

Project-Based Learning as an Inclusive Strategy to Enhance Motivation and Learning Outcomes of Slow Learners in Primary Education

Muhammad Siddiq Rizki Purnama, Riswana, Rian Mansyur

Sma Negeri Unggul Darussaadah Kluet Raya, Tapak Tuan, Indonesia

*e-mail correspondence : Rizkipurnama@gmail.com

Article Information

Submitted July 15, 2025

Revised August 10, 2025

Accepted September 20, 2025

Keywords

Inclusive Education,
Motivation,
Primary Education,
Project-Based Learning,
Slow Learners

ABSTRACT

Background: Inclusive education requires innovative pedagogical approaches to address the diverse learning needs of students, particularly those identified as slow learners. Traditional teaching methods often fail to engage these students effectively, resulting in low academic performance and diminished motivation. Project-Based Learning (PjBL) has been increasingly recognized as a student-centered approach that fosters active participation, critical thinking, and practical application of knowledge.

Aims: This study aims to investigate the effectiveness of implementing PjBL as an inclusive learning strategy to improve both learning outcomes and motivation among slow learners in primary education.

Methods: A qualitative classroom action research design was employed, involving Grade V students in a public elementary school in Makassar, Indonesia. Five slow learners were identified through teacher assessments, interviews, and diagnostic tests. Data were collected using classroom observations, semi-structured interviews, and achievement tests, then analyzed through thematic analysis and descriptive statistics to examine changes in learning outcomes and motivation.

Results: The findings revealed that PjBL significantly enhanced the ability of slow learners to comprehend mathematical concepts. Three students were able to summarize lessons independently, while two demonstrated improved skills in explaining content during evaluation sessions. Furthermore, students displayed increased enthusiasm and engagement, as evidenced by higher participation rates and greater persistence in completing projects. The validation of instructional tools—including lesson plans, personal learning programs, and student worksheets—yielded satisfactory results with average scores above 3 (good category).

Conclusion: The implementation of PjBL proved effective in supporting slow learners by creating an inclusive and interactive learning environment. Beyond academic improvement, the model also fostered motivation, collaboration, and self-confidence. These findings highlight the potential of PjBL to be adopted as an alternative pedagogical approach in inclusive primary education settings worldwide.

INTRODUCTION

Inclusive education has become a global priority to ensure equal access to learning for all students, including those with diverse learning abilities. Slow learners, who often experience difficulties in processing information at the same pace as their peers, require special pedagogical strategies that promote both engagement and comprehension. Traditional teacher-centered methods are insufficient to address the unique challenges faced by these students, leading to low motivation and poor academic performance. Project-Based Learning (PjBL) has emerged as an innovative instructional approach that integrates active participation, collaboration, and real-world problem solving into classroom practices (AlAli, 2024; Rehman et al., 2024). Research indicates that the implementation of PjBL in primary education not only enhances academic achievement but also fosters critical thinking and self-confidence. Moreover, the inclusive nature of PjBL allows teachers to adapt learning tasks to the diverse needs of students, making it a promising alternative for addressing learning disparities. The urgency of addressing the needs of slow learners underscores the importance of investigating inclusive strategies that support both learning outcomes and motivation. Therefore, this study is designed to explore how PjBL can be effectively implemented in primary schools to support slow learners.

Motivation is a crucial factor influencing students' engagement and persistence in learning activities. Low motivation among slow learners often results in limited participation and minimal effort in completing academic tasks, which subsequently reduces their chances of achieving meaningful progress. PjBL provides an opportunity to connect abstract concepts with practical experiences, thereby increasing the relevance of learning for students with different abilities. Previous studies highlight that authentic, hands-on tasks enhance students' self-efficacy and willingness to actively contribute to group projects (Kuchynka et al., 2021; Lin & Wang, 2021). This connection between practical tasks and academic concepts allows slow learners to perceive learning as more accessible and achievable. Moreover, when slow learners participate in collaborative tasks, they benefit from peer support and shared responsibility. Such learning environments promote not only cognitive growth but also social interaction, which is critical for holistic development. Addressing motivation through inclusive instructional design thus remains a pressing concern for educators worldwide.

