



## Problem Based Learning in Improving Mathematical Creative Thinking Ability Using STEM : Literature Review

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### Articles Information

### Abstrak

#### Keywords:

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Penelitian ini bertujuan untuk menguji kemampuan berpikir kreatif matematis siswa dengan menggunakan model pembelajaran berbasis masalah. Metode yang digunakan dalam penelitian ini adalah metode Systematic Literature Review (SLR). Pembelajaran Berbasis Masalah dapat menjadi alternatif yang efektif dalam meningkatkan kemampuan berpikir kreatif matematis siswa dalam konteks pembelajaran statistika. Diperlukan penelitian lebih lanjut untuk menggali lebih dalam mekanisme dan strategi yang efektif dalam mengembangkan kemampuan berpikir kreatif matematis melalui pendekatan Problem Based Learning berbasis STEM.

### Abstact

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This research aims to examine students' mathematical creative thinking abilities using a problem-based learning model. The method used in this research is the Systematic Literature Review (SLR) method. Problem Based Learning can be an effective alternative in improving students' creative mathematical thinking abilities in the context of statistics learning. Further research is needed to explore more deeply the mechanisms and strategies that are effective in developing creative mathematical thinking abilities through a STEM-based Problem Based Learning approach.



## INTRODUCTION

Mathematical problem solving is the main goal of students learning mathematics because through mathematics learning activities students are expected to have creative thinking skills by learning to solve mathematical problems using more than one way. This means that the ability to think creatively is influenced by students' ability to solve problems. Creative thinking skills can help students face the changing world (Yudistira, 2023). Research (Zakiah et al., 2020) confirms creativity and creative thinking skills are important abilities in the 21st century. Changes that occur quickly and dynamically must be balanced with non-routine ways of thinking or the ability to come up with new ideas (Wayan Widana, 2020). Creative thinking is thinking that is directed to determine answers or different ways of solving a mathematical problem (Prastiti et al., 2018). Students can reach this level after being able to solve a problem and think further to determine answers or different ways of solving the problem (Prastiti, 2020). Creative thinking is a process in thinking that produces a wide and diverse range of possible ideas (Handayani, A., & Koeswanti, H. D. 2021)

Through creative thinking skills, students are invited to directly solve problems that exist in everyday life with creative ideas that have not even been thought of before (Nisa, 2019). The three key components assessed in creativity are fluency, flexibility and novelty. Fluency refers to the number of ideas generated in response to a prompt. Flexibility is seen in the changes in approach when responding to a command. Novelty is the originality of ideas made in response to an order (Siswono, 2006). Furthermore, creative thinking is defined as a process that a person uses in synthesising ideas, building new ideas and applying them to produce new products fluently and flexibly.

The fact of low mathematical creative thinking ability in students is that most students still imitate one way that has been exemplified by the teacher. When asked to show a different way, they have difficulty with the excuse of being confused, not having ideas. If given more time to come up with ideas, they feel bored. According to the students, the routine flow in learning mathematics is that the teacher comes, checks attendance, explains the material, gives examples of problems, then gives practice problems and asks students to work on these problems according to the examples given by the teacher, and always ends with giving homework.

A learning approach that accommodates passive things to be active is Problem Based Learning (Marhaeni et al., 2021). Problem Based Learning can be used as a learning model to develop students' thinking skills, especially at the vocational level (Pirlangga, 2022). PBL as a student-centred learning method through problem solving to develop communication and collaboration skills and requires reflection from various perspectives (Kurniawan et al., 2021). Learning using PBL is better in improving mathematical problem-solving skills (Prastiti, 2020).

