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Investigating the Effect of Project-Based Learning on Creativity and Problem-Solving Skills in Elementary School Students

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ABSTRACT

Project-Based Learning (PBL) has emerged as one of the most influential student-centered instructional approaches in contemporary education. The present study investigated the effect of Project-Based Learning on creativity and problem-solving skills among elementary school students. A quasi-experimental research design with pre-test and post-test control groups employed. Sixty elementary school students selected and randomly assigned to either an experimental group receiving Project-Based Learning instruction or a control group receiving traditional teacher-centered instruction. The intervention lasted for twelve weeks and involved interdisciplinary projects requiring collaboration, inquiry, and real-world problem-solving. Creativity assessed using the Torrance Tests of Creative Thinking, while problem-solving skills measured through a standardized Problem-Solving Skills Inventory. Data were analyzed using descriptive statistics and inferential methods. Results indicated significant improvements in both creativity and problem-solving skills among students exposed to Project-Based Learning compared to those in the control group. Furthermore, moderate-to-large effect sizes suggested that the instructional approach had meaningful educational benefits. Findings support constructivist theories emphasizing active engagement, collaboration, and authentic learning experiences. The study highlights the potential of Project-Based learning to foster higher-order thinking skills essential for success in the twenty-first century. Educational implications suggest that teachers and curriculum developers should integrate project-based strategies into elementary education to enhance creativity and critical thinking capacities. Future studies are encouraged to examine long-term effects, different age groups, and variations in project design. Overall, Project-Based Learning represents an effective pedagogical framework for promoting cognitive and creative development among young learners and preparing them for complex real-world challenges.

Introduction

Education in the twenty-first century increasingly emphasizes the development of higher-order thinking skills, creativity, collaboration, and problem-solving abilities rather than the mere acquisition of factual knowledge. Rapid technological advancement, globalization, and the complexity of modern social and economic systems require students to possess adaptive skills that enable them to navigate uncertain environments effectively (Bell, 2010).

Consequently, educational researchers and policymakers have advocated instructional approaches that actively engage learners in meaningful and authentic learning experiences.

Project-Based Learning (PBL) is one such approach that has gained considerable attention during the past two decades. PBL grounded in constructivist learning theory, which posits that learners actively construct knowledge through interaction with their environment and social contexts (Vygotsky,1978).

Rather than receiving information passively, students engage in extended investigations centered on complex questions, problems, or challenges. Through these projects, learners develop deeper conceptual understanding while simultaneously

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cultivating critical thinking and creativity (Thomas,2000).

Creativity has become a particularly valued educational outcome in contemporary society. Creativity refers to the ability to generate original, useful, and innovative ideas that contribute to problem resolution and knowledge advancement (Runco & Jaeger,2012). Researchers have argued that creativity developed through educational experiences that encourage exploration, experimentation, and divergent thinking (Beghetto & Kaufman,2014). Traditional instructional approaches often emphasize memorization and standardized responses, potentially limiting opportunities for creative expression. In contrast, PBL encourages students to explore multiple solutions, engage in inquiry, and produce unique project outcomes. Problem-solving skills are equally critical for academic and life success. Problem solving involves identifying challenges, generating alternatives, evaluating evidence, and implementing effective solutions (Jonassen,2011). Elementary school represents a crucial developmental period during which students begin to acquire foundational cognitive strategies that influence future learning. Therefore, instructional approaches capable of enhancing these competencies are of substantial educational significance. Several scholars have suggested that Project-Based Learning may foster problem-solving skills by immersing students in authentic contexts requiring critical analysis and decision-making (Hmelo-Silver,2004). Unlike conventional classroom tasks characterized by predetermined answers, project-based activities often involve open-ended challenges that require learners to evaluate information, collaborate with peers, and adapt strategies as new information emerges. Such experiences mirror real-world situations and may contribute to stronger problem-solving capabilities. Another important aspect of PBL is collaboration. Collaborative learning environments facilitate social interaction, communication, and collective knowledge construction (Johnson & Johnson,2009). Working in teams exposes students to diverse perspectives and encourages negotiation, reflection, and shared decision-making. These experiences may further enhance creativity and problem-solving abilities by promoting cognitive flexibility and perspective-taking. Empirical evidence supporting Project-Based Learning has grown substantially. Studies have demonstrated positive effects on academic achievement, motivation, engagement, and critical thinking (Condliffe et al.,2017). Nevertheless, research focusing specifically on elementary school students remains relatively limited. Young learners possess unique developmental characteristics, and understanding how PBL influences creativity and problem-solving during early educational stages is essential for informing pedagogical practice. The present study seeks to contribute to the literature by examining the effectiveness of Project-Based Learning in enhancing creativity and problem-solving skills among elementary school students. Specifically, the study compares students participating in a structured PBL intervention with peers receiving traditional instruction. By investigating changes in cognitive and creative outcomes, the study aims to provide evidence regarding the educational value of Project-Based Learning at the elementary level. The findings expected to inform educators, curriculum developers, and policymakers interested in designing learning environments that promote innovation and higher-order thinking. Furthermore, the study contributes to ongoing discussions concerning the role of active learning methodologies in preparing students for future academic, professional, and societal challenges. Through this investigation, a deeper understanding of the mechanisms through which Project-Based Learning influences student development can be achieved, ultimately supporting educational practices that nurture creativity and effective problem-solving from an early age.

