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THE IMPACT OF PROJECT-BASED LEARNING ON STUDENTS' CREATIVITY: A SYSTEMATIC LITERATURE REVIEW FROM 2005 TO 2025

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Abstract

Creativity is a critical skill for students to address global challenges in the 21st century. Despite the growing application of Project-Based Learning (PBL) to foster students' creativity, its specific impact remains underexplored. This study aims to investigate how PBL enhances students' creativity by conducting a systematic literature review of studies published between 2005 and 2025. Using the PRISMA methodology, 26 articles were selected, analyzing country of origin, research trends, research types, topics, and results. The findings show that PBL significantly boosts creativity by encouraging creative thinking. However, limitations such as small sample sizes and varying contexts hinder the generalizability of the results. The study argues for further research to explore the long-term effects of PBL in diverse educational settings and the development of standardized creativity assessment tools. It also emphasizes the importance of integrating technology into PBL and improving teacher training to optimize its impact. This research contributes to the understanding of PBL's role in enhancing student creativity and provides valuable insights for educators and policymakers to refine teaching strategies that promote creativity in various educational contexts.

Keywords: Project Based Learning, Students' Creativity

INTRODUCTION

Creativity is an essential skill that students must possess to face the ever-evolving global challenges (Fitriani, 2024; Gómez et al., 2023; Rohman et al., 2024). In the context of 21st-century education, creativity is considered a key competency that supports students' success both academically and in everyday life (Arizona, 2020; Sucilestari et al., 2025). Therefore, education needs to adapt approaches that effectively foster students' creativity. One such method increasingly applied to enhance students' creativity is Project-Based Learning (PBL). PBL provides students with opportunities to engage in real-world projects that integrate theory and practice, while encouraging collaboration and the search for innovative solutions to problems (Han et al., 2022; Zhang et al., 2024). However, despite numerous studies highlighting the

benefits of PBL in developing students' skills, particularly in academic and social aspects, its impact on students' creativity remains not fully understood (Arizona, Sucilestari, & Suhardi, 2025; Arizona, Sucilestari, Mutiara, et al., 2025).

Previous research has largely focused on the impact of Project-Based Learning (PBL) in enhancing students' cognitive and social abilities, with limited attention given to how PBL specifically fosters students' creativity (Harjono et al., 2024; Parwoto et al., 2024; Siew & Ambo, 2018). This highlights a research gap that needs to be addressed, namely, how PBL contributes to developing students' creativity across various disciplines and educational contexts. Therefore, this study aims to explore and analyze the impact of PBL on students' creativity, providing a deeper understanding of the potential of PBL in enhancing creativity through the implementation of relevant real-world projects (Arizona et al., 2023; Arizona, Sucilestari, et al., 2024; Sucilestari & Arizona, 2018a).

The urgency of this research lies in the need to gain a deeper understanding of teaching methods that can effectively stimulate students' creativity, as high creativity plays a crucial role in academic achievement and the development of life skills (Arizona, Rokhmat, et al., 2024). This study is expected to contribute to the renewal of education policies and offer new insights for educators in designing more creative and impactful learning experiences. The findings of this research will also provide practical guidance for educators to optimize the use of Project-Based Learning (PBL) in supporting the development of students' creativity (Abidin et al., 2020; Sucilestari & Arizona, 2018b).

The importance of creativity in education has driven numerous studies to explore effective ways to develop students' creative skills, one of which is through Project-Based Learning (PBL)(Sucilestari et al., 2023, 2024). While many studies have investigated the impact of PBL on students' academic abilities, particularly in enhancing creative thinking and problem-solving skills, research specifically examining the overall impact of PBL on students' creativity remains limited (Cheng et al., 2022; Lou et al., 2017; Ummah et al., 2019). Based on previous research findings, PBL has been shown to encourage students to think creatively by linking theoretical knowledge with real-world practice, while also enhancing collaborative, analytical, and problem-solving skills. Therefore, this study offers novelty by delving deeper into the impact of PBL on students' creativity over the past two decades (2005-2025). The aim of this study is to analyze the effect of PBL on students' creativity based on relevant articles, examining aspects such as the country of origin of the research, research subjects, research type, topics discussed, and the results found.

METHOD

This investigation constitutes a systematic literature review employing the PRISMA methodology. This method consists of 4 (four) phases, namely: (1) identification, (2) screening, (3) eligibility, (4) included. The flow diagram of research activities carried out using the PRISMA method can be seen in Figure 1. The article selection process for the systematic literature review on the impact of Project-Based Learning (PBL) on students' creativity began with a search in the Scopus database on August 13, 2025. A total of 2,202 articles were identified based on the search criteria, including the article title, abstract, and keywords "project-based learning" and "creativity." The next step involved screening the articles based on these specific keywords, resulting in 145 articles. Further exclusions were made based on the document type, removing 52 conference papers, 7 book chapters, 2 reviews, 2 books, 1 note, and 1 editorial, leaving 80 articles eligible for the next stage.

During the eligibility stage, additional exclusions were made based on the language of the articles. Articles in Spanish (3), Japanese (1), Indonesian (1), and Russian (1) were removed, resulting in 74 articles deemed eligible for inclusion in the final review. In the final inclusion stage, articles with closed or paid access types, such as Gold (24 articles), Green (8 articles), and Hybrid Gold (1 article), were also excluded. After this rigorous selection process, 26 articles were included in the final review for further analysis.

2.1 Eligibility Requirements

The data for this study was collected by identifying articles published over the past 20 years (2005-2025) that are relevant to the research topic. The article data used in this research were sourced from publications between January 2005 and August 2025. These articles were retrieved from the Scopus electronic database, where they were filtered by subject area and language, ensuring that only English-language open-access articles were included. In total, 26 relevant articles were selected for this study.

2.2 Searching Techniques

The method employed to search for articles in this study involved using keywords such as "Project-Based Learning" AND "Creativity." The article search was conducted through the Scopus database. Scopus was chosen as the database for this search because articles published within it undergo a rigorous screening process, ensuring a higher level of objectivity in the results obtained.

