Journal of Education Management and Policy Horizons (EMPH)
Vol. 1, No. 1, Juli 2026, Hal. 9-15

Project Based Learning (PjBL) as a Learning Management Strategy to Improve Creative Thinking Skills and Mathematics Learning Outcomes of Class V Students at MIN 2 Pati

Ainun Nurjannah[1], Latifah Nuraini[2], and Irma Nur Afidah[3]

1Institut Pesantren Mathali'ul Falah, City, Indonesia
2 Institut Pesantren Mathali'ul Falah, City, Indonesia
3 Institut Pesantren Mathali'ul Falah, City, Indonesia
[1]ainunnana@gmail.com, [2] latifah@ipmafa.ac.id, [3] irmanurafidah@ipmafa.ac.id,

---

Abstract

This study investigates the effect of implementing the Project-Based Learning (PjBL) model on fifth-grade students' creative thinking skills and mathematics learning outcomes at MIN 2 Pati during the 2024/2025 academic year. The research was motivated by the need for instructional approaches that enhance students' creativity, academic achievement, and the quality of mathematics learning in madrasah settings. In addition to evaluating the effectiveness of PjBL, the study examines its implications for instructional management and quality learning practices. A quantitative approach with a quasi-experimental, non-equivalent control group design was employed. The participants were fifth-grade students at MIN 2 Pati. Data were collected through observation sheets, pretest-posttest assessments, and documentation, then analyzed using statistical techniques. The results showed that the PjBL model significantly improved students' creative thinking skills, with an independent sample t-test significance value of 0.001 ($p < 0.05$). The experimental class achieved a mean score of 25.8, compared with 19.5 in the control class. PjBL also significantly enhanced mathematics learning outcomes, with a significance value of 0.001 ($p < 0.05$). The experimental class obtained an average score of 83.3, while the control class averaged 70.4. These findings indicate that PjBL is an effective instructional strategy for fostering creativity, improving mathematics achievement, supporting the implementation of the Kurikulum Merdeka, and promoting active, collaborative, and sustainable quality learning in madrasah education.

Keywords: *Project-Based Learning (PjBL), creative thinking, learning outcomes)*

---

1. INTRODUCTION

The 21st century marks a century of shifting eras in globalization, which has significantly impacted the development of technology and science. In this century, individuals are required to possess several competencies to face the

advancement of information technology. These skills can be developed through the educational process, including creative thinking, critical thinking, problem solving, and collaboration (Abduh & Istiqomah, 2021).

Learning in this era must be grounded in these four skills to ensure that the characteristics of 21st-century learning are achieved. Consequently, teachers must be able to implement appropriate methods or models aligned with 21st-century skills. The models used must also involve students actively in the learning process (Rosnaeni, 2021). This is because 21st-century learning is no longer teacher-centered but student-centered; students participate actively in learning activities while the teacher serves as a facilitator, as reflected in the current curriculum (Muhammad Rafik et al., 2022).

The Kurikulum Merdeka (Independent Curriculum), previously known as the Prototype Curriculum, is a refinement of the previous 2013 Curriculum. It has been adapted to the conditions of society and students in the post-pandemic era. The Kurikulum Merdeka is a flexible, character-and-competency-based curriculum that also emphasizes creativity, established by the government starting in the 2022/2023 academic year. This curriculum is currently applicable to primary and secondary education levels (Mulyasa, 2023).

Implementation of the Kurikulum Merdeka requires not only curriculum transformation but also improvements in instructional management practices at the school and madrasah levels. Educational institutions are expected to adopt learning models that facilitate student-centered learning while simultaneously supporting educational quality assurance. Therefore, teachers and school leaders need evidence-based strategies capable of improving both learning processes and learning outcomes (Sallis, 2014).

From an educational management perspective, effective classroom learning contributes to institutional quality improvement. Learning models are no longer viewed solely as pedagogical tools but also as management instruments that support classroom organization, resource utilization, teacher performance, and student achievement. Consequently, evaluating innovative learning models is important for educational decision-making and policy implementation within schools and madrasahs (Bush, 2020).

One instructional model that aligns with these objectives is Project-Based Learning (PjBL). Besides improving academic achievement, PjBL encourages collaborative learning environments, active student participation, and effective classroom management. These characteristics make PjBL relevant not only from a pedagogical perspective but also from an educational management perspective, particularly in supporting quality learning practices under the Kurikulum Merdeka framework (Bell, 2010).