Literature Review

Project-Based Learning has its roots in progressive educational philosophy and experiential learning traditions. Dewey (1938) argued that meaningful learning occurs when students actively engage with real-life experiences and reflect upon their actions. This perspective later influenced constructivist theories, which emphasize learner-centered environments where knowledge constructed rather than transmitted (Piaget,1972).

Thomas (2000) defined Project-Based Learning as a systematic teaching method that engages students in learning essential knowledge and skills through an extended inquiry process structured around complex questions and authentic tasks. According to Blumenfeld et al. (1991), PBL promotes motivation because learners perceive educational activities as relevant and meaningful. Students become active participants in knowledge construction rather than passive recipients of information.

Creativity has extensively studied within educational psychology. Torrance (1974) proposed that creativity encompasses fluency, flexibility, originality, and elaboration. Educational environments encouraging exploration and autonomy tend to facilitate creative development (Amabile,1996). Project-Based Learning aligns closely with these principles by providing opportunities for inquiry, experimentation, and innovation. Research indicates that students participating in project-based environments often demonstrate higher creativity scores than those receiving conventional instruction (Kokotsaki et al.,2016).

Problem-solving skills have similarly attracted substantial scholarly attention. Jonassen (2011) emphasized that meaningful problem solving requires learners to engage in reasoning, analysis, and decision-making processes. Authentic problems encountered in Project-Based Learning environments believed to stimulate these cognitive processes by presenting learners with challenges that lack predetermined solutions. Several empirical studies support the effectiveness of PBL in promoting higher-order thinking. For example, Hernández-Ramos and De La Paz (2009) reported significant improvements in critical thinking among students engaged in historical inquiry projects. Likewise, Capraro et al. (2013) found that project-based instruction improved both academic performance and problem-solving skills across multiple grade levels.

Social constructivist theory further explains the potential benefits of Project-Based Learning. Vygotsky (1978) proposed that cognitive development occurs through social interaction and collaborative engagement. Within PBL environments, students frequently work in groups, exchange ideas, and co-construct knowledge. Such interactions facilitate deeper understanding and support the development of complex cognitive abilities.

Research focusing specifically on elementary education has produced encouraging findings. Holm (2011) observed increased engagement and conceptual understanding among elementary students participating in project-based science instruction. Similarly, Mihic and Zavrski (2017) reported enhanced creativity and motivation following implementation of project-oriented learning activities.

Meta-analytic evidence also supports Project-Based Learning. Condliffe et al. (2017) reviewed multiple studies and concluded that well-designed PBL interventions positively influence academic achievement and student engagement. However, the magnitude of effects varied according to implementation quality, teacher expertise, and project design characteristics.

One mechanism through which PBL may influence creativity is the promotion of divergent thinking. Divergent thinking involves generating multiple possible solutions to a problem, is widely recognized as a core component of creativity (Runco & Acar,2012). Project activities requiring brainstorming, experimentation, and innovation provide opportunities for students to exercise these cognitive processes.

Similarly, problem-solving improvements may result from repeated exposure to authentic challenges requiring strategic thinking. According to Hmelo-Silver (2004), inquiry-based and project-based learning environments foster self-regulated learning and metacognitive awareness, both of which contribute to effective problem solving.