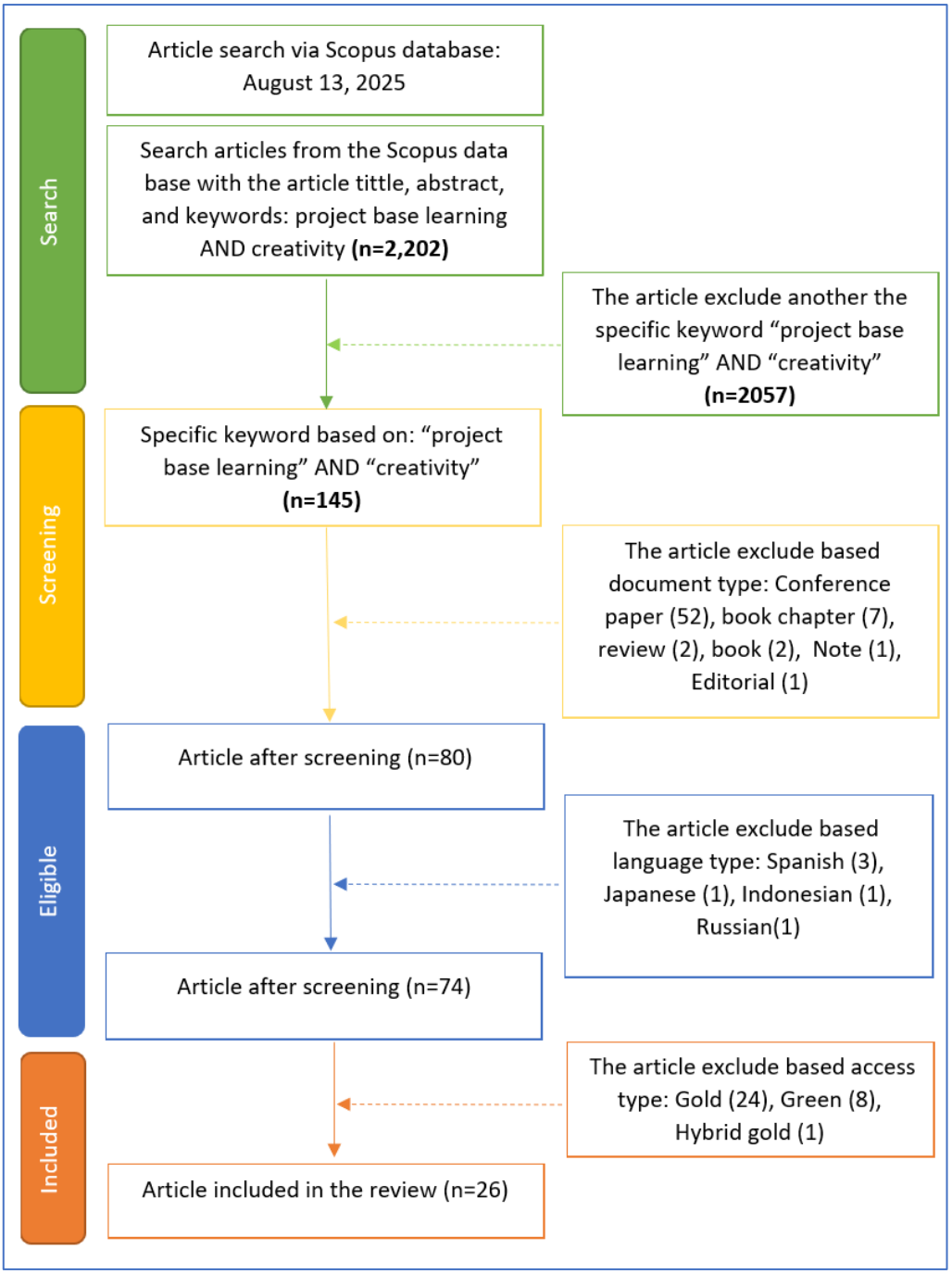

Figure 1 Systematic Literature Review information flow using PRISMA

2.3 Process in Study Selection and Data Collection

In this study, a data selection and collection process was carried out. The selection process involved evaluating abstracts to determine whether the data in the article abstracts met the criteria set for this research. The next step was to perform selection by examining the full content of the articles that met the eligibility requirements for this study. Subsequently, the data were

collected and analyzed using MS Excel to generate results that meet all the criteria. The information gathered was then analyzed according to the data classifications to be examined in this study: (1) Country of Origin and Affiliation, (2) Research Trends, (3) Type, (4) Topics, and (5) results.

FINDINGS AND DISCUSSION

3.1 Country of Origin and Afiliation

After analyzing and reviewing relevant articles, data related to the country of origin indicatecs that Asia is the continent that has produced the most articles examining the impact of project-based learning on students' creativity over the past two decades on Scopus.