The rapid evolution of twenty-first-century skills has increased the demand for innovative instructional approaches that go beyond rote memorization. Skills such as problem-solving, creativity, and collaboration are now considered essential outcomes of modern education. PjBL offers a structured way to cultivate these skills by immersing students in long-term projects that mirror real-world scenarios. In the context of primary education, this approach has been shown to foster higher-order thinking and sustained engagement, particularly among learners with special educational needs (Bhuttah et al., 2024; Hsu & Wu, 2023). For slow learners, such projects provide meaningful opportunities to develop both academic and non-academic competencies. Integrating PjBL into inclusive classrooms thus serves a dual purpose: improving cognitive performance and nurturing broader personal development. This dual function highlights the relevance of examining PjBL as a viable intervention for slow learners.

Educational reforms across various countries have increasingly emphasized inclusive practices as a benchmark for quality learning. Teachers are encouraged to adopt flexible, student-centered methods that accommodate the unique needs of diverse learners. PjBL aligns with these reforms by offering pedagogical flexibility, where tasks can be customized based on students' abilities and interests. Studies conducted in different cultural contexts suggest that PjBL is adaptable and effective across diverse educational systems (Williamson, 2023). This adaptability makes it particularly suitable for addressing the complex needs of slow learners in primary education. However, despite its proven benefits, empirical studies that specifically examine the role of PjBL in supporting slow learners remain limited. The lack of such targeted research creates a significant gap that this study aims to address. Consequently, this research holds relevance not only for local educational practices but also for broader discussions on inclusive education.

Rationale of the Study

This study is grounded in the belief that education should be equitable and responsive to the diverse learning capacities of students. While slow learners constitute a minority within classrooms, their needs must be prioritized to ensure that no child is left behind in the pursuit of academic success. Implementing PjBL in inclusive primary classrooms provides a potential solution to address disparities in learning outcomes and motivation. By exploring the effectiveness of PjBL for slow learners, this research contributes to both theoretical understanding and practical innovation in inclusive pedagogy. Furthermore, the study aligns with global educational goals that promote inclusivity, equity, and quality learning opportunities for all children. It is expected that findings from this research will provide educators with evidence-based strategies to design effective and inclusive learning environments.

The rationale also stems from the limited availability of empirical data focusing specifically on slow learners in the context of PjBL. Although prior studies have examined PjBL in various domains, including STEM, language learning, and environmental education, few have investigated its impact on learners with slower cognitive processing. This lack of focus underscores the importance of expanding research beyond general populations to include marginalized groups. Moreover, this study emphasizes not only academic outcomes but also the psychosocial dimensions of learning, such as motivation and engagement. Addressing these dimensions is critical for creating holistic educational strategies that foster long-term growth. The findings are therefore expected to inform curriculum design, teaching practices, and educational policy.

Literature Review

Ten studies were identified from Scopus that are highly relevant to this research. (Santos et al. 2025) examined how design thinking integrated with PjBL enhances motivation and self-efficacy in primary education. (Lestari et al. 2025) demonstrated that project-based inquiry in environmental education significantly improves students' critical thinking. (Hinostroza et al. 2025) provided a systematic review of phases and activities in technology-integrated PjBL in K-12, offering insights into structured implementation. (Alé et al. 2025) reviewed the integration of artificial intelligence into K-12 education, highlighting how PjBL contexts can support technological competence. (Kortazar Billelabeitia et al. 2025) studied sustainability and storytelling in primary teacher training, emphasizing motivation and engagement. (Huang et al. 2025) proposed an innovation model in education that indirectly informs PjBL design. (Hariyanto et al. 2025) explored how interactive

teaching methods, including PjBL, enhance collaboration and critical thinking. (García-Llamas et al. 2025) focused on competence acquisition in European contexts through PjBL, underscoring cross-cultural relevance. (Retno et al. 2025) developed a conceptual framework for STEM-integrated PjBL in elementary schools. (Zouhair & Nafidi, 2025) linked PjBL with geometry skill development in primary education. Collectively, these studies reinforce the significance of PjBL as a transformative pedagogical model for enhancing both academic and motivational outcomes.