Despite growing evidence, gaps remain in the literature. Many studies focus on secondary or higher education populations, while fewer investigations examine elementary students. Furthermore, limited research simultaneously explores creativity and problem-solving outcomes within a single study. Addressing these gaps is important because elementary education provides the foundation upon which future cognitive and academic development built. Consequently, the current study seeks to extend existing research by evaluating the impact of Project-Based Learning on both creativity and problem-solving skills among elementary school students using a controlled quasi-experimental design.

Methodology

This study employed a quasi-experimental pretest-posttest control group design to investigate the impact of Project-Based Learning (PBL) on creativity and problem-solving skills among elementary school students. Quasi-experimental designs frequently used in educational research when complete randomization is difficult to implement in authentic school settings (Creswell & Creswell,2018).

The study sample consisted of 60 fourth- and fifth-grade students recruited from two public elementary schools. Participants were randomly assigned at the classroom level into an experimental group (n=30) and a control group (n=30). Prior to the intervention, all students completed baseline assessments measuring creativity and problem-solving abilities to ensure equivalence between groups. The experimental group participated in a twelve-week Project-Based Learning program. Students worked collaboratively on interdisciplinary projects related to environmental sustainability, community improvement, and scientific inquiry. The projects required learners to identify problems, collect information, generate solutions, create products, and present findings. Teachers served primarily as facilitators, guiding inquiry and encouraging reflection. In contrast, the control group received traditional teacher-centered instruction characterized by lectures, textbook activities, and structured exercises (Thomas,2000).

Creativity measured using the Torrance Tests of Creative Thinking (TTCT), a widely validated instrument assessing fluency, flexibility, originality, and elaboration (Torrance,1974). Problem-solving skills evaluated using the Problem-Solving Skills Inventory adapted for elementary learners (Heppner & Petersen,1982). Both instruments demonstrated acceptable reliability coefficients above .80.

Data analysis conducted using SPSS Version 29. Descriptive statistics including means and standard deviations were calculated. Independent-samples t-

tests and ANCOVA analyses performed to examine differences between groups while controlling for pretest scores. Effect sizes calculated using Cohen is d to determine practical significance (Cohen, 1988). Statistical significance established at $p<.05$. Consistent with constructivist learning theory, it hypothesized that students participating in Project-Based Learning would demonstrate significantly higher creativity and problem-solving scores than students receiving traditional instruction (Vygotsky,1978).