## METHOD

This literature review features Problem Based Learning in Improving Mathematical Creative Thinking Ability. The journals reviewed used Indonesian with a publication range of the last 5 years. Journal searches were conducted in the electronic database google scholar. Systematic literature review is a research method that investigates, interprets, and evaluates findings on a research topic to answer predetermined questions (Kitchenham & Charters, 2007). The keywords used in the journal search were ‘Problem Based Learning’ and ‘Mathematical Creative Thinking Ability’. Systematic review using PRISMA guidelines which have been widely used by previous researchers such as those conducted by (Purwanto & Alhelga S.B.K., 2020), (Kanang et al., 2021).

## RESULT AND DISCUSSION

The following is a literature review of Problem Based Learning in Improving Mathematical Creative Thinking Ability:

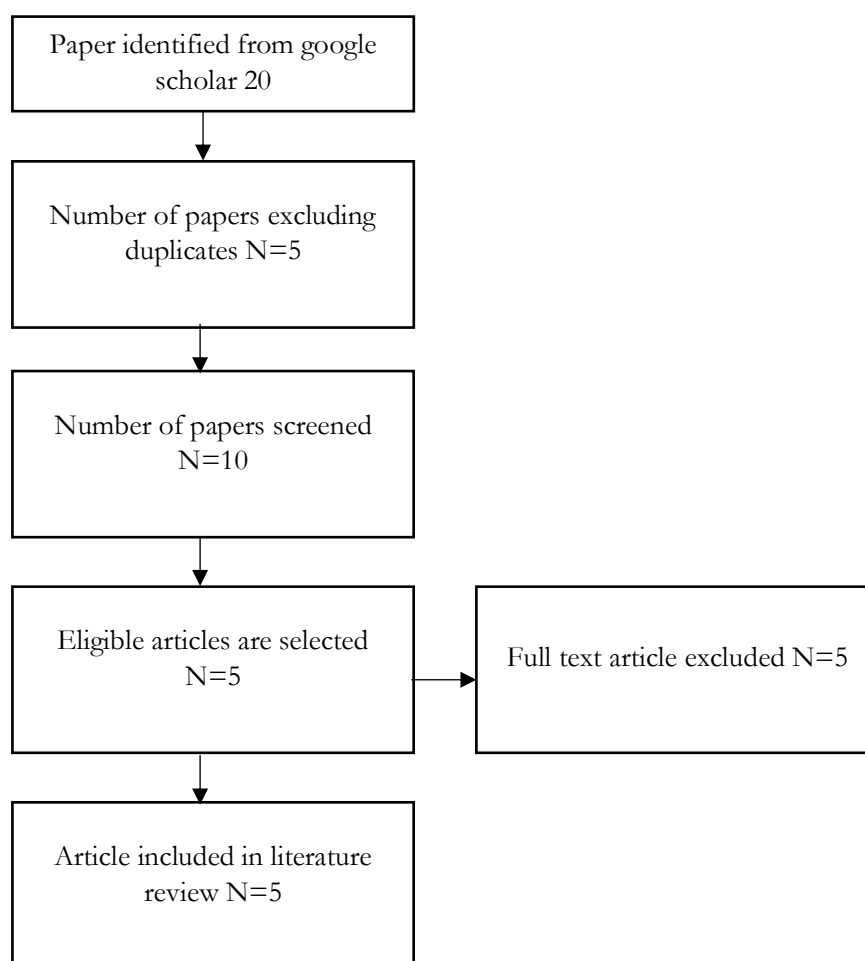


Figure 1. PRISMA

The description of the articles according to the keywords resulted in 5 articles discussing about Problem Based Learning in Improving Mathematical Creative Thinking Ability

Table 1. Articles Related Problem Based Learning in Improving Mathematical Creative Thinking Ability