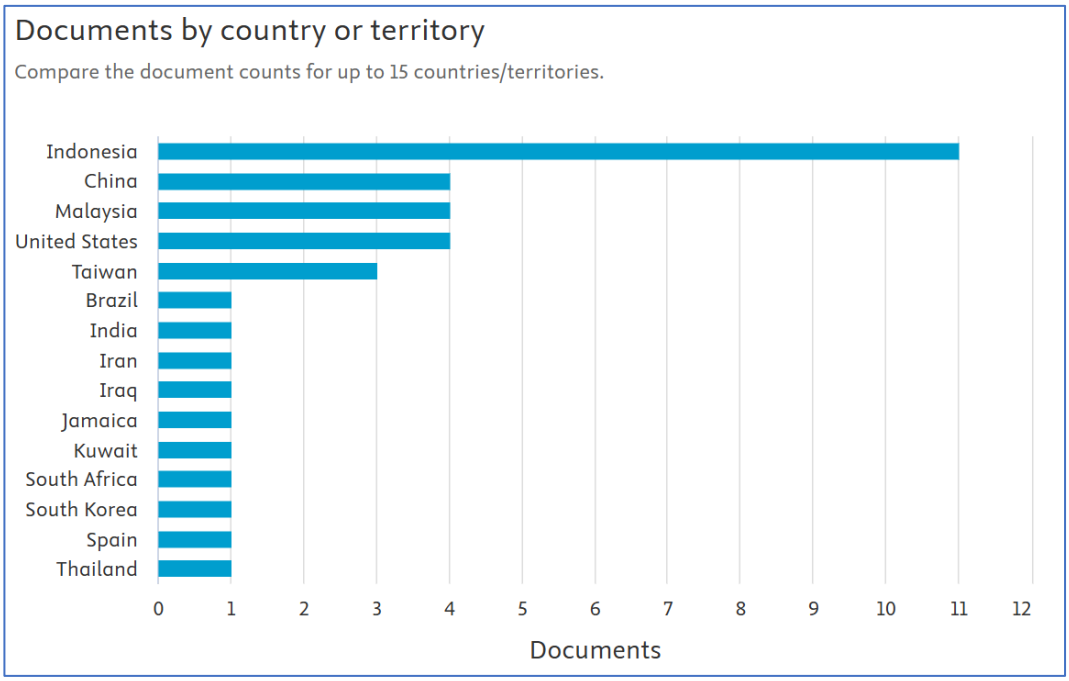

Figure 2 Distribution of research articles in terms of country oforigin

Figure 2 shows the distribution of documents by country or region, with Indonesia being the largest contributor, followed by China and Malaysia. The United States, Taiwan, Brazil, and India also contributed a significant number of documents. Meanwhile, countries such as Iran, Iraq, Jamaica, Kuwait, South Africa, South Korea, Spain, and Thailand each contributed only one or two documents.

Figure 3 illustrates the distribution of documents by affiliation, with Yogyakarta State University being the primary affiliation, contributing the largest number of documents. Jakarta State University also made a significant contribution, ranking second. Other affiliations, such as Kaomei Junior College

of Health, Nelcast Ltd, and Ping Tung Country Jioru Junior High School, each contributed a smaller yet still notable number of documents. Affiliations like the National Academy for Education, Mandalika University of Education, and Zhengzhou Institute of Industrial Technology made relatively balanced contributions, although lower than the two leading universities. Meanwhile, Hangzhou Caihe No.2 Primary School and China Australia Business College contributed fewer documents.

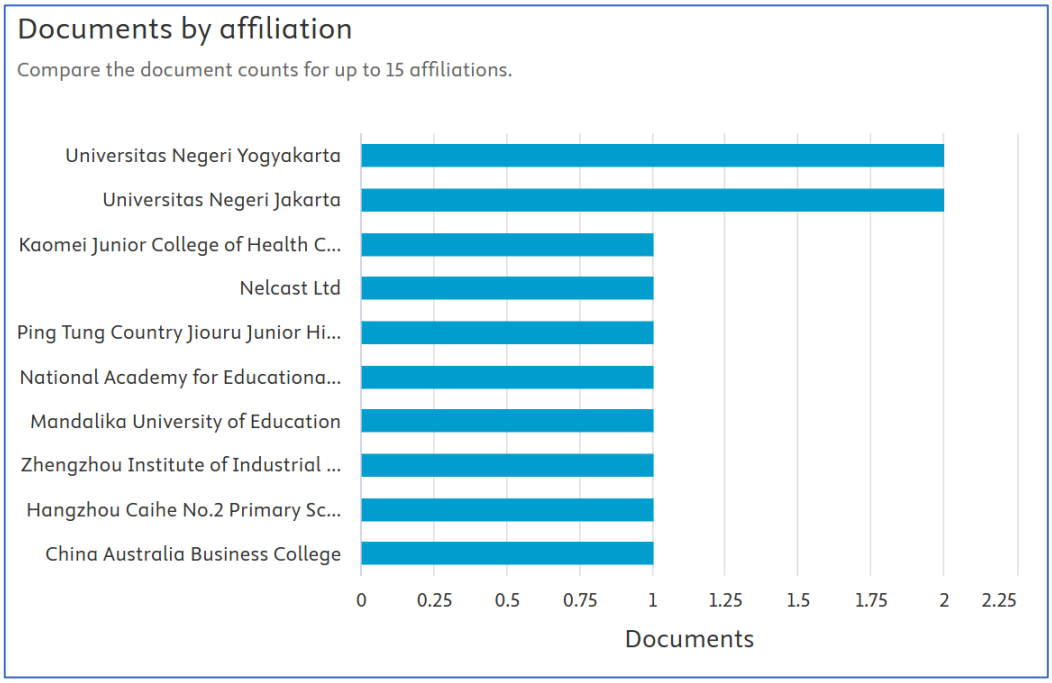

Figure 3 Distribution of research articles in terms of affiliation

3.2 Research Trends

Figure 4 illustrates the distribution of documents by year from 2011 to 2025. It is evident that the number of documents published was very low until 2017, with minimal contributions each year. However, starting in 2018, there was a significant surge, peaking in 2024, where the number of published documents increased sharply, exceeding 8 documents. This increase indicates a shift or event that contributed to the high documentation output during this period.