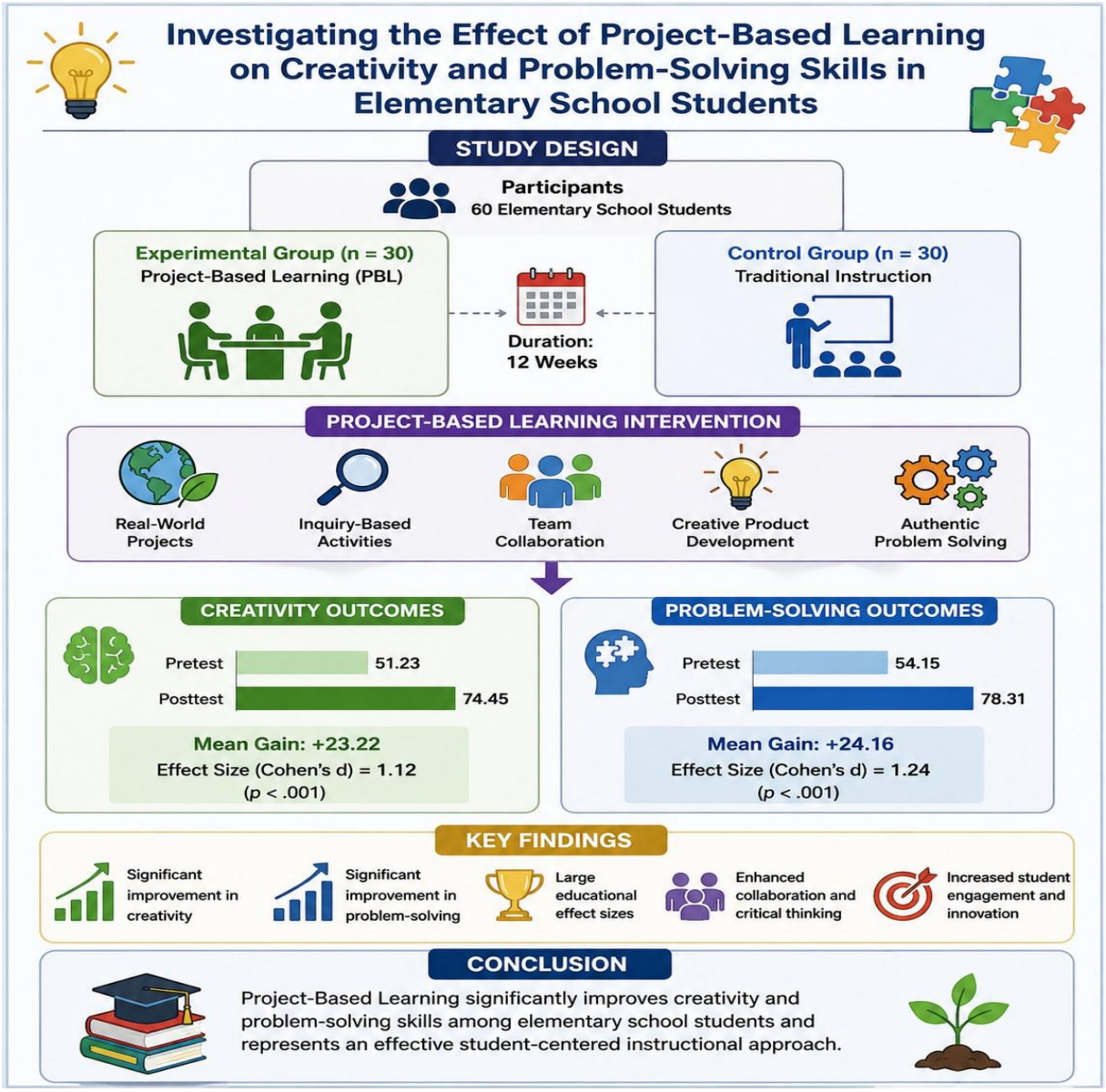

Figure 1. Methodologies

Results

Table 1. Descriptive Statistics for Creativity Scores

Group	Pretest Mean ± SD	Posttest Mean ± SD	Mean Gain
Experimental (PBL)	51.23 ± 8.12	74.45 ± 7.34	+23.22
Control	50.88 ± 8.45	57.62 ± 8.01	+6.74

The findings presented in Table 1 indicate notable differences between the experimental and control groups regarding creativity development. At baseline, both groups demonstrated nearly identical creativity scores, suggesting that students began the study with comparable levels of creative ability. The

experimental group recorded a pretest mean score of 51.23, whereas the control group obtained a mean score of 50.88. This similarity supports the assumption that any subsequent differences reasonably attributed to the intervention rather than preexisting disparities. Following the twelve-week instructional period, substantial improvements observed in the experimental group. Students exposed to Project-Based Learning achieved a posttest mean score of 74.45, representing an increase of 23.22 points. By comparison, students receiving traditional instruction exhibited a smaller increase of only 6.74 points. These results indicate that Project-Based Learning was considerably more effective in promoting creativity than conventional classroom practices. Several factors may explain these findings.

First, project-based activities encourage divergent thinking by requiring students to generate multiple ideas and alternative solutions. Creativity researchers have consistently identified divergent thinking as a central component of creative performance (Runco & Jaeger,2012). During project implementation, students were encouraged to explore various approaches, test hypotheses, and create unique products, thereby stimulating originality and flexibility.

Second, collaborative project work likely contributed to creativity enhancement. Exposure to diverse perspectives enables students to combine ideas in novel ways and engage in constructive dialogue. Such interactions often facilitate creative insight and innovation. Furthermore, authentic tasks presented meaningful contexts that increased student motivation and engagement, both of which are associated with creative achievement. The relatively modest gains observed in the control group may reflect natural developmental progression and routine classroom learning. However, the magnitude of improvement was substantially smaller than that observed in the PBL group. These findings align with previous research suggesting that student-centered instructional approaches foster greater creative growth than traditional methods.

Overall, Table 1 provides strong evidence that Project-Based Learning significantly enhances creativity among elementary school students. The results support constructivist perspectives emphasizing active engagement, inquiry, and experiential learning as essential conditions for creative development.