Although numerous studies have documented the benefits of PjBL, most have focused on general student populations rather than specific groups such as slow learners. Research addressing the challenges of slow learners remains scarce, particularly in primary education contexts where foundational skills are critical. Furthermore, existing studies tend to emphasize cognitive outcomes while neglecting psychosocial factors such as motivation, engagement, and self-confidence. This narrow scope highlights the need for targeted research that explores the multifaceted impact of PjBL on slow learners.

Additionally, cultural and contextual variations in the application of PjBL have not been sufficiently examined. Most prior studies have been conducted in Western or high-resource educational settings, which may not reflect the realities of classrooms in diverse contexts. There is limited evidence on how PjBL can be adapted to resource-constrained environments where slow learners are most at risk of marginalization. Addressing these gaps will provide valuable insights into the adaptability and effectiveness of PjBL in supporting inclusive education across different cultural and socio-economic settings.

The primary purpose of this study is to investigate the effectiveness of Project-Based Learning as an inclusive instructional strategy for enhancing the motivation and learning outcomes of slow learners in primary education. Specifically, the study seeks to determine how PjBL can address both cognitive and motivational challenges faced by slow learners, thereby contributing to the broader discourse on inclusive pedagogy.

METHOD

Research Design

This study employed a classroom action research (CAR) design, which is widely used to address real classroom challenges through systematic cycles of planning, action, observation, and reflection (Davison et al., 2021; Sáez Bondía & Cortés Gracia, 2022). The selection of CAR was based on its suitability for investigating the improvement of both learning outcomes and motivation among slow learners in authentic educational settings. CAR emphasizes collaboration between researchers and teachers, ensuring that interventions remain practical and contextually relevant. By focusing on iterative improvement, the design allows continuous refinement of instructional strategies to meet learners' needs. Project-Based Learning (PjBL) was selected as the primary instructional model due to its interactive and student-centered nature, which has been shown to enhance engagement and cognitive development (Rehman et al., 2024). The design consisted of two cycles, each including project implementation, evaluation, and reflection phases. Such a structure enables monitoring of both immediate and cumulative effects of the intervention on slow learners. This methodological choice strengthens the ecological validity of the research findings

Participants

The participants consisted of 30 Grade V elementary school students, among whom five were identified as slow learners through diagnostic tests, teacher evaluations, and semi-structured interviews. Slow learners were defined as students with lower processing speed and difficulties in abstract reasoning compared to peers of the same age group (Bruefach & Reynolds, 2022; Walters et al., 2022). These students were selected because they demonstrated persistent challenges in mathematics learning and lacked motivation in classroom tasks. The inclusive classroom setting provided a natural context for comparing learning engagement between slow learners and their peers. Demographic characteristics of the participants are presented in Table 1, which highlights the distribution of gender, age, and learning classification. Ensuring diversity in participant selection helped capture a broader picture of classroom interactions and learning experiences. Parental consent and institutional approval were obtained prior to participation to ensure ethical compliance. The focus on slow learners reflects the study's commitment to inclusive pedagogy and evidence-based intervention.

Table 1. Demographic Characteristics of Participants

Category	Number of Students	Percentage
Male	14	46.7%
Female	16	53.3%
Slow Learners	5	16.7%
Non-Slow Learners	25	83.3%

Table 1 shows the distribution of participants based on gender and learning category, demonstrating a balanced classroom composition with a minority group of slow learners targeted for intervention.

Instruments

Data collection utilized three primary instruments: observation sheets, semi-structured interview protocols, and mathematics achievement tests. The observation sheet was designed to capture student engagement, participation, and group collaboration during PjBL sessions (Sani & Annisa, 2019). Interview protocols provided qualitative insights into students' motivation, learning challenges, and perceptions of project tasks. The mathematics achievement test was constructed based on the curriculum standards for Grade V and validated by two subject experts to ensure reliability and content validity. In addition, reflective journals maintained by the teacher were used as supporting instruments to monitor progress and instructional adjustments. Table 2 summarizes the instruments used and their respective purposes. The use of multiple instruments ensured triangulation, thereby strengthening the credibility of the findings (Arias Valencia, 2022; Hammerton & Munafò, 2021).