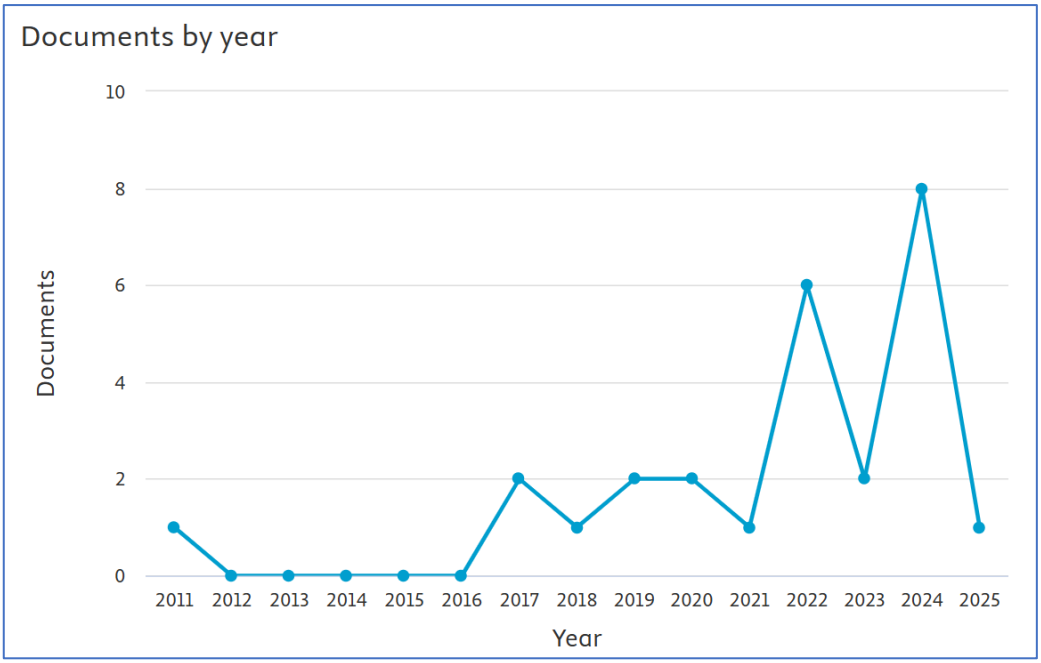

Figure 4 Distribution of research articles in terms of affiliation

After the peak in 2024, the number of documents slightly decreased, although it still remained higher than in previous years. This suggests consistency in document publication, albeit not at the level seen in 2024. Overall, the chart shows a dynamic pattern of document publication, with a clear surge occurring from 2020 to 2024, which may have been influenced by external factors or an increased focus in the research field during this period.

3.3 Topic

The Figure 5 illustrates the distribution of documents by topic, with "Social Sciences" being the dominant field, accounting for nearly 45% of the total documents. This is followed by "Psychology," contributing approximately 18.4% of the total documents published. "Computer Science" and "Mathematics" each account for 8.2%, making them significant fields, although not as prominent as Social Sciences and Psychology.

Other fields, such as "Energy," "Environmental Science," "Arts and Humanities," and "Business, Management, and Decision Science," contribute smaller percentages, ranging from 2% to 4%. "Engineering" and the "Other" category each account for 2%. This distribution pattern reflects a greater focus on social sciences and psychology, with notable contributions from technology and fundamental science fields as well.

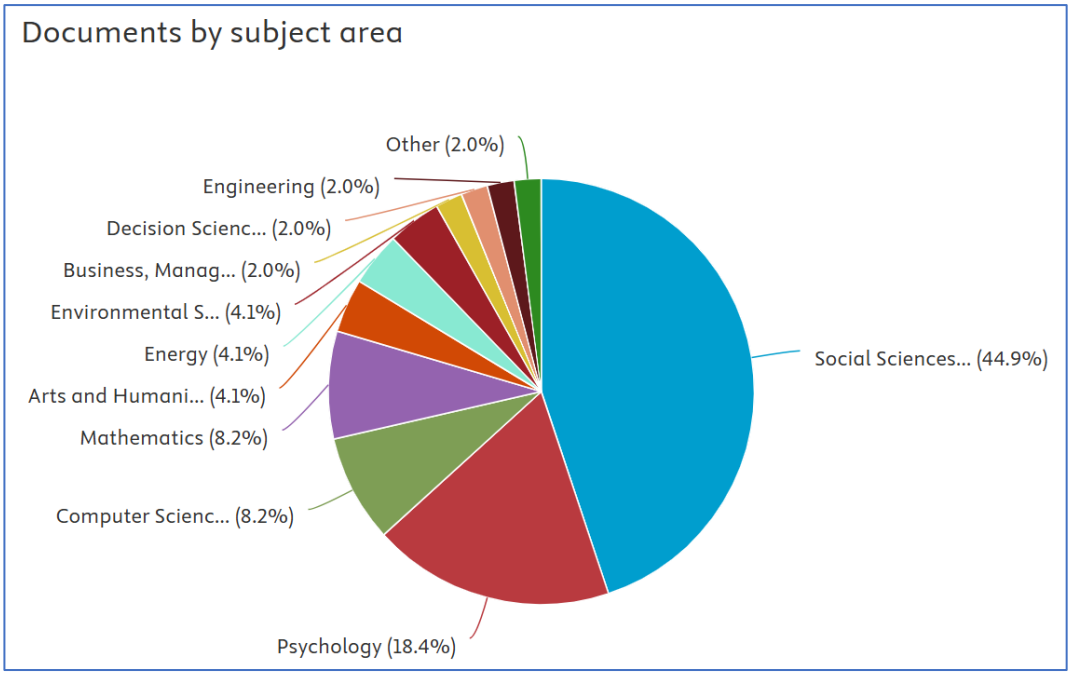

Figure 5 Research topics.

3.4 Type

The data analysis results from the study of the articles provide information on the types of research in the articles that examine project-based learning and student creativity, as shown in Table 1. The research studies analyzed in this review are primarily categorized into Experimental research, with 14 studies, which represents the most common approach. This category includes various studies, such as those by Gómez et al. (2023) and Siew & Ambo (2018), that utilized experimental designs to assess the effectiveness of Project-Based Learning (PBL) on creativity, critical thinking, and collaboration. The Research and Development (R&D) category follows with two studies, notably Usmeldi & Amini (2022), which focused on the development and testing of new educational models and tools to enhance PBL. Additionally, Qualitative research, which includes three studies like Ummah et al. (2019), delves deeper into the effects of PBL on student creativity and engagement in various educational settings.

In addition to these, the study also identifies other research types, including Case Studies (2 studies), Conceptual Framework (1 study), Autoethnography (1 study), and Mixed Method research (1 study). These methodologies explore different dimensions of PBL and its outcomes, such as Steinbeck (2011), which used case study analysis to understand the global implementation of design thinking. The findings highlight the variety of approaches employed in studying PBL, ranging from theoretical frameworks to empirical investigations, and underscore the widespread application of PBL

in enhancing 21st-century skills like creativity and critical thinking across diverse educational contexts.

Table 1. Research Type

Research Type	N	Authors
Experimental	14	Gómez et al. (2023), Siew & Ambo (2018), Anazifa (2017), Asyari et al. (2024), Harjono et al. (2024), Hao et al. (2024), Zhang et al. (2024), Cheng et al. (2022), Lou et al. (2017), Parwoto et al. (2024), Rohman et al. (2024), Hsiao et al. (2022), Halimah et al. (2020), Jia et al. (2023)
Research and Development (R&D)	2	Usmeldi & Amini (2022), Sutopo et al. (2024)
Qualitative	3	Ummah et al. (2019), Fitriani (2024), Putri et al. (2019)
Case Study	2	Halimah et al. (2020), Steinbeck (2011)
Conceptual Framework	1	Mandumpal et al. (2022)
Autoethnography	1	Fitriani (2024)
Mixed Method	1	Isa et al. (2020)
Classroom Action Research (CAR)	1	Putri et al. (2019)
Educational Practice Research	1	Zhang et al. (2024)
Pedagogical Research	1	Di Blasio & Ardeni (2021)

3.5 Result

Table 2 presents the findings from the studies analyzed in Scopus articles regarding Project-Based Learning (PBL) and student creativity. The last column of Table 2 outlines potential future research topics, highlighting areas with opportunities for deeper exploration and further studies.