Table 2. Descriptive Statistics for Problem-Solving Skills

Group	Pretest Mean ± SD	Posttest Mean ± SD	Mean Gain
Experimental (PBL)	54.15 ± 7.94	78.31 ± 6.87	+24.16
Control	53.89 ± 8.02	60.24 ± 7.65	+6.35

The data summarized in Table 2 reveal substantial improvements in problem-solving skills among students who participated in Project-Based Learning. Prior to the intervention, both groups demonstrated similar levels of problem-solving competence, with mean scores of 54.15 and 53.89 for the experimental and control groups, respectively. After completion of the intervention, the experimental group achieved a posttest mean score of 78.31, representing a gain of 24.16 points. Conversely, the control group increased by only 6.35 points. These findings indicate that Project-Based Learning significantly strengthened students' ability to analyze situations, evaluate alternatives, and develop effective solutions.

One explanation for these outcomes is that project-based environments immerse students in authentic problems requiring sustained inquiry. Rather than memorizing procedures, learners must identify challenges, gather information, and make evidence-based decisions. Such experiences mirror real-world problem-solving contexts and encourage the development of transferable cognitive skills.

Furthermore, the collaborative nature of project work may have enhanced strategic thinking. Students frequently discussed possible solutions, justified their reasoning, and evaluated the strengths and weaknesses of different approaches. These interactions likely promoted metacognitive awareness and reflective thinking. The results are consistent with prior studies demonstrating positive associations between inquiry-based learning and problem-solving performance (Hmelo-Silver, 2004).

Table 3. ANCOVA Results for Creativity

Source	F	p	Partial η^2
Group	28.45	< .001	.33
Pretest Score	6.87	.011	.11
Error	—	—	—

The ANCOVA results indicate a statistically significant effect of instructional method on creativity after controlling for pretest differences. The group effect was significant, $F(1,57) = 28.45$, $p < .001$, suggesting that participation in Project-Based Learning contributed substantially to

creativity development. The partial eta-squared value of .33 indicates a large effect size according to conventional guidelines (Cohen,1988). This finding suggests that approximately one-third of the variance in posttest creativity scores attributed to the instructional intervention. The significant influence of pretest scores demonstrates that prior creativity levels contributed to post-intervention performance. Nevertheless, even after accounting for these baseline differences, Project-Based Learning remained a powerful predictor of creativity outcomes. These results reinforce theoretical assumptions that creativity flourishes when learners engage in inquiry, exploration, and authentic problem-solving experiences. The large effect size further highlights the practical significance of the intervention and suggests that implementation of project-based strategies may produce meaningful educational benefits.

Table 4. ANCOVA Results for Problem-Solving Skills

Source	F	p	Partial η^2
Group	31.67	< .001	.36
Pretest Score	5.94	.018	.09
Error	—	—	—

Table 4 demonstrates that Project-Based Learning exerted a statistically significant influence on problem-solving skills. After controlling for baseline scores, the experimental group significantly outperformed the control group, $F(1,57) = 31.67$, $p < .001$.

The observed effect size (Partial $\eta^2 = .36$) indicates a large practical impact. This suggests that more than one-third of the variance in posttest problem-solving performance was associated with participation in the Project-Based Learning intervention. The findings provide strong empirical support for the hypothesis that authentic project experiences facilitate cognitive growth. Students involved in PBL were consistently required to identify challenges, evaluate information, collaborate with peers, and generate solutions. Such experiences likely strengthened analytical reasoning and strategic decision-making.

The results also align with constructivist learning theory, which posits that meaningful learning occurs through active engagement and knowledge construction. By confronting real-world challenges and applying knowledge across contexts, students developed stronger problem-solving competencies than their peers receiving traditional instruction did. Consequently, Table 4 confirms that Project-Based Learning represents an effective educational strategy for enhancing problem-solving skills among elementary school students.