The development of this curriculum is also closely related to mathematics learning at the elementary school level. Mathematics plays a vital role in the development of science and technology as it provides the foundation for mathematical reasoning; therefore, mathematical abilities need to be developed from an early age. However, mathematics learning outcomes in various schools have reportedly not yet reached the expected results. Many students still perceive mathematics as a difficult subject, and student motivation remains low. This low motivation is evident in the students' lack of enthusiasm for learning the subject (Maryoto, 2018). Given that elementary-level learning is a concrete stage, instruction should utilize real objects or events (Ramadianti, 2021). Thus, in mathematics learning, teachers are required to use aids that facilitate students' understanding of the material. A lack of communication between teachers and students can also lead to a lack of interest in learning.

Interaction between teachers and students will be effective if it occurs as a two-way process; teachers are expected to create a learning environment that elicits student responses. These responses can be observed through their participation in learning (Abduljabar, 2014). In essence, educational interaction occurs two-way; thus, interaction needs to be designed to achieve optimal results in accordance with the established

learning objectives. For effective educational interaction to occur, certain requirements must be met, such as the approach, method, conditions, facilities, and an understanding of the students' intellectual, psychological, and biological development (Yogica et al., 2020). As the author found at MIN 2 Pati, issues still persist in mathematics learning, particularly in Grade V.

In the learning system at MIN 2 Pati, the mathematics teacher is the classroom teacher. Mathematics is considered boring by some students at MIN 2 Pati, as evidenced by their lack of enthusiasm. According to the VB classroom teacher, only a few students ask questions when a lesson concludes. This lack of interest can also affect learning outcomes. Therefore, teachers are expected to implement interesting teaching methods and models that can foster a passion for learning and improve student mathematics outcomes.

Essentially, educators play a role in stimulating students to participate more actively in ongoing learning activities, which enables them to improve their learning outcomes. One determinant of student success is engagement through a series of direct or indirect learning activities, both inside and outside the classroom. The delivery of teaching methods and models used by teachers influences the students' level of understanding in an effort to improve learning outcomes (Wulandari et al., 2024).

The use of effective learning models can produce efficient learning and optimize student abilities (Wicaksono et al., 2017). One learning model that teachers can implement in mathematics to hone creative thinking skills and improve learning outcomes is the Project-Based Learning (PjBL) model. PjBL is a model that utilizes projects by assigning tasks to students involving exploration, assessment, interpretation, synthesis, and information to improve learning outcomes (Syarifah et al., 2021). Project-Based Learning is an alternative model suitable for the characteristics of students at the SD/MI (elementary) level because it encompasses four main elements: attitude, process, product, and application in daily life (Wijanarko et al., 2017).

Training students' creative thinking skills in mathematics is considered highly appropriate because mathematics is a discipline based on information technology, characterized by the use of reasoning and logic as its foundation (Widana & Septiari, 2021), This makes it suitable for teachers to develop students' creative thinking. In the 21st century, the use of the PjBL model plays an important role in the learning process as it emphasizes the creativity of both teachers and students (Muhammad Rafik et al., 2022). Project learning is chosen because it is long-term, interdisciplinary, student-centered, and integrated with real-world problems (Aliftika et al., 2019). The creativity students exhibit while working on PjBL projects allows them to learn to solve problems logically, connecting learning to their real lives.

This serves as the motivation for the author to conduct research using the Project-Based Learning (PjBL) model in mathematics learning to determine the level of creativity and learning outcomes of Grade V students at MIN 2 Pati. Through the use of the PjBL model, it is expected that the creativity and learning outcomes of students in mathematics will increase.

The implementation of PjBL in elementary mathematics learning can also be explained through Piaget's Cognitive Development Theory. According to Piaget, elementary school students are generally in the concrete operational stage, where learning becomes more effective when abstract concepts are connected with concrete experiences. Through project activities involving data collection, organization, and representation, students can construct mathematical understanding through direct interaction with learning objects (Alfadhilah, 2025)

Furthermore, Vygotsky's Social Constructivism Theory explains that learning occurs through social interaction and collaborative activities. The group-based nature of PjBL facilitates knowledge construction through discussion, cooperation, and peer support. These interactions enable students to

internalize mathematical concepts and develop higher-order thinking skills, including creative thinking and problem-solving abilities (Mcleod, 2025)

2. METHODS

The research approach used in this study is quantitative research. Quantitative research is a type of educational research in which the researcher decides what to study, formulates specific questions, narrows the scope of the inquiry, collects measurable data from participants, analyzes numbers using statistics, and conducts an impartial investigation in an objective manner (Hera & Elvandari, 2021).