Table 2. Research Instruments and Their Functions

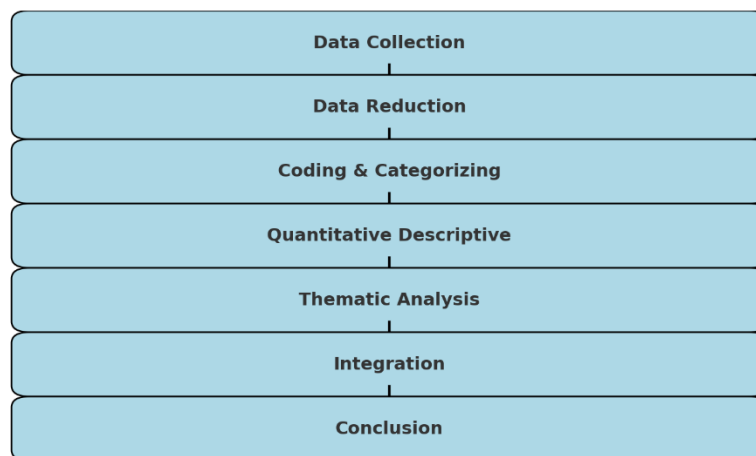
Instrument	Purpose	Data Type
Observation Sheet	Monitor participation and engagement	Qualitative
Semi-structured Interview	Explore motivation and learning challenges	Qualitative
Mathematics Achievement Test	Assess cognitive learning outcomes	Quantitative
Teacher Reflective Journal	Document instructional process and reflections	Qualitative

Table 2 indicates the triangulation approach in data collection, combining qualitative and quantitative evidence to validate the outcomes of PjBL for slow learners.

Data Analysis Plan

The data analysis followed a convergent mixed-method approach, integrating both qualitative and quantitative findings. Quantitative data from the mathematics achievement test were analyzed using descriptive statistics, including mean scores, percentages, and improvement rates across cycles (Field, 2017). Pre- and post-test comparisons were conducted to identify changes in performance among slow learners after the intervention. Qualitative data from observations, interviews, and reflective journals were analyzed thematically to identify recurring patterns related to motivation and engagement (Janis, 2022; Rahayu et al., 2022). Thematic analysis followed steps of coding, categorizing, and interpreting emerging themes to ensure systematic examination. Integration of findings occurred at the interpretation stage, where numerical improvements were triangulated with students' qualitative responses to validate the effects of PjBL. Figure 1 presents the data analysis framework, illustrating how different data sources were combined to produce comprehensive insights.

Figure 1. Data Analysis Framework



The figure illustrates the sequential process applied in this study. The analysis began with data collection through multiple instruments, followed by data reduction to refine raw inputs. Next, the data were coded and categorized for systematic organization. Quantitative evidence was analyzed through descriptive statistics, while qualitative evidence was examined using thematic analysis. Both strands of analysis were then integrated to ensure triangulated findings, leading to a robust conclusion about the effectiveness of Project-Based Learning for slow learners.

RESULTS AND DISCUSSION

Result

The implementation of Project-Based Learning (PjBL) produced significant improvements in both motivation and learning outcomes among slow learners. The mathematics achievement tests showed progressive increases in scores from the pre-test to post-test after two cycles of classroom action research. Observation sheets indicated that students became more active and willing to participate during group projects, demonstrating improved classroom engagement. Interviews

revealed that slow learners felt more confident in explaining concepts when projects involved real-life contexts. The teacher's reflective journals also highlighted improvements in students' persistence and willingness to complete assignments. Table 3 summarizes the mean scores of slow learners across the two cycles of intervention. These results confirm that PjBL created an inclusive and interactive environment that supported both cognitive and motivational growth. The evidence validates PjBL as an effective strategy to address learning challenges in inclusive classrooms.