Table 2. Data related to finding, limitations, and future research.

No	Researcher and Year	Finding	Limitations	Future Research
1	(Mandumpal et al., 2022)	✓Proposed the Innovation-Based Learning (InnBL) framework to integrate creativity and research from the first year. ✓Enhances graduate employability and aligns education with Industry 4.0.	✓Requires advanced infrastructure and skilled faculty, which may be lacking. ✓Difficulty in transferring skills to non-research careers.	✓Test and institutionalize InnBL to evaluate effectiveness. ✓Explore adaptation in diverse contexts and its impact on innovation.
2	(Ummah et al., 2019)	✓The study focused on implementing project-based learning (PjBL) to enhance creativity in students through the creation of mathematical learning manipulatives. ✓The results showed significant improvements in students' creativity, particularly in flexibility and novelty, while originality was considered fair. ✓PjBL enabled students to apply theoretical knowledge in practical, creative ways, fostering better problem-solving and innovation skills.	✓The study was limited to a specific cohort of students taking a course in learning media, which may restrict the generalizability of the findings to other educational contexts.	✓Future studies could explore the long-term impact of PjBL on creativity and its application across different subjects or age groups. ✓Expanding the research to include a larger and more diverse group of participants would provide more robust findings.
3	(Kwon & Lee, 2025)	✓STEM Project-Based Learning (PBL) significantly enhances students' creativity. ✓The meta-analysis revealed a large overall effect size of 3.888, indicating a strong positive impact on creative abilities.	✓Limited number of studies included in the meta-analysis. ✓Variability in study methods and creativity assessment tools. ✓Self-reported measures of creativity, which may introduce bias.	✓Further studies should focus on a larger variety of contexts and examine moderator effects. ✓Development of standardized, reliable instruments to measure creativity more accurately. ✓Exploration of the long-term impact of STEM PBL on creativity development.
4	(Gómez et al., 2023)	✓Both Project-Based Learning (PBL) interventions (using Scratch and Arduino robotics) significantly increased the creativity of high-ability students. ✓No significant difference was found between the two types of interventions, suggesting both methods effectively foster creativity.	✓The CREA test used did not allow for separate analysis of different creativity components (fluency, flexibility, originality). ✓The sample size may limit the generalizability of the results. ✓Variations in how each teacher implemented the interventions may have introduced bias.	✓Use more specific instruments to assess different creativity components. ✓Explore the impact of similar enrichment programmes on non-highly able students. ✓Investigate how these programmes can be scaled to formal classroom settings, requiring teacher training in PBL and creativity development.

No	Researcher and Year	Finding	Limitations	Future Research
5	(Halimah et al., 2020)	✓The study examined how Project-Based Learning (PBL) combined with lapbooking could foster creativity in primary school students. ✓The results demonstrated that using lapbooking in PBL allowed students to creatively explore topics, and it significantly enhanced their creativity. ✓Students were actively engaged in the process, which included investigating a topic, designing, and assembling their projects in lapbooks.	✓The study involved a small sample size (24 students) from one school, limiting generalizability. ✓The homogeneity of the sample (Sundanese children) may restrict the applicability of the findings to more diverse student populations.	✓Future studies could explore the use of lapbooking and PBL in different educational contexts and cultural backgrounds. ✓Research could also examine the long-term effects of such teaching methods on creativity.
6	(Siew & Ambo, 2018)	✓The PjBL-STEM module effectively enhances scientific creativity in Fifth Graders. ✓Significant improvements were seen in fluency, originality, elaboration, title abstraction, and resistance to premature closure. ✓ Students showed positive feedback, enjoying the activities and improved collaboration.	✓Issues with group cooperation and insufficient materials. ✓Some students were less engaged in sketching and presentations.	✓Address group cooperation challenges and material shortages. ✓Focus on improving student engagement in sketching and presentations.
7	(Anazifa, 2017)	✓The study compares the effects of Project-Based Learning (PBL) and Problem-Based Learning (PBL) on students' creativity and critical thinking skills in a biology course on the respiratory system. ✓Both teaching methods significantly impacted creativity and critical thinking. However, Project-Based Learning (PBL) had a greater effect on creativity compared to Problem-Based Learning (PBL). ✓There was no significant difference between PBL and Problem-Based Learning in terms of improving students' critical thinking.	✓The study involved only one topic (respiratory system) in a single school, which may limit the generalizability of the findings. ✓Limited to a specific group of students (11th-grade science students), so the results may not apply to other educational levels or subjects.	✓Replicate the study in other subjects and educational contexts to confirm the results. ✓Investigate long-term effects of PBL and Problem-Based Learning on creativity and critical thinking beyond a single unit of study.
8	(Asyari et al., 2024)	✓The study examined the use of Project-Based Learning (PBL) with Google Sites to enhance student creativity and collaboration in a Physics Tadris Study Program. ✓Results showed significant improvements in both creativity (fluency, flexibility, elaboration, and originality) and collaboration (active	✓The study involved a relatively small sample size (44 students) from a specific program, which may limit the generalizability of the results. ✓The research was conducted within a controlled educational context,	✓Future studies could investigate the long-term impact of using Google Sites in PBL across other subjects and disciplines. ✓Research could also focus on improving accessibility to technology for students from