An experimental research design was employed in this study to test whether the Project-Based Learning (PjBL) model significantly influences student learning outcomes in mathematics, specifically regarding data representation materials at MIN 2 Pati. This design was chosen because it was not feasible for the researcher to change the naturally formed class compositions at the school without disrupting the academic schedule (Sugiono, 2011).

Experimental research is a research approach where the researcher can control one or more variables to identify cause-and-effect relationships between the dependent and independent variables. The researcher applies treatment or manipulation to one or more groups, while the other group serves as a control group (Creswell & Creswell, 2025)

This study utilized a Quasi-Experimental Design, specifically the non-equivalent control group design. The research was conducted using two classes: a control class and an experimental class. The control class was given a pre-test and a post-test but received no special treatment. Meanwhile, the experimental class was given a pre-test before the treatment and a post-test after the treatment to measure student learning outcomes. During the treatment, the researcher filled out observation sheets to measure the students' creative thinking abilities (Creswell & Creswell, 2025)

The population in this study consisted of all fifth-grade students at MIN 2 Pati for the 2024/2025 academic year. The sampling technique used was purposive sampling, through which Class V-A was selected as the experimental class and Class V-B as the control class, based on considerations of similar academic characteristics and classroom teacher recommendations. Purposive sampling was used to ensure the sample met specific criteria relevant to the research objectives, namely classes with a comparable level of initial homogeneity (Arikunto, 2021). The total number of subjects included 44 students actively involved in the entire learning process.

Data were analyzed through two main stages: prerequisite tests and hypothesis testing. Prerequisite tests included normality tests using Kolmogorov-Smirnov and homogeneity of variance tests using Levene's Test. Once prerequisites were met, hypothesis testing was conducted using the Independent Sample t-test to compare the mean differences between the experimental and control classes, as well as the N-Gain Score test to measure the magnitude of improvement (effectiveness) in student abilities (Rukmana et al., 2024). All statistical calculations were assisted by SPSS version 26.0 software to minimize manual data interpretation errors.

3. RESULTS AND DISCUSSION

Research results and discussions should be integrated into a coherent flow. Present research findings clearly and logically, supported by rich data visualizations such as tables, figures, or graphs. All visual illustrations (figures and tables) must be explicitly referenced in the body text before appearing.

The following is a summary of the descriptive data from the research results, comparing the performance of the experimental class (PjBL) and the control class (Conventional):

Tabel 1. Comparison of Average Scores for Creative Thinking and Learning Outcomes

Variable	Group	Mean Pre-test	Mean Post-test	N-Gain Score
Creative Thinking	Experimental (PjBL)	12.4	25.8	0.61 (Medium)
	Control	11.8	19.5	0.32 (Low)
Learning Outcomes	Experimental (PjBL)	62.5	83.3	0.55 (Medium)
	Control	61.8	70.4	0.22 (Low)

Based on Table 1, it is evident that the experimental class using the Project-Based Learning (PjBL) model showed higher achievements in both research variables. In the creative thinking variable, the post-test average for the experimental class reached 25.8, far exceeding the control class at 19.5. The same pattern was found in cognitive learning outcomes, where the experimental class achieved an average of 83.3 while the control class remained at 70.4. The results of the hypothesis testing using the Independent Sample t-test yielded a significance value (2-tailed) of 0.001 ($p < 0.05$) for both variables, confirming that these differences are statistically significant.

Based on the data analysis above, four main trends were observed:

- **Significant Improvement in the PjBL Class:** There was a sharp upward trend in the experimental class from the initial to final scores, particularly in creative thinking skills, which increased more than twofold (12.4 to 25.8).

- **Dominance of Project Effectiveness:** The N-Gain scores indicate that the PjBL model falls into the "**Medium**" category (0.61 and 0.55), while the conventional model is in the "**Low**" category. This indicates that PjBL is more effective in facilitating the understanding of data representation concepts.

- **Wide Achievement Gap:** A wide gap in learning outcomes emerged (a mean difference