Global Education Journal
Vol. 4, 2 (May-August, 2026), pp. 299-303
EISSN: 2986-6529, DOI: https://doi.org/10.59525/gej.1670

Implementation of Science Project-Based STEAM Learning in Increasing Student Creativity in Elementary Schools

Vivi Uvaira Hasibuan[1], Fitri Yani[2]

[1,2] Haji University of North Sumatra, Indonesia; uvairavivi@gmail.com

ARTICLE INFO

Creativity; Elementary School; Project-Based Learning; Science Teaching Aids Steam-PJBL; Students

Article history:

Received 2026-04-12
Revised 2026-05-16
Accepted 2026-06-18

ABSTRACT

The demands of competence in the 21st century learning era place high-level thinking skills, creativity, and mastery of skills across fields of knowledge as aspects that cannot be ignored in the implementation of higher education. This study aims to explore the application of a project-based learning model that integrates the Science, Technology, Engineering, Art, and Mathematics (STEAM) approach as an effort to foster the creative thinking skills of students of the Elementary School Teacher Education Study Program (PGSD) in designing natural science teaching aids (IPA) for the elementary education level. The research method used was a one-shot case study involving 20 students as participants. Teaching and learning activities are designed in the form of a project to make teaching aids based on used materials that combine the dimensions of science, technology, engineering, art, and mathematics. Data collection was carried out through observation techniques and questionnaire dissemination using creativity assessment instruments that included three main aspects, namely planning, implementation, and evaluation. Data analysis was carried out descriptively using percentage calculation techniques. The results of the analysis showed that overall the level of student creativity was in the very high category, with an average score of 84.67. In detail, the planning aspect obtained a score of 88, the implementation aspect obtained a score of 86, and the evaluation aspect obtained a score of 80. These results indicate that the application of the STEAM-PjBL model is able to facilitate PGSD students in creating science learning products that are characterized by high creativity, contextual, and problem-solving-oriented.

Corresponding Author:
Vivi Uvaira Hasibuan
Hajj University of North Sumatra, Indonesia; Email: uvairavivi@gmail.com

1. INTRODUCTION

The demands of competence in the 21st century learning era place high-level thinking skills, creativity, and mastery of skills across fields of knowledge as aspects that cannot be ignored in the implementation of higher education (Legi et al., 2023). For students who study in the Elementary School Teacher Education Study Program (PGSD), the mastery of these competencies has a broader strategic dimension, considering that graduates will carry out their responsibilities as educators who are required to implement active and innovative learning approaches in the elementary school environment. In this context, Project Based Learning (PjBL) is considered as one of the relevant models, because this approach

inherently encourages active student involvement through a series of real product design and realization activities (Hairunisa, Hakim, & Nurjumiati, 2019).

The integration between the PjBL model and the STEAM approach opens up a wide space for students to develop their creative capacity through a structured and systematic thinking process in the context of science learning in elementary school. Conceptual understanding of creativity in the STEAM framework shows that these abilities include the dimension of novelty of ideas, flexibility in thinking, and the ability to elaborate relevant solutions (Rahayu, 2011; Dewi, Sunarno, & Prabowo, 2019). Thus, the development of creativity is not solely individual, but is also closely related to the quality of the environment and the purposively designed learning process.

The actual condition of science learning in elementary schools still shows the dominance of conventional methods such as lectures and structured exercises, which in turn has implications for low student involvement and inhibition of their creative development (Umar, 2017). As a more contextual and applicative alternative, the project-based STEAM approach offers students the opportunity to design teaching aids, develop learning media, and develop science-based solutions that are relevant to the reality of learning in elementary schools (Solissa, 2024). Through the integration of elements of science, technology, engineering, art, and mathematics, this approach encourages students to explore concepts creatively while utilizing technology in creating meaningful learning products.

Various empirical findings show that the application of the PjBL model has been proven to be able to significantly improve creative thinking, collaboration, and problem-solving skills in student groups (Hartati, Suryati, & Kurniawan, 2022; Kinasih & Ratnawati, 2024). This model provides an authentic and intensive learning experience, so that students are adequately equipped to evaluate and refine their products on an ongoing basis.

Findings in the field indicate that the learning process in a number of courses in the PGSD Study Program, including the Basic Science course, still tends to be lecturer-centered. The conventional learning patterns applied, such as lectures, questions and answers, simple discussions, and the provision of exercises, cause students to not be optimally involved in the learning process. As a result, students' creative thinking skills have not been developed optimally, while aspects of scientific skills and attitudes have also not received proportionate attention. This situation cumulatively slows down the development of students' creativity over time. Therefore, a more contextual learning strategy is needed and is able to encourage active engagement, so that students' skills, creativity, and conceptual understanding can develop in an integrated manner. One of the models that is considered relevant to answer these needs is project-based learning, which emphasizes the active participation of students through the process of creating real products in learning activities.