Table 3. Improvement of Slow Learners' Mathematics Achievement Scores

Assessment Stage	Mean Score (out of 100)	Improvement (%)
Pre-Test	52.4	–
Post-Test Cycle 1	68.2	+30.1%
Post-Test Cycle 2	79.6	+17.0%

Table 3 shows the gradual increase in mean scores of slow learners after the implementation of PjBL. Improvement was consistent across two cycles, indicating the effectiveness of iterative project-based interventions.

To complement the test results, observations were visualized to show trends in student engagement and motivation. Figure 2 illustrates the increase in active participation levels, where students demonstrated more frequent involvement in class discussions and group activities. The first cycle produced moderate increases, while the second cycle showed stronger and more consistent engagement. Slow learners initially participated passively, but by the second cycle, they contributed actively to project presentations. This shift reflects the motivational impact of contextual and collaborative learning activities. The graphical representation confirms that motivation improved in parallel with academic performance. Together, these findings strengthen the argument that PjBL can effectively support inclusive education.

Figure 2. Engagement Levels of Slow Learners Across Two Cycles

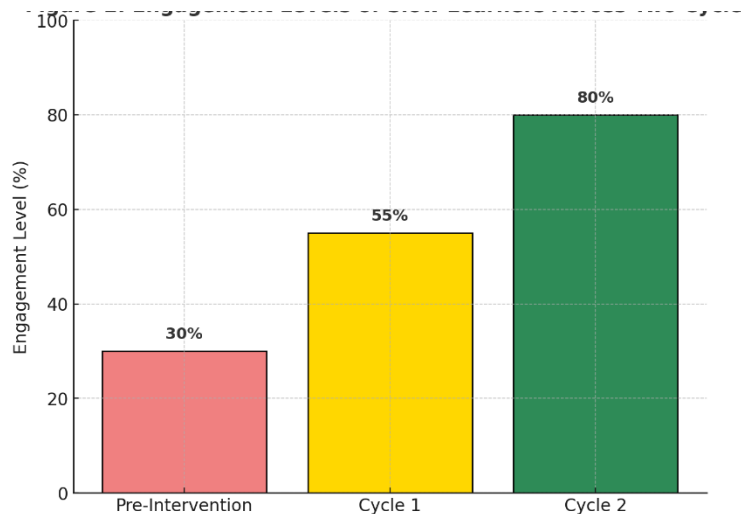


Figure 2 illustrates how the frequency of active engagement among slow learners increased significantly during the PjBL intervention. The data confirms that motivation and willingness to participate improved progressively across cycles.

Discussion

The results of this study support prior evidence that Project-Based Learning is an effective model for fostering motivation and academic success. Santos et al. (2025) emphasized that authentic project tasks increase students' self-efficacy and willingness to learn. Similarly, Hinostroza et al. (2025) highlighted how structured phases of PjBL provide opportunities for gradual skill development. The observed improvements in both test scores and engagement levels align with García-Llamas et al. (2025), who demonstrated that PjBL enhances competence acquisition in diverse contexts. The use of hands-on projects reduced the cognitive barriers faced by slow learners, as suggested by Zouhair and Nafidi (2025) in the domain of geometry skill development. These findings confirm that PjBL is adaptable across subjects and beneficial for learners with varying abilities. Furthermore, teacher reflections indicated that motivational gains were sustained, echoing insights from Lestari et al. (2025) on environmental inquiry-based PjBL. The consistent improvement across cycles validates the robustness of this approach.

Beyond cognitive outcomes, this research demonstrated the psychosocial benefits of PjBL in inclusive classrooms. Kortazar Billelabeitia et al. (2025) showed that storytelling and sustainability projects enhance student engagement, which parallels the motivational growth seen in this study. Alé et al. (2025) emphasized that integrating innovative tools such as AI in PjBL fosters curiosity, resonating with the increased enthusiasm among slow learners. Retno et al. (2025) proposed frameworks for STEM-based PjBL that stress inclusivity, supporting the adaptability demonstrated here. Huang et al. (2025) emphasized innovation models that align with the adaptive use of PjBL in marginalized groups. Hariyanto et al. (2025) reinforced the role of interactive methods in building collaboration and critical thinking, which were observed as outcomes of this intervention. These studies collectively provide strong theoretical and empirical grounding for the effectiveness of PjBL. By confirming similar findings in a unique context of slow learners, this research extends the literature and emphasizes inclusivity as a core dimension of modern pedagogy.