No	Researcher and Year	Finding	Limitations	Future Research
		participation, responsibility, flexibility, and mutual respect). ✓ The PBL-Google Sites method was more effective than conventional teaching methods, providing a more interactive and enjoyable learning environment. ✓	which may not fully reflect real-world variations in technological access and student proficiency.	different backgrounds and settings.
9	(Han et al., 2022)	✓ Psychological safety positively impacts creativity in Project-Based Learning (PBL), with psychological empowerment acting as a mediator. ✓ A fault-tolerant culture moderates the relationship between psychological safety and psychological empowerment, further enhancing creativity. ✓ The study emphasizes the importance of creating a safe, empowering, and supportive environment in PBL to maximize student creativity.	✓ The research was conducted with a sample of students from Chinese higher education, which may limit its generalizability. ✓ Data was based on self-reports, which could introduce biases.	✓ Explore how different educational contexts and cultures affect the relationship between psychological safety, empowerment, and creativity. ✓ Investigate the negative effects of excessive psychological safety and how to balance it in educational settings.
10	(Jia et al., 2023)	✓ The review identifies Design Thinking and Project-Based Learning (DT-PBL) as a transformative educational approach enhancing students' creativity, problem-solving skills, and innovation. ✓ DT-PBL is effective across various disciplines, including engineering, design, vocational, and MBA education. ✓ The approach also positively influences teacher development by promoting student-centered teaching and encouraging interdisciplinary learning.	✓ The research is still in its early stages, with limited empirical studies. ✓ Challenges include the open-ended nature of the method, difficulties in assessment, and the need for extensive resources.	✓ Further exploration of how DT-PBL can be adapted for different disciplines and educational settings. ✓ Investigate long-term impacts on students' academic performance and 21st-century skills. ✓ Research on effective teacher training and overcoming implementation challenges like resource availability and class size.
11	(Usmeldi & Amini, 2022)	✓ The development of a Creative Project-Based Learning (CPjBL) model for Electric Motor Installation has proven effective in improving students' creativity and competencies. ✓ Students were able to solve problems and create projects with increased creativity, especially in the knowledge domain, skill application, and work attitudes. ✓ The CPjBL model showed improvements in students' creative thinking, particularly in fluency, flexibility, and elaboration,	✓ While the model was effective, some students showed difficulties with originality in creative tasks. ✓ The study's sample size was limited to three schools, which may affect the broader applicability of the results.	✓ Further studies could focus on enhancing originality in creative tasks through CPjBL. ✓ Research could explore the scalability of this model across different vocational subjects and educational contexts.

No	Researcher and Year	Finding	Limitations	Future Research
		with some challenges in fostering originality. ✓		
12	(Parwoto et al., 2024)	✓Collaborative Project-Based Learning (PjBL), when combined with computer activities, significantly enhances creativity in kindergarten children. ✓Play motivation further supports creativity in children, particularly when they engage in collaborative PjBL.	✓The study was limited to a single educational setting (Makassar Lotus Kindergarten) and a specific age group, which may limit generalizability. ✓The influence of individual differences in creativity was not explored.	✓Investigate long-term effects of collaborative PjBL on creativity. ✓Explore the impact of play motivation and learning strategies across various age groups and educational contexts.
13	(Sutopo et al., 2024)	✓The study developed and tested a Peer-Project-Based Learning (Peer-PbL) model for CNC simulation programming courses. ✓The model includes steps such as team creation, project planning, performance monitoring, presentations, and peer assessment. ✓Feasibility testing by experts in CNC, machine learning, and learning technology indicated strong support for the model's effectiveness in increasing self-efficacy and creativity. ✓After implementing the model, students showed significant improvements in both self-efficacy and creativity, suggesting that the Peer-PbL model is effective in enhancing student learning outcomes in CNC courses.	✓The study was conducted with a small sample size (15 students), which limits the generalizability of the results. ✓The research was conducted within a specific course context, so the findings may not apply to other subjects or disciplines.	✓Future studies should involve larger sample sizes and replicate the model in different courses or educational contexts. ✓Investigating long-term effects of the Peer-PbL model on students' skills and creativity in vocational education could provide further insights.
14	(Steinbeck, 2011)	✓Design thinking is an effective methodology for fostering creativity in students, addressing complex and unstructured problems. ✓Applied in a global context, such as in a collaboration with universities in Colombia, design thinking helps build creative competence in students from various disciplines. ✓The process involves understanding users, ideating, prototyping, and testing solutions, making it highly suitable for innovation-based education.	✓The methodology's implementation outside engineering and design disciplines may require adjustments. ✓Success depends on diverse teams and robust interaction, which may be challenging to replicate in every educational setting.	✓Investigate how design thinking can be integrated into different educational contexts, including distance and blended learning. ✓Explore the effectiveness of design thinking in developing creative problem-solving skills across various disciplines. ✓Study the impact of using social media and collaborative technologies in supporting creative processes within

No	Researcher and Year	Finding	Limitations	Future Research
				design thinking frameworks.
15	(Hsiao et al., 2022)	✓The study assessed the effects of Project-Based Learning (PBL) combined with the Cognitive-Affective Interaction Model (CAIM) on junior high school students' STEAM knowledge, creativity, and hands-on performance. ✓Results showed that the experimental group (EG), using PBL with CAIM, significantly outperformed the control group (CG), which used PBL alone, in terms of STEAM knowledge, creativity, and hands-on performance. ✓The study also found that incorporating CAIM into PBL enhanced students' creativity, particularly in curiosity and complexity, by providing them with more opportunities to independently engage and solve problems creatively.	✓The study was limited to a single class of junior high school students, and findings may not be generalizable across different educational settings. ✓The research did not fully explore the long-term impact of the teaching strategies on students' knowledge retention and creativity.	✓Future studies could involve larger sample sizes and diverse educational contexts to better understand the broader application of PBL with CAIM. ✓Long-term studies examining the lasting effects of this teaching strategy on students' creativity and knowledge retention would provide deeper insights.
16	(Lu et al., 2022)	✓The study explored the effects of a PBL-oriented STEAM curriculum on students with learning disabilities, using micro:bit and paper cutting to support creativity and learning outcomes. ✓Results showed immediate and retention effects on creativity, measured using the Torrance Tests of Creative Thinking (TTCT). ✓Significant improvements in creativity were observed, especially in flexibility, originality, and openness, for all participants. ✓The PBL approach allowed students to engage in interdisciplinary tasks and boosted their self-confidence and problem-solving skills.	✓The study involved only three participants, which limits the generalizability of the findings. ✓The research was focused on a specific group of students with learning disabilities, which may not be applicable to the general student population.	✓Expand the study to include more participants and diverse student populations to confirm the results. ✓Explore the long-term impacts of the PBL-oriented STEAM curriculum on students with disabilities. ✓Investigate other ways to integrate technology and creativity in STEAM education.
17	(Cheng et al., 2022)	✓The study evaluated a project-based STEAM program focused on designing musical instruments to enhance creativity among fourth-grade students. ✓Results showed that students in the experimental group (PBL STEAM) demonstrated	✓The study was limited to a single project (designing a musical instrument), and future research could involve a broader range of projects. ✓The teacher's potential bias, as the	✓Further studies could involve multiple projects and utilize different teachers to avoid the experimenter effect. ✓Long-term studies could explore the sustained impact of project-based STEAM

