Indonesian Science Education Research
(ISER)
Available online https://jurnal.unimed.ac.id/2012/index.php/iser
ISSN Online: 2715-4653

THE EFFECT OF THE PJBL-STEM MODEL ON CREATIVE THINKING SKILL ON SCIENCE LEARNING

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Accepted: November 22th, 2024. Published: December 31th, 2024

Abstract

This scientific writing assignment investigates the impact of the PjBL-STEM model on students' creative thinking abilities in the context of the education system in Indonesia. This research focuses on 21st Century learning skills, namely creative, critical and process. One of the learning models recommended by the government is Project Based Learning (PjBL). In order to combine contextual with project assignments and to achieve 21st century skills, it is necessary to implement the PjBL model with a STEM (Science, Technology, Engineering and Math) approach. The methodology of this study involves a systematic literature review of 8 articles published in the last ten years. The findings of the study show that the PjBL-STEM model not only improves students' creative thinking abilities but also deepens their understanding of concepts, increases their active involvement in learning, and improves their ability to apply knowledge in various situations. The study concluded that the PjBL-STEM model is more effective than conventional teaching methods in improving students' creative thinking abilities.

Keywords: PjBL-STEM, Science, Creative, Thinking, Ability

Introduction

According to Arend in (Mulyono, 2018) The learning model is a conceptual framework that describes the systematic (regular) procedures and organization of learning activities (experiences) to achieve learning objectives (learning competencies). In other words, the learning model is the design of learning activities so that the implementation of KBM can run well, interesting, easy to understand and in a clear order. One of the learning models that can be applied so that students can more easily understand the learning material is the application of the Project based learning (PjBL) model. According to (Lestari and Juanda, 2019) said that in addition to learning from problems that exist in real life, students can also learn from the projects they make so that students become more capable, creative and independent

The Project Based Learning (PjBL) learning model is a learning model that uses projects/activities as the core of learning (Ma'arij, 2017). Project-based learning is closely related to students' creative thinking skills, because by using a project-based learning model, students can increase creativity, activeness, and thinking skills so that students' science process skills can develop. The PjBL model directs that students can overcome problems and emphasize contextual learning in complex ways such as giving students the freedom to explore, plan learning activities, collaboratively, carry out projects, and finally produce a product (Farah, Suwono, & Ibrohim, n.d.)

The integration of the PjBL learning model with the STEM approach is a good step to improve students' creative thinking skills. STEM as an approach can be implemented using various innovative teaching models such as problem-based learning (PBL), inquiry, and Project Based Learning (PjBL). An innovative learning model that can be collaborated with STEM is the PjBL learning model. The PjBL learning syntax is included in the engineering process which is part of the STEM approach so that the two support each other for the achievement of students' creative thinking. STEM-PJBL learning can support student creativity because in this learning students are required to make a product that requires creativity in solving a problem. The five stages of STEM-PJBL, namely first reflection, then research, followed by discovery, application, and finally communication (Laboy-Rush, 2010). Based on research conducted by (Triastuti, 2020) shows that STEM-based PjBL learning can increase students' mastery of concepts and creativity. Learning in the 21st Century must be oriented in addition to knowledge as well as on students' skills (Wijaya et al, 2016). To face these challenges, students must master several skills in the 21st Century or called 4th Century Skills (4C's) which consist of: creative and innovative thinking skills, communication skills, critical thinking skills, and collaboration skills(Nastiti et al., 2020). The ability to think creatively must be mastered by students in the 21st century(Zubaidah, 2016; Nastiti et al, 2020). Creative thinking is the ability to observe a problem or situation from a new perspective and an unusual solution (Gafour, 2020). Through mastering creative thinking skills, it is hoped that students will be able to face various real-world challenges in the future in accordance with educational goals in Indonesia.

Based on this statement, a learning model is needed that can improve students' creative thinking skills and learning in accordance with the 21st Century. The purpose of this study is to determine the influence of the use of the PjBL-STEM model on creative thinking skills.

Purpose

This study aims to investigate the effect of the application of the PjBL-STEM learning model on students' creative thinking abilities in the educational environment. The main focus of this study is to evaluate the effectiveness of the learning model in improving students' understanding of concepts and academic achievements. In addition, this study also wants to assess the level of student engagement during the learning of the PjBL-STEM model. It is hoped that this research will provide insight into the positive impact of the PjBL-STEM learning model on students' creative thinking skills, including increased understanding of concepts, active involvement in learning, and students'

ability to apply knowledge in this technological era. In addition, it is hoped that this research will make a significant contribution to learning practices in various educational institutions by providing a solid foundation for the development of more effective and innovative learning strategies

Research Question

Research Question (RQ) in this study is presented in the following Table 1:

Table 1. Research Question

Sought Questions and Analysis
1. What are the types of research used by previous researchers regarding the study of the application of the PjBL-STEM learning model? Analysis: At this stage, the researcher analyzes articles about what types of research are often used regarding the study of the application of the PjBL learning model.
2. What is the effect of the application of the PjBL-STEM learning model to improve creative thinking skills in the learning process? Analysis: At this stage, the researcher analyzed the influence of the application of the PjBL-STEM learning model in the learning process through previous articles

Research Method

The research methods used are Literature Review (Snyder, 2019) using the PRISMA method (Preferred Reporting Items for Systematic Reviews and Meta-analyses (Page and Moher, 2017)

