinking ability increased after applying the problem-based learning model.

4. Conclusion

Thus, it can be concluded that students' creative thinking abilities are influenced by internal and external factors. The internal factor discussed in this study is self-efficacy, while the external factor is the learning model which in this study is the problem-based learning model. The higher the level of student self-efficacy, the higher the creative thinking ability. The problem-based learning model also has a significant effect on students' creative thinking abilities. In its application, it also needs time management and learning support tools so that the results are maximized.

5. References

- Apriansyah, D., & Ramdani, M. (2018). *ANALISIS KEMAMPUAN PEMAHAMAN DAN BERPIKIR KREATIF MATEMATIKA SISWA MTs PADA MATERI BANGUN RUANG SISI DATAR*. 2(2), 1–7.
- Ardeniyansah, & Rosnawati, R. (2018). Implementation of Problem-Based Learning in terms of Student Mathematical Creative Thinking. *Journal of Physics: Conference Series*, 1097, 012111. <https://doi.org/10.1088/1742-6596/1097/1/012111>
- Dewi, S., Mariam, S., & Kelana, J. B. (2019). MENINGKATKAN KEMAMPUAN BERPIKIR KREATIF IPA SISWA SEKOLAH DASAR MENGGUNAKAN MODEL CONTEXUAL TEACHING AND LEARNING. *Journal of Elementary Education*, 02.
- Handayani, A., & Koeswanti, H. D. (2021). Meta-Analisis Model Pembelajaran Problem Based Learning (PBL) Untuk Meningkatkan Kemampuan Berpikir Kreatif. *Jurnal Basicedu*, 5(3), 1349–1355. <https://doi.org/10.31004/basicedu.v5i3.924>
- Handayani, D., Sепthiani, S., Raya No, J., Jagakarsa, K., Jakarta Selatan, K., & Khusus Ibukota Jakarta, D. (2021). *Pengaruh Kecerdasan Emosional Aspek Kesadaran Diri Terhadap Prestasi Belajar Matematika*. 05(02), 1352–1358.
- Latifa, A. N (2022). Penerapan Model Problem Based Learning untuk Meningkatkan Kemampuan Berpikir Kreatif pada Materi Aturan Sinus dan Cosinus Siswa Kelas X.MIPA.6 SMAN 1 Magetan. Dalam *Seminar Nasional Sosial Sains* (Vol. 1). Pendidikan. <http://prosiding.unipma.ac.id/index.php/SENASSDRA>
- Moma, L. (2015). *PENGEMBANGAN INSTRUMEN KEMAMPUAN BERPIKIR KREATIF MATEMATIS UNTUK SISWA SMP* (Vol. 4, Nomor 1).
- Muthaharah, Y. A. (2018). Analisis Kemampuan Berpikir Kreatif matematis Siswa SMP dalam Menyelesaikan Soal Bangun Ruang Sisi Datar. *E-Jurnal Mitra Pendidikan*, 2 (1), 63–75.
- Panjaitan, A. H., & Surya, E. (2017). *CREATIVE THINKING (BERPIKIR KREATIF) DALAM PEMBELAJARAN MATEMATIKA*. <https://www.researchgate.net/publication/321849189>
- 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. <https://doi.org/10.31004/cendekia.v3i1.87>
- Setiaji, R., Dewi Koeswati, H., & Giarti, S. (2018). *PERBEDAAN PENGGUNAAN DISCOVERY LEARNING DAN PROBLEM SOLVING TERHADAP HASIL BELAJAR IPA SISWA KELAS 4 SD GUGUS COKRO KEMBANG JENAWI KARANGANYAR* (Vol. 2). <http://stkiptam.ac.id/indeks.php/basicedu>

- Sözbilir, F. (t.t.). *A Relationship between On-The-Job Training Practices, Self-Efficacy, and Innovative Behavior*.
- Suciawati, V. (2019). PENGARUH SELF EFFICACY TERHADAP KEMAMPUAN BERPIKIR KREATIF MATEMATIK SISWA. *Jurnal Didactical Mathematics*, 2(1), 17–22.
<http://jurnal.unma.ac.id/index.php/dm>
- Sunaryo, Y. (2017). *PENGUKURAN SELF-EFFICACY SISWA DALAM PEMBELAJARAN MATEMATIKA DI MTs N 2 CIAMIS*.
- Wenno, I. H., Jamaludin, J., & Batlolona*, J. R. (2021). The Effect of Problem Based Learning Model on Creative and Critical Thinking Skills in Static Fluid Topics. *Jurnal Pendidikan Sains Indonesia*, 9(3), 498–511.
<https://doi.org/10.24815/jpsi.v9i3.20829>