In its implementation, PjBL integrated with STEAM requires students to formulate problems, design projects, conduct tests, and evaluate the resulting science learning products (Usmeldi & Amini, 2022; Setyarini, Kuswandi, & Wicaksono, 2020). This approach allows the development of creative thinking skills through the stages of replication, modification, and improvisation in the process of making science props that can be applied in elementary schools. Previous research confirms that PjBL is able to significantly improve students' creative thinking skills through the completion of challenging and comprehensive project tasks (Ummah, Hartati, & Rachmawati, 2019).

In addition, the implementation of STEAM based on the science project also contributes to the development of collaborative skills and problem-solving. The group work process in completing the project encourages students to communicate ideas, exchange information, and make decisions together effectively (Rahman et al., 2009). The stages in PjBL which include planning, implementation, reflection, and presentation of project results are in line with the characteristics of holistic and hands-on experience-based STEAM learning (Lindawati, 2013). This is an important foundation in shaping students' creativity which is not only reflected in the products produced, but also in their ability to articulate the underlying thought process.

Based on the description above, the study on the implementation of STEAM learning based on the science project as a strategy to develop the creativity of PGSD students is very relevant to be carried out.

This approach not only facilitates the sharpening of creative thinking skills, but also produces learning products that are applicable and can be adopted in science learning practices in elementary schools. Previous findings strengthen the position of STEAM-PjBL as an approach that significantly contributes to increasing students' creativity, problem-solving skills, and collaborative capacity (Natty, Kristin, & Anugraheni, 2019; Manganhang, Pantudai, & Rawis, 2023; Anazifa & Djukri, 2017).

2. METHODS

This study was designed using the One-Shot Case Study design, where a group of subjects was given treatment in the form of project-based STEAM learning implementation, then the results were observed without comparison from the control group. This design was chosen because of its orientation that focuses on the process and achievement of student creativity during project activities, in accordance with the research guidelines for quantitative experimental education (Sugiyono, 2017).

The research subjects consisted of 20 students of the Elementary School Teacher Education Study Program (PGSD) who were attending a lecture on High Class Science Education. Learning is focused on the application of a project-based model, where students are challenged to design and produce educational aids based on waste or second-hand items available in the surrounding environment.

Data collection was carried out through two techniques, namely observation and questionnaire distribution, using observation sheet instruments and creative thinking scales. The data obtained is focused on indicators in the creative thinking scale to measure the level of innovation and originality of students during the learning process (Anuar et al., 2025). Furthermore, the data was analyzed using the percentage calculation technique with the following formula:

$$Na = \frac{X}{Xm}$$

Na = Value of Student Creativity
X = Student's score
Xm = Maximum achievable score

The creativity assessment criteria used in this study were adopted and modified from Sari et al. (2018), as presented in the following table.

Table 1. Classification of Student Creativity Level

No.	Classification	Percentage Range
1	Very High	81 - 100
2	Height	61 - 80
3	Medium	41 - 60
4	Low	21 - 40
5	Very Low	1 - 20

3. FINDINGS AND DISCUSSION

The results of the study show that the application of the project-based STEAM learning model has succeeded in encouraging the increase of student creativity in utilizing used materials as the basic material for making educational props. The assessment of students' work was carried out using a creative thinking scale instrument developed by Anuar et al. (2025). The recapitulation of the average score of student creativity in the use of waste as a learning medium is presented in Table 2.

Table 2. Recapitulation of Average Score of Student Creativity in the STEAM-PjBL Project

No.	Aspects Assessed	Average Score	Categories
1	Planning	88	Very High
2	Implementation	86	Very High
3	Evaluation	80	Height
	Overall Average	84,67	Very High

The observation data showed that the planning aspect obtained the highest score, which was 88, which indicated that students had been able to identify problems in science learning, select used materials that fit their needs, and systematically prepare the design of teaching aids before project activities began. The implementation aspect obtained a score of 86, which reflects the student's ability to develop products gradually through designing, assembling, testing, and repairing props. Meanwhile, the evaluation aspect obtained a score of 80, which shows that students have basic skills in describing the function of the product produced, although the capacity for reflection, reporting, and argument for design improvements still needs to be improved. Overall, these findings indicate that students have a very high level of creativity in project management in the High Class Science course.

The findings of this study confirm that project-based learning plays a significant role in the development of the creativity of PGSD students. The application of PjBL is not limited to certain courses, but can be adapted in various lecture contexts in higher education (Lestari & Brahma, 2025). In addition, PjBL has been proven to encourage the improvement of generic skills, including science skills, which is one of the main focuses in the implementation of the Independent Curriculum (Putu & Wijaya, 2023). Within the framework of a structured project, students are able to develop ideas systematically in processing waste into functional products, so that their creativity develops in real terms. In fact, the products produced often have economic value that has the potential to open up entrepreneurial opportunities (Ramadhan & Hindun, 2023).