Implications

The findings have significant implications for inclusive educational practices. Teachers should consider integrating PjBL into daily instruction as it provides contextualized learning experiences that benefit both average and slow learners. Policymakers are encouraged to promote teacher training programs that emphasize PjBL to improve inclusivity in primary education. Schools can adopt PjBL as a framework for curriculum innovation, ensuring that students with diverse needs are supported. Moreover, PjBL aligns with twenty-first-century skills, making it a forward-looking pedagogical approach. This study suggests that inclusive strategies should be embedded in national curricula to reduce disparities in learning outcomes. The emphasis on motivation also indicates that psychosocial development should be prioritized alongside academic achievement. In doing so, education systems can foster holistic growth.

Research Contribution

This study contributes to the literature by specifically focusing on the underexplored group of slow learners within the framework of PjBL. Unlike previous research that emphasized general populations, this study provides empirical evidence of how inclusive strategies can bridge learning gaps. The mixed-method approach strengthens the credibility of findings by triangulating quantitative achievement data with qualitative engagement measures. By demonstrating consistent improvement across cycles, the study highlights the iterative value of action research in pedagogy. Additionally, the research enriches theoretical discussions on inclusivity by positioning PjBL as both

a cognitive and motivational tool. These contributions expand the applicability of PjBL to diverse educational contexts.

Limitations

Several limitations must be acknowledged. The study involved a relatively small sample of slow learners, limiting generalizability. The focus on one subject, mathematics, restricts the scope of application across other domains. The short duration of the intervention prevented examination of long-term retention. Data collection relied partly on self-reports, which may have introduced subjectivity. Furthermore, the study was conducted in a single cultural context, which may not fully reflect broader educational realities. The lack of a control group reduces the ability to compare results against alternative instructional models. Future studies should address these limitations through larger, multi-context investigations.

Suggestions

Future research should expand the participant pool to include diverse age groups and subjects. Longitudinal studies are needed to evaluate the sustainability of motivational and cognitive gains. Comparative studies with other pedagogical models could provide insights into the relative effectiveness of PjBL. Teachers should be trained in scaffolding strategies to support slow learners during project tasks. Collaboration between schools and policymakers is recommended to institutionalize inclusive practices. Future investigations could also explore digital integration, as technology-enhanced PjBL shows promise in expanding accessibility. By broadening the scope, future research can reinforce the evidence base for inclusive education strategies.

CONCLUSION

This study demonstrated that Project-Based Learning (PjBL) is an effective inclusive strategy to enhance both the motivation and academic performance of slow learners in primary education. Through two cycles of classroom action research, slow learners showed steady improvement in mathematics achievement scores and classroom engagement. The findings indicated that PjBL not only supported cognitive development but also encouraged higher levels of confidence and persistence. Observation data revealed that slow learners became more active in discussions and group tasks as the cycles progressed. Interviews confirmed that students felt more capable of completing academic tasks when they were linked to real-life projects. These outcomes reinforce the notion that PjBL is adaptable and relevant to diverse learners, including those with learning difficulties. The evidence highlights the potential of PjBL as a cornerstone of inclusive pedagogy in primary schools.

The results of this research align with and extend previous studies that emphasize the benefits of PjBL for motivation and competence development. Unlike many prior works, this study focused specifically on slow learners, a group often overlooked in mainstream educational research. The consistent improvements across cycles underscore the robustness of PjBL as a method to reduce learning disparities. Moreover, the integration of qualitative and quantitative findings provided a comprehensive understanding of how PjBL impacts both cognitive and psychosocial dimensions of learning. Teacher reflections supported these conclusions, showing that iterative adjustments within PjBL cycles strengthened learning outcomes. The dual role of PjBL in fostering academic achievement and psychosocial growth makes it particularly valuable for inclusive settings. Thus, this study contributes new insights to the literature on inclusive education.