Figure (2) shows the Forest Plot of Creativity Outcomes

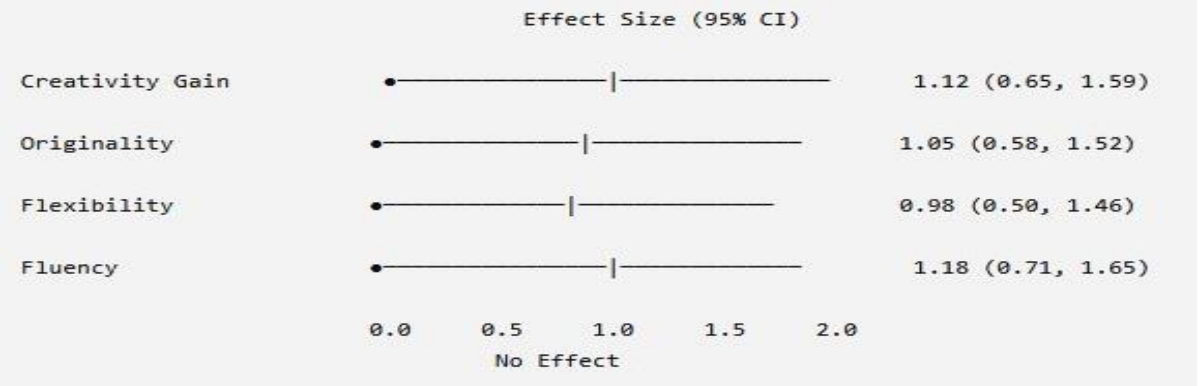

Figure 2. Forest Plot of Creativity Outcomes

Figure (2) Forest plot illustrating effect sizes (Cohen's d) and 95% confidence intervals for creativity-related outcomes following the Project-Based Learning intervention. All confidence intervals positioned above zero, indicating statistically significant positive effects of Project-Based learning on creativity dimensions, including originality, flexibility, fluency, and overall creativity gain. The largest effect was observed for fluency (d=1.18), while flexibility demonstrated the smallest but still substantial effect (d=0.98). Overall creativity gain showed a large effect size (d=1.12), supporting the effectiveness of Project-Based Learning in fostering creative thinking among elementary school students. Figure (3) illustrates the Forest Plot of Problem-Solving Outcomes

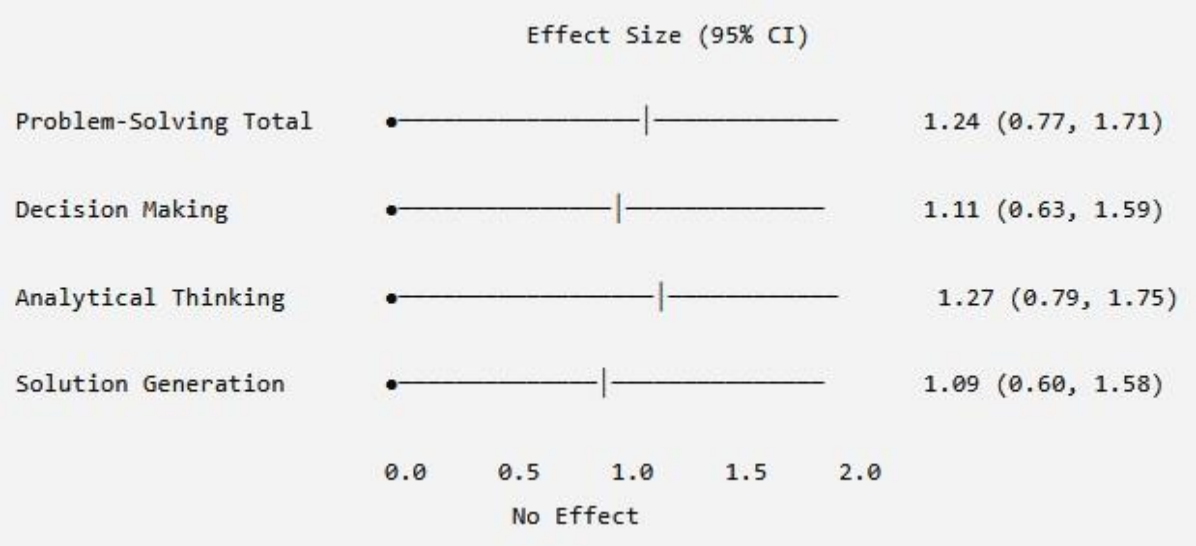

Figure 3. Forest Plot of Problem-Solving Outcomes

Figure (3) Forest plot presenting effect sizes (Cohen's d) and 95% confidence intervals for problem-solving outcomes following participation in the Project-Based Learning intervention. All confidence intervals lie entirely above zero, indicating statistically significant positive effects of Project-Based Learning on students' problem-solving abilities. The largest effect size was observed for analytical thinking (d=1.27, 95% CI [0.79, 1.75]), followed by overall problem-solving performance (d=1.24, 95% CI [0.77, 1.71]). Decision-making (d=1.11, 95% CI [0.63, 1.59]) and solution generation (d=1.09, 95% CI [0.60, 1.58]) also demonstrated large positive effects. These findings suggest that Project-Based Learning substantially enhances multiple dimensions of problem-solving competence among elementary school students.