No	Researcher and Year	Finding	Limitations	Future Research
		significant improvement in creativity, both individually (e.g., divergent thinking and originality) and at the group level, compared to the control group (traditional science education). ✓ Students also developed stronger skills in interdisciplinary problem-solving, reflecting enhanced creative capacities.	same instructor taught both groups, could have influenced the outcomes.	education on creativity over time.
18	(Fitriani, 2024)	✓ This autoethnographic study explored the use of Project-Based Learning (PBL) through webinar assignments during the COVID-19 pandemic in higher education. ✓ The study found that PBL enhanced student engagement, creativity, and collaboration in an online setting, particularly through the organization of webinars. ✓ The students developed key skills such as communication, creativity, and teamwork while producing practical, real-world projects. ✓ The research also demonstrated that the use of online PBL, specifically through webinars, facilitated a high level of student participation and learning despite the challenges posed by the pandemic.	✓ The study focused on a single university, which may limit the generalizability of the findings to other institutions. ✓ The sample size was limited to the students in three classes over three semesters, which might not be representative of broader student populations.	✓ Future research could explore the long-term impacts of PBL on student engagement and creativity. ✓ Further studies could investigate the use of PBL in different disciplines and compare online and in-person learning outcomes.
19	(Isa et al., 2020)	✓ The study investigates the role of Project-Based Learning (PoBL) in enhancing the employability skills of Woodwork Technology Education (WTE) students at Colleges of Education (Technical) in Nigeria. ✓ Findings revealed that the current WTE curriculum lacks sufficient incorporation of employability skills such as problem-solving, communication, critical thinking, and leadership. ✓ The use of PoBL could significantly improve these skills by providing practical, industry-aligned tasks that enhance students' creativity and ability to work collaboratively. ✓	✓ The study involved a small sample (67 lecturers and 7 interview participants) from two colleges, which may limit generalizability. ✓ The research was conducted within a single academic field (WTE) at Nigerian technical colleges, and its findings may not apply to other fields or institutions.	✓ Further studies could explore how PoBL can be applied to other technical and vocational education fields. ✓ Research could also investigate the long-term effects of PoBL on students' employability after graduation.

No	Researcher and Year	Finding	Limitations	Future Research
20	(Putri et al., 2019)	✓The study used Project-Based Learning (PBL) to enhance ecoliteracy and student creativity through waste utilization in social studies. ✓Results showed an increase in ecoliteracy and student engagement, with students becoming more active and confident in expressing their opinions. ✓Students demonstrated improved creativity in utilizing waste materials.	✓The study was limited to a small sample (fifth-grade students at a single school), which may affect the generalizability of the findings. ✓Some learning activities did not fully engage all students, and teacher guidance was still lacking in certain areas.	✓Replication with larger, more diverse student groups to confirm the results. ✓Explore the long-term impact of PBL on ecoliteracy and creativity across different educational contexts. ✓Investigate how teachers can more effectively implement PBL to enhance student engagement and creativity.
21	(Lou et al., 2017)	✓The study explored the effects of STEM Project-Based Learning (PBL) integrated with CaC2 steamship activities on creativity among junior high school students. ✓Results indicated that the PBL model significantly improved students' creativity, particularly in areas like imagination, curiosity, and problem-solving. ✓Students applied STEM knowledge effectively during the hands-on design and testing phases of the CaC2 steamship project. ✓	✓The study was limited to 60 students from one junior high school, which may affect the generalizability of the results. ✓The study focused on a single project theme, limiting the diversity of STEM applications.	✓Future studies could explore the long-term impact of STEM PBL on creativity and academic performance. ✓Expanding the research to different schools and regions would provide more generalizable findings.
22	(Harjono et al., 2024)	✓The Project-Based Learning (PjBL) model enhanced the creativity of prospective physics teachers (PPTs), particularly in generating learning media. ✓Creativity improvement was observed for both Field Dependent (FD) and Field Independent (FI) cognitive styles, but FD individuals showed higher creativity gains. ✓The study found that PjBL is particularly effective for those with a FD cognitive style in fostering creativity, as FD individuals are more engaged in collaborative activities. ✓	✓The study was conducted with a small sample of 40 PPTs from a single university, limiting generalizability. ✓The use of a one-group pretest-posttest design lacks a control group, which limits the ability to infer causal relationships.	✓Future studies should replicate the research with larger and more diverse samples to enhance generalizability. ✓Investigate the long-term effects of PjBL on creativity and teaching practices. ✓Explore how specific aspects of PjBL (e.g., task types, project structures) affect creativity across different cognitive styles.
23	(Hao et al., 2024)	✓Project-Based Learning (PBL) and Project-Based Flipped Classrooms (PBFC) positively affect critical thinking and creativity in	✓The study was conducted with a single group of students at one vocational college,	✓Expand the study to different vocational colleges and fields of study to enhance the