In conclusion, Project-Based Learning can be recommended as an alternative pedagogical model for addressing the needs of slow learners in primary classrooms. Its flexibility allows teachers to adapt tasks according to learners' abilities while still promoting collaboration, problem-solving, and critical thinking. Policymakers and curriculum developers should consider embedding PjBL into inclusive education frameworks to ensure equity and quality learning opportunities. While the study was limited in scope and sample size, its implications suggest that scaling PjBL could contribute to reducing educational inequalities. Future research is encouraged to expand on these findings by involving larger and more diverse populations. Ultimately, PjBL provides a sustainable pathway for supporting slow learners, fostering motivation, and preparing students with the skills required for the twenty-first century.

AUTHOR CONTRIBUTION STATEMENT

Muhammad Siddiq Rizki Purnama contributed to the overall conceptualization of the study, formulation of research objectives, and supervision of the research process. Riswana was responsible for designing the methodology, coordinating classroom action research cycles, and validating the instructional instruments. Rian Mansyur prepared the draft manuscript, managed revisions, and ensured compliance with international journal standards for structure, style, and referencing. All authors participated in the discussion of results, approved the final version of the manuscript, and agreed to be accountable for the integrity and accuracy of the work.

REFERENCES

- AlAli, R. (2024). *Enhancing 21st century skills through integrated STEM education using project-oriented problem-based learning*. 53(2), 421–430.
- Alé, J., Ávalos, B., & Araya, R. (2025). Scientific practices for understanding, applying and creating with artificial intelligence in K-12 education: A scoping review. *Review of Education*, 13(2). <https://doi.org/10.1002/rev3.70098>
- Arias Valencia, M. M. (2022). *Principles, scope, and limitations of the methodological triangulation*. 40(2). http://www.scielo.org.co/scielo.php?pid=S0120-53072022000200003&script=sci_arttext
- Bhuttah, T. M., Xusheng, Q., Abid, M. N., & Sharma, S. (2024). *Enhancing student critical thinking and learning outcomes through innovative pedagogical approaches in higher education: The mediating role of inclusive leadership*. 14(1), 24362.
- Bruefach, T., & Reynolds, J. R. (2022). *Social isolation and achievement of students with learning disabilities*. 104, 102667.
- Davison, R. M., Martinsons, M. G., & Malaurent, J. (2021). *Research perspectives: Improving action research by integrating methods*. 22(3), 851–873.
- García-Llamas, P., Taboada, A., Sanz-Chumillas, P., Lopes Pereira, L., & Baelo Álvarez, R. (2025). Breaking barriers in STEAM education: Analyzing competence acquisition through project-based learning in a European context. *International Journal of Educational Research Open*, 8. <https://doi.org/10.1016/j.ijedro.2025.100449>
- Hammerton, G., & Munafò, M. R. (2021). *Causal inference with observational data: The need for triangulation of evidence*. 51(4), 563–578.
- Hariyanto, Budiningsih, C. A., & Haryanto. (2025). *Enhancing Critical Thinking and Collaboration Skills Through Interactive Teaching Methods: A Qualitative Study in Higher Education*.