Research Procedure

An article in the literature review was obtained from one *Digital Library* namely Google Schoolar. The search for literature for this research uses keywords: "PjBL-STEM, SCIENCE, Learning Outcomes, Junior High School". The literature search was carried out from May 24-26. In the selection of articles, exclusion and inclusion criteria are needed to select the main research. The exclusion and inclusion criteria in this literature can be seen in the following Table 2:

Table 2. Exclusion and Inclusion Criteria

Exclusion Criteria
1. Research is not accessible in its entirety
2. Research with development methods
3. Incomplete abstract
4. Non-PjBL-STEM learning model
5. Non-science learning materials
Inclusion Criteria
1. Articles published in 2014 – 2024
2. Research topics include science learning
3. Literature from proceedings, theses, and scientific works
4. Research topics in the form of PjBL-STEM and student learning outcomes

After the inclusion and exclusion criteria are determined, then the selection of articles to be reviewed.

Result and Discussion

Based on the systematic literature review that has been carried out, 10 articles are obtained that are worthy of analysis. The article used is an article from Indonesia because this research discusses the influence of the PjBL-STEM model on student learning outcomes. Table 3 presents the results of the analysis of 8 articles.

Table 3. Results of Article Analysis of the Application of the PjBL-STEM Model in Improving Creative Thinking Skills

Writer	Heading	Result
Cici Meisi Karlina, Endang Susilowati, Isma Aziz Fakhrudin (2023)	Pengaruh Model Pembelajaran STEM-PJBL terhadap Kemampuan Berpikir Kreatif Siswa SMP Negeri 1 Slogohimo Wonogiri di Era Pandemi pada Materi Hidrosfer	The results of the study show that the use of the STEM-PJBL Learning Model has a positive influence on the improvement of the creative thinking ability of SMP Negeri 1 Slogohimo Wonogiri students on the Hydrosphere material. There was a significant improvement in the originality aspect of students' creative thinking ability after treatment with the STEM-PJBL Learning Model. This shows that the

		STEM-PJBL learning approach can be effective in stimulating students' creative thinking skills in the midst of limited learning situations due to the pandemic
S. Prajoko, I.Sukmawati, A. F. Maris, A.N. Wulanjani (2023)	PROJECT BASED LEARNING (PJBL) MODEL WITH STEM APPROACH ON STUDENTS' CONCEPTUAL UNDERSTANDING AND CREATIVITY	With a paired t-test significance value of 0.002, as well as an evaluation of product creativity in the form of a mind map that reached a value of 0.64, which was included in the good category. This shows that the combination of PjBL with STEM approaches is effective in learning
Herta Astri Yudika Sinurat, Syaiful Damris Muhammad (2022)	The Implementation of Integrated Project-Based Learning Science Technology Engineering Mathematics on Creative Thinking Skills and Student Cognitive Learning Outcomes in Dynamic Fluid	In this study, the results of the creative thinking skills test showed that classes that implemented STEM-integrated Project-Based Learning (PJBL) had higher creative thinking skills than classes that used conventional learning methods. There was a significant difference in the results of students' creative thinking skills between the two groups.
Annisa Septia Rahayu, Ika Maryani (2023)	STEM-PjBL and creativity of science learning students in elementary schools	In summary, the results of the study show that the use of the STEM-PjBL model in science learning in elementary schools can increase students' creativity. The implementation of this approach can improve students' higher-order thinking skills and influence their understanding of science concepts. By applying this approach, students can develop creativity, improve their understanding of science concepts, and achieve better learning outcomes.
Dyah Pramesti, Riezky Maya Probosar, Nurma Yunita Indiyanti (2022)	Effectiveness of Project Based Learning Low Carbon STEM and Discovery Learning to Improve Creative Thinking Skills	The results of the research test showed that there was a significant difference in effectiveness between the PjBL-Low Carbon STEM approach and discovery learning in improving the creative thinking skills of grade IX students on electrical materials. The n-gain score for the experimental class was 0.275, while for the control class it was only 0.126. This shows that the experimental class that applied PjBL-Low Carbon STEM had a greater increase in n-gain

		compared to the control class that used the discovery learning model
Resmi Ningrum, Taufik Rahman, Riandi (2022)	Penerapan Stem From Home dengan Model PjBL guna Meningkatkan Penguasaan Konsep dan Keterampilan Berpikir Kreatif Siswa SMP	The application of the STEM from home learning model with the PjBL model can also improve students' creative thinking skills. The results of the N-Gain analysis showed that 63% of students experienced an increase in creative thinking skills with a medium category
Ratmeli Storina (Storina, 2022)	Implementasi Model PjBL - STEM terhadap Kreativitas Siswa pada Mata Pelajaran IPA di SMP Negeri 5 Batam	The results of the study show that the implementation of the PjBL-STEM model can increase students' creativity. Creativity assessment is carried out on 3 aspects: process, person, and product. The average score of students' creativity reached 79% with the category of "very creative".

Based on previous research that has been reviewed, it can be concluded that the PjBL-STEM learning model can improve students' creative thinking skills. As shown in the table above. In this study, there are 8 articles that were severely selected. There are 7 articles using the quasi-experiment method and 1 article using the pre-experimental method. Although the research methods used are different, the results are obtained that the average of the experimental class has a high average. This shows that the use of the PjBL-STEM learning model helps improve students' creative thinking skills.

Conclusion

Based on the research that has been carried out, there is an increase in creative thinking skills using the PjBL-STEM learning model.

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