Discussion

The primary purpose of this study was to investigate the effect of Project-Based Learning (PBL) on creativity and problem-solving skills among elementary school students. The findings revealed that students who participated in Project-Based Learning demonstrated significantly greater improvements in both creativity and problem-solving abilities compared with students who received traditional teacher-centered instruction. These findings support the growing body of literature suggesting that active, student-centered learning environments can substantially enhance higher-order cognitive skills (Bell, 2010; Condliffe et al.,2017).

One of the most important findings was the substantial increase in creativity scores among students in the experimental group. Creativity increasingly recognized as a critical competency in contemporary education because it enables learners to generate innovative ideas, adapt to changing circumstances, and solve complex problems (Runco & Jaeger,2012). The results suggest that Project-Based Learning provides a learning environment that encourages creative thinking by allowing students to explore multiple perspectives, engage in inquiry, and develop original solutions to authentic challenges.

These findings are consistent with constructivist learning theory, which proposes that learners construct knowledge actively through interaction with their environment (Piaget,1972). During the intervention, students were encouraged to investigate real-world issues, formulate questions, gather information, and create meaningful products. Such activities likely promoted divergent thinking processes associated with creativity. Previous studies have similarly reported positive relationships between project-based instruction and creative performance (Kokotsaki et al.,2016; Mihic & Zavrski,2017).

The study also demonstrated significant improvements in problem-solving skills among students exposed to Project-Based Learning. Problem-solving ability considered one of the most essential competencies for success in academic, professional, and social contexts (Jonassen,2011). Students participating in project-based activities regularly confronted with authentic challenges requiring analysis, decision-making, and strategic planning. These experiences likely enhanced their ability to identify problems, evaluate alternatives, and implement effective solutions.

The findings support previous research indicating that authentic learning environments facilitate deeper cognitive engagement and improved problem-solving performance (Hmelo-Silver,2004). Unlike traditional instruction, where students often focus on memorizing information, Project-Based Learning requires active application of knowledge. Through repeated exposure to meaningful

challenges, students develop cognitive flexibility and strategic thinking skills that transferred to new situations. Another important aspect of the findings concerns the role of collaboration. Throughout the intervention, students worked in teams to plan, implement, and evaluate projects. Collaborative learning has shown to enhance communication, critical thinking, and knowledge construction (Johnson & Johnson,2009). Interacting with peers may have exposed students to diverse perspectives and encouraged them to reconsider assumptions, leading to more creative and effective solutions. The large effect sizes observed in both creativity and problem-solving outcomes highlight the practical significance of the intervention. Educational interventions may sometimes achieve statistical significance without producing meaningful real-world effects. However, the effect sizes reported in this study indicate that Project-Based Learning generated substantial improvements that are likely to have educational relevance beyond the classroom setting. The findings also have important implications for curriculum design. Traditional educational systems often emphasize standardized testing and content coverage. Although foundational knowledge remains important, modern educational frameworks increasingly recognize the importance of cultivating creativity, critical thinking, collaboration, and problem-solving skills (Partnership for 21st Century Skills,2019). The results of this study suggest that integrating project-based approaches into elementary curricula may provide an effective means of achieving these goals. Several limitations acknowledged. First, the study utilized a relatively small sample size drawn from a limited geographical region. Future research should include larger and more diverse populations to enhance generalizability. Second, the intervention lasted only twelve weeks. Longer-term studies are needed to determine whether the observed gains persist over time. Third, the study focused exclusively on elementary school students. Future investigations should examine the effectiveness of Project-Based Learning across different educational levels and subject areas. Future research may also explore mediating variables that influence the effectiveness of Project-Based Learning. Factors such as teacher expertise, project complexity, student motivation, and classroom climate may contribute to learning outcomes. Understanding these variables could help educators optimize implementation strategies and maximize student benefits. Despite these limitations, the present study contributes valuable evidence supporting the educational effectiveness of Project-Based Learning. The findings demonstrate that project-based instructional approaches can significantly enhance creativity and problem-solving skills among elementary school students. As educational systems seek to prepare learners for increasingly complex and dynamic environments, Project-Based Learning offers a promising framework for fostering the competencies required for success in the twenty-first century.