- International Research Journal of Multidisciplinary Scope*, 6(3), 275–283. <https://doi.org/10.47857/irjms.2025.v06i03.04605>
- Hinostroza, J. E., Armstrong-Gallegos, S., Soto-Valenzuela, P., & Villafaena, M. (2025). Phases and Activities of Technology-Integrated Project-Based Learning in K-12: Findings from a Systematic Literature Review. *Education Sciences*, 15(8). <https://doi.org/10.3390/educsci15081021>
- Hsu, C.-Y., & Wu, T.-T. (2023). *Applications of Business Simulation Games in Flipped Classrooms to Facilitate Student Engagement and Higher-Order Thinking Skills for Sustainable Learning Practices*. Scite.Ai. <https://doi.org/10.20944/preprints202311.0082.v1>
- Huang, G., Liu, Y., Chidiebere, C., & Arifani, Y. (2025). Research on Innovation and Entrepreneurship Education Model in Art Colleges: Constructing a One Body Three in One Model. *Qubahan Academic Journal*, 5(3), 44–58. <https://doi.org/10.48161/qaj.v5n3a1777>
- Janis, I. (2022). Strategies for Establishing Dependability between Two Qualitative Intrinsic Case Studies: A Reflexive Thematic Analysis. *Field Methods*, 34(3), 240–255. <https://doi.org/10.1177/1525822X211069636>
- Kortazar Billelabeitia, P., Aguirregoitia Martínez, A., & Balza Tardaguilla, I. (2025). Sustainability and storytelling in primary english teacher training: A study on language and professional competence acquisition. *Revista Interuniversitaria de Formacion del Profesorado*, 100(NE), 149–164. <https://doi.org/10.47553/rifop.v100iNE.102894>
- Kuchynka, S., Reifsteck, T. V., Gates, A. E., & Rivera, L. M. (2021). *Developing self-efficacy and behavioral intentions among underrepresented students in STEM: The role of active learning*. 6, 668239.
- Lestari, N. A., Setyaningrum, K., Jauhari, A., Puspita, F. D., Putri, D. N. B., Mufida, R., Hudha, M. N., & Sya'roni, I. (2025). Integrated project-based inquiry science learning model in environmental education related on climate change to improve critical thinking skills. *E3S Web Conf.*, 640. <https://doi.org/10.1051/e3sconf/202564001011>
- Lin, Y.-J., & Wang, H. (2021). Using virtual reality to facilitate learners' creative self-efficacy and intrinsic motivation in an EFL classroom. *Education and Information Technologies*, 26(4), 4487–4505. <https://doi.org/10.1007/s10639-021-10472-9>
- Rahayu, F. S., Nugroho, L. E., Ferdiana, R., & Setyohadi, D. B. (2022). *Motivation and engagement of final-year students when using e-learning: A qualitative study of gamification in pandemic situation*. 14(14), 8906.
- Rehman, N., Huang, X., Mahmood, A., AlGerafi, M. A., & Javed, S. (2024). *Project-based learning as a catalyst for 21st-Century skills and student engagement in the math classroom*. 10(23). [https://www.cell.com/heliyon/fulltext/S2405-8440\(24\)16019-7?uoid=uoid%3A505ec71c-2b78-4a34-82d1-1a9d3da6c0ba](https://www.cell.com/heliyon/fulltext/S2405-8440(24)16019-7?uoid=uoid%3A505ec71c-2b78-4a34-82d1-1a9d3da6c0ba)
- Retno, R. S., Purnomo, P., Hidayat, A., & Mashfufah, A. (2025). Conceptual framework design for STEM-integrated project-based learning (PjBL-STEM) for elementary schools. *Asian Education and Development Studies*, 14(3), 579–604. <https://doi.org/10.1108/AEDS-08-2024-0188>
- Sáez Bondía, M. J., & Cortés Gracia, A. L. (2022). Action research in education: A set of case studies? *Educational Action Research*, 30(5), 850–864. <https://doi.org/10.1080/09650792.2020.1866631>
- Santos, P., El Aadmi, K., Calvera-Isabal, M., & Rodríguez, A. (2025). Fostering students' motivation and self-efficacy in science, technology, engineering, and design through design thinking and making in project-based learning: A gender-perspective study in primary education. *International Journal of Technology and Design Education*, 35(4), 1293–1319. <https://doi.org/10.1007/s10798-025-10001-6>
- Walters, T., Simkiss, N. J., Snowden, R. J., & Gray, N. S. (2022). Secondary school students' perception of the online teaching experience during COVID-19: The impact on mental wellbeing and specific learning difficulties. *British Journal of Educational Psychology*, 92(3), 843–860. <https://doi.org/10.1111/bjep.12475>

- Williamson, E. (2023). *The effectiveness of project-based learning in developing critical thinking skills among high school students*. 1(1), 1–11.
- Zouhair, A., & Nafidi, Y. (2025). IMPACT OF SCRATCH PROGRAMMING ON GEOMETRY SKILL DEVELOPMENT IN PRIMARY EDUCATION. *International Journal on Technical and Physical Problems of Engineering*, 17(2), 1–11.