Research and year	Title	Result
Vistara, M., Asikin, M., Ardiansyah, A., & Pudjiastuti, E. (2022)	STEM Context-Oriented Problem Based Learning on Students' Mathematical Creative Thinking Ability	Implementation of the Problem Based Learning learning model with STEM nuances can improve students' mathematical creative thinking abilities. Furthermore, the implementation of this model can be integrated into teaching materials or learning videos
Mahendrawan, E., Solihat, I., & Yanuarti, M. (2022)	The Effectiveness of Using Problem Based Learning (PBL) Worksheets for Arithmetic Material Judging from the Ability to Think Creatively in Mathematics	The research results show that the use of Problem Based Learning (PBL) worksheets is more effective in terms of mathematical creative thinking abilities compared to conventional approaches.
Mimbarwati, M., Mulyono, M., & Suminar, T. (2023)	The Influence of Self-Confidence on Students' Creative Mathematical Thinking Ability through the Problem Based Learning Model Assisted by Google Classroom	The coefficient value is positive meaning that between students' self-confidence and students' mathematical creative thinking abilities have a positive relationship and influence each other towards a balanced and balanced increase.
Rahmawati, L., Juandi, D., & Nurlaelah, E. (2022).	Implementation of STEM in improving critical and creative mathematical thinking skills	The STEM approach has a positive influence on increasing students' creative thinking and critical mathematical thinking abilities. Project Based Learning and Problem Based Learning are learning models that are significantly suitable for application in STEM education
Andini, R., Winarti, E. R., & Mintarsih, M. (2022)	Students' mathematical critical thinking abilities in the problem-based learning model assisted by teaching materials with a STEM approach	problem-based learning model learning assisted by teaching materials with a STEM approach is better (has a positive effect) than problem-based learning model learning without using teaching materials with a STEM approach. The majority of students showed a positive response to problem-based learning assisted by teaching material models with a STEM approach.

Research that examines the influence of the STEM-based Problem Based Learning model on statistical material on improving problem-solving abilities and creative mathematical thinking is a very interesting and relevant topic in the field of mathematics education. Problem Based Learning is a learning approach that emphasizes giving students real problems to be solved actively and collaboratively. Meanwhile, STEM (Science, Technology, Engineering, and Mathematics) is a cross-disciplinary approach that integrates these four fields to provide students with a holistic understanding. By combining Problem Based Learning and STEM in statistics material, it is hoped that students can develop problem-solving abilities and creative mathematical thinking in more depth and integration with real-world contexts. This research can make an important contribution to the development of innovative and effective learning methods in improving students' mathematical skills. Apart from that, the results of this research can also provide valuable information for educators and policy makers in improving education. Some of the findings that can be found in this research include:

- a. Increased divergent thinking abilities: STEM-based Problem Based Learning can help students develop divergent thinking abilities, namely the ability to think creatively, generate new ideas, and see problems from different points of view.
- b. Improved critical thinking skills: Through the Problem Based Learning approach, students are invited to analyze problems, identify relevant information, and develop effective problem-solving strategies. This can help students to develop critical thinking skills in solving statistical problems.
- c. Increasing mathematical creative thinking abilities: STEM-based Problem Based Learning can also help students to develop mathematical creative thinking abilities, namely the ability to relate mathematical concepts to real-world contexts, produce innovative solutions, and communicate mathematical thinking clearly.

Thus, the results of this research indicate that the STEM-based Problem Based Learning model can be effective in improving students' mathematical creative thinking abilities in the context of statistics learning. Further research can be carried out to explore more deeply the mechanisms and strategies that are effective in developing creative mathematical thinking abilities through a STEM-based Problem Based Learning approach.

## **CONCLUSION**

Based on a literature review regarding the use of Problem Based Learning in improving mathematical creative thinking abilities, it can be concluded that the Problem Based Learning approach has a positive contribution in developing students' creative thinking abilities. Some of the findings found in the research include increasing divergent thinking abilities, critical thinking abilities, and creative mathematical thinking abilities through STEM-based Problem Based Learning. Thus, Problem Based Learning can be an effective alternative in improving students' creative mathematical thinking abilities in the context of statistics learning. Further research is needed to explore more deeply the mechanisms and strategies that are effective

in developing creative mathematical thinking abilities through a STEM-based Problem Based Learning approach.

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