No	Researcher and Year	Finding	Limitations	Future Research
		business English learners at higher vocational colleges. ✓PBFC had a larger impact on both critical thinking and creativity compared to traditional PBL. ✓PBFC proved to be a more effective teaching approach for developing higher-order thinking skills.	limiting the generalizability of the results. ✓The study primarily focused on business English learners, so the findings may not be directly applicable to other subjects.	generalizability of the findings. ✓Further investigate the long-term impacts of PBFC on creativity and critical thinking.
24	(Rohman et al., 2024)	✓The Ethnoecological-STEM Project-Based Learning (E-STEM PjBL) model effectively enhances science concept mastery, critical thinking skills, and creativity in prospective science teachers. ✓Students showed significant improvements in understanding science concepts and developing critical thinking and creativity skills.	✓The study involved a small sample size (31 students), which may limit generalizability. ✓Data collection was based on a single course and a limited time frame.	✓Replication of the study in different educational contexts with larger sample sizes. ✓Further examination of the long-term effects of E-STEM PjBL on students' critical thinking and creativity.
25	(Zhang et al., 2024)	✓The study focused on enhancing medical students' intrinsic motivation through project-based learning, emphasizing creativity and innovation. ✓Key strategies included assigning individualized projects that sparked curiosity, empathy, and a sense of responsibility. ✓Students showed significant improvements in professional skills, creativity, and competition results, demonstrating the positive impact of authentic and personalized project-based learning on intrinsic motivation.	✓The study primarily focused on medical students, which may limit the generalizability to other fields. ✓The research was confined to one institution, so the findings might not apply to broader educational contexts.	✓Replicating the study across diverse disciplines and institutions to assess the broader impact on motivation and creativity. ✓Investigating the long-term effects of project-based learning on students' career development and innovation skills.
26	(Di Blasio & Ardeni, 2021)	✓The study discusses the project-based learning (PBL) activity "Ma chi parla?" (Who is Talking?), which involved students in creating audiovisual translations (dubbing and subtitling) from English to Italian as part of an advanced Italian language course. ✓The activity fostered creativity, collaboration, and intercultural dialogue among students and instructors. ✓The project highlighted dubbing as a significant cultural and pedagogical tool in Italy and offered insights into the process of audiovisual translation	✓The first implementation of the activity had some shortcomings, including a lack of clarity in assessing the integration of cultural elements. ✓Limited exposure to the history of dubbing and its professional, linguistic, and cultural implications.	✓Future implementations could integrate a more in-depth historical context of dubbing in Italy and its cultural effects. ✓Expansion of the project to explore the intersection of professional and unofficial dubbing, including student engagement with online practices like fandubbing. ✓Further exploration of intercultural issues in dubbing, such as

No	Researcher and Year	Finding	Limitations	Future Research
		(AVT), particularly through reverse translation.		accent and regional linguistic diversity.

The findings from the analyzed studies consistently highlight the positive impact of Project-Based Learning (PBL) on enhancing student creativity, as reflected in various experimental, qualitative, and other research designs. Previous studies, such as those by Gómez et al. (2023) and Siew & Ambo (2018), support the findings of this review, demonstrating that PBL is effective in fostering creativity across various domains, including flexibility, originality, and elaboration. This is further corroborated by Kwon & Lee (2025), who found that STEM Project-Based Learning (PBL) significantly enhances creativity, with a large overall effect size, although they acknowledge the limitation of a small number of studies included in their meta-analysis.

Research in Research and Development (R&D), such as by Usmeldi & Amini (2022) and Sutopo et al. (2024), has made significant contributions by developing and testing new educational models and tools that enhance PBL's effectiveness in improving creativity and competencies. These studies suggest that the models they developed can be adapted for use in various educational contexts, from primary schools to higher education. Additionally, Han et al. (2022) emphasize the importance of creating a psychologically safe environment in PBL, which significantly enhances student creativity. However, these findings also highlight the limitation of studies that focus on small sample sizes or specific groups, which restricts the generalization of results (such as in studies involving students with disabilities, like Lu et al., 2022).

Furthermore, studies by Anazifa (2017) and Fitriani (2024) illustrate that the application of PBL in different learning contexts, such as biology education or online learning environments, can lead to improvements in creativity and problem-solving skills. However, both studies also acknowledge limitations in terms of cross-disciplinary applications and the broader generalizability of their findings. Sutopo et al. (2024) further demonstrate that the Peer-Project-Based Learning (Peer-PbL) model, tested in CNC programming courses, resulted in significant improvements in self-efficacy and creativity, although the results were constrained by the small sample size and the highly specialized course context.

On the other hand, Fitriani (2024) employed an Autoethnographic approach, highlighting that PBL, particularly in an online learning context during the COVID-19 pandemic, contributed significantly to student engagement, creativity, and collaboration. Despite the findings, the study was limited by its focus on a single university with a small sample size. This limitation calls for

further research to investigate the long-term impact of PBL in online learning settings and its effect on students' creativity and engagement.

This study reinforces the effectiveness of PBL in enhancing creativity; however, several limitations remain, particularly regarding sample size, context variations, and methods of assessing creativity. The existing studies suggest that further research is necessary to explore the long-term effects of PBL across various disciplines, including the integration of technology and the development of more inclusive educational models. Future research should focus on the factors that can further improve PBL effectiveness, such as refining creativity assessment tools and applying PBL in more diverse cultural and disciplinary contexts. Additionally, the role of educators in supporting the implementation of PBL is crucial, and further exploration is needed to investigate how teacher training can enhance the positive outcomes identified in this review.

CONCLUSION

This study demonstrates that Project-Based Learning (PBL) significantly enhances student creativity by fostering creative thinking, collaboration, and problem-solving skills. Based on the country of origin and affiliation, Asia, particularly Indonesia, has contributed the most research on the impact of PBL on student creativity, with notable contributions from China and Malaysia. Research trends show a significant increase in published documents from 2018, peaking in 2024. The dominant research topics include Social Sciences and Psychology, with significant contributions also from Computer Science and Mathematics. While the benefits of PBL in enhancing creativity are evident, there are limitations in the existing research, such as small sample sizes and context variations, which hinder the generalizability of the findings. In terms of research types, the majority of studies were experimental, followed by Research and Development (R&D), qualitative research, and case studies. Key findings from these studies emphasize the positive effects of PBL in fostering creativity, yet the existing studies also highlight the need for further investigation into the long-term effects of PBL across various disciplines and educational contexts. Therefore, addressing these limitations and exploring PBL's broader impact is crucial for advancing our understanding of its role in developing creativity in students.

Further research is needed with larger and more diverse sample sizes, as well as the development of more accurate creativity assessment tools. Additionally, studies should explore the integration of PBL with technology and focus on improving teacher training to enhance the effectiveness of PBL implementation. This would contribute to a broader understanding of how PBL can be optimally applied to foster creativity in various educational settings.

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