The implementation of STEAM based on the science project provides opportunities for PGSD students to integrate aspects of science, technology, engineering, art, and mathematics in a single product that can be applied in elementary schools. Through the process of designing, testing, and reflecting on the media or teaching aids developed (Hairunisa, Hakim, & Nurjumiati, 2019), students are actively involved in the process of authentic creative thinking. The project portfolio functions as an evaluation instrument that represents students' skills in drafting, testing products, evaluating results, and making improvements, as well as reflecting on the principles of learning by doing (Illahi, 2022). This approach has proven to be effective in improving creative and critical thinking skills, in line with the findings of Rezkillah et al. (2024) who stated that the integration of PjBL with STEAM supports the ability to solve problems systematically and creatively.

The results of this study are in accordance with the findings of Izzania et al. (2025), who concluded that STEAM-PjBL-based teaching materials are able to improve the science literacy of elementary school students contextually. This compatibility is also seen in the findings of Budiyono et al. (2020), who revealed that STEAM integration has a positive influence on students' creative thinking skills. Based on the overall description, research on the implementation of STEAM based on science projects has a high urgency in order to develop the creativity of prospective elementary school teachers. This research provides a comprehensive overview of how students design science teaching aids, how their creativity develops during the project process, and how the resulting products can contribute to improving the quality of science learning in elementary schools. PjBL integrated with STEAM has consistently been proven to increase creativity and learning outcomes, making it relevant to be adopted as a science learning innovation for prospective elementary school teachers (Natty, Kristin, & Anugraheni, 2019; Manganhang, Pantudai, & Rawis, 2023; Anazifa & Djukri, 2017).

4. CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the application of the project-based STEAM learning model has a positive and significant impact on the development of the creativity of students of the Elementary School Teacher Education Study Program (PGSD) of Haji University of North Sumatra in the context of Higher Class Science Education lectures. Students show a very high level of creativity in utilizing waste and used goods as the main materials for making learning aids, reflecting the development of innovative capabilities through a project-based approach. These findings confirm that project-based learning is a suitable model to be implemented in the education program of prospective elementary school teachers, because it is able to grow 21st century

skills in an integrated manner, including critical thinking skills, innovation, and awareness of environmental sustainability. As a follow-up, the study can be expanded by examining the influence of project-based STEAM models on other competency dimensions, such as collaboration skills, communication skills, or student problem-solving capacity.

REFERENCES

Anazifa, R. D., & Djukri. (2017). Project-based learning and problem-based learning: Are they effective to improve student's thinking skills? Indonesian Journal of Science Education, 6(2), 346-355. https://doi.org/10.15294/jpii.v6i2.11100

Budiyono, A., Husna, H., & Wildani, A. (2020). The effect of the application of the STEAM integrated PBL model on creative thinking skills is reviewed from the understanding of students' concepts. Edusains, 12(2), 166-176. https://doi.org/10.15408/es.v12i2.13248

Hairunisa, H., Hakim, A. R., & Nurjumiati, N. (2019). A study on the influence of the project-based learning model on the creativity of PGSD Study Program students in the Basic Concepts of Science course. Journal of Mathematics and Natural Sciences Education, 9(2), 93-96. https://doi.org/10.37630/jpm.v9i2.190

God, M. T. (2022). Portfolio-based learning and its relevance to improving student creativity. Journal of Educational Sciences, 10(1), 1-12.

Izzania, R. D. S. M., Agusdianita, N., Yusnia, Y., Ramadhani, M. H., & Lorenza, S. (2025). The effect of using STEAM-PjBL teaching materials to improve the science literacy skills of elementary school students. Social, Humanities, and Educational Studies (SHES): Conference Series, 8(3), 1682-1690.

Lestari, I. D., & Brahma, I. A. (2025). Implementation of project-based learning models in the Independent Curriculum in higher education. Factors of the Scientific Journal of Education, 11(2), 129-137. https://doi.org/10.30998/fjik.v11i2.25981

Manganhang, J., Pantudai, F., & Rawis, J. A. M. (2023). Application of Project Based Learning learning model to improve creativity and science learning outcomes of grade V students. Educational: Journal of Education, 5(2), 1163-1173. https://doi.org/10.31004/edukatif.v5i2.4962

Natty, R. A., Kristin, F., & Anugraheni, I. (2019). Increase students' creativity and learning outcomes through the Project Based Learning learning model in elementary schools. Journal of Basic Education, 3(4), 1082-1092. https://doi.org/10.31004/basicedu.v3i4.262

Nugraha, I. R. R., Supriadi, U., & Firmansyah, M. I. (2023). The effectiveness of Project Based Learning learning strategies in increasing student creativity. Journal of Social Studies Research and Education (JPPI), 17(1), 39-47.

Rezkillah, I. I., Julaifah, N., Ramadhani, S., & Kasturi, K. (2024). STEAM-integrated Project-Based Learning model for problem-solving capabilities. Indonesian Journal of Education and Learning (JPPI), 4(3), 1289-1295. https://doi.org/10.53299/jppi.v4i3.702

Sugiyono. (2017). Quantitative, qualitative, and R&D research methods.