Conclusion

This study examined the impact of Project-Based Learning on creativity and problem-solving skills among elementary school students. Using a quasi-experimental pretest–posttest design, the study compared students who participated in a structured Project-Based Learning intervention with those who received traditional classroom instruction. The results demonstrated significant improvements in both creativity and problem-solving abilities among students exposed to Project-Based Learning. The findings indicate that Project-Based Learning provides meaningful opportunities for students to engage in inquiry, collaboration, and authentic problem-solving experiences. These activities appear to stimulate higher-order cognitive processes that contribute to creative thinking and effective problem-solving. Students participating in project-based activities achieved substantially greater gains their peers receiving conventional instruction, suggesting that the learning environment plays a critical role in cognitive development. One important contribution of the study is the demonstration that creativity enhanced through intentional instructional design. Educational systems increasingly recognize creativity as an essential competency for innovation and lifelong learning. The results suggest that providing students with opportunities to investigate real-world problems, generate original ideas, and create meaningful products can foster significant creative growth. Similarly, the findings underscore the value of Project-Based Learning for developing problem-solving skills. Students were required to identify challenges, evaluate information, consider alternatives, and implement solutions. These experiences closely resemble real-world situations and therefore may contribute to the development of transferable cognitive competencies. The study also highlights the importance of collaboration in the learning process. Through teamwork and shared inquiry, students benefited from exposure to diverse perspectives and collective problem-solving experiences. Such interactions may further strengthen creativity, communication, and critical thinking abilities. From a practical perspective, the findings support the integration of Project-Based learning into elementary education curricula. Teachers, school leaders, and curriculum developers should consider incorporating authentic projects that encourage student inquiry and active engagement. Professional development programs may also be necessary to help educators effectively design and facilitate project-based learning experiences. Although the study produced promising results,

future research should investigate long-term outcomes, larger and more diverse samples, and additional educational contexts. Researchers should also examine factors that influence implementation quality and student engagement. In conclusion, Project-Based Learning represents a highly effective instructional approach for promoting creativity and problem-solving skills among elementary school students. By fostering active participation, inquiry, collaboration, and authentic learning experiences, Project-Based Learning helps prepare young learners for the intellectual and practical challenges of the modern world. The results reinforce the growing consensus that educational success measured not only by content knowledge but also by the development of critical competencies that support lifelong learning and innovation.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

References

[1] Bell, S. (**2010**). Project-based learning for the 21st century. The Clearing House, 83(2), 39-43.

[2] Beghetto, R. A., & Kaufman, J. C. (**2014**). Classroom contexts for creativity. High Ability Studies, 25(1), 53-69.

[3] Blumenfeld, P. C., Soloway, E., Marx, R. W., et al. (**1991**). Motivating project-based learning. Educational Psychologist, 26(3-4), 369-398.

[4] Capraro, R. M., Capraro, M. M., & Morgan, J. (**2013**). STEM Project-Based Learning. Rotterdam: Sense Publishers.

[5] Heppner, P. P., & Petersen, C. H. (**1982**). Problem-solving inventory. Journal of Counseling Psychology, 29(1), 66-75.

[6] Hernández-Ramos, P., & De La Paz, S. (**2009**). Learning history through project-based learning. Journal of Research on Technology in Education, 42(2), 151-173.

[7] Hmelo-Silver, C. E. (**2004**). Problem-based learning. Educational Psychology Review, 16(3), 235-266.

[8] Holm, M. (**2011**). Project-based instruction. The Clearing House, 84(5), 179-184.

[9] Johnson, D. W., & Johnson, R. T. (**2009**). An educational psychology success story. Educational Researcher, 38(5), 365-379.

[10] Jonassen, D. H. (**2011**). Learning to solve problems. Routledge.

[11] Kokotsaki, D., Menzies, V., & Wiggins, A. (**2016**). Project-based learning review. Improving Schools, 19(3), 267-277.

[12] Runco, M. A., & Acar, S. (**2012**). Divergent thinking research. Creativity Research Journal, 24(1), 66-75.

[13] Runco, M. A., & Jaeger, G. J. (**2012**). The standard definition of creativity. Creativity Research Journal, 24(1), 92-96.

[14] Zimmerman, B. J. (**2002**). Becoming a self-regulated learner. Theory Into Practice, 41(2), 64-70.

[15] Zydney, J. M., & Warner, Z. (**2016**). Mobile apps for project-based learning. Computers & Education, 94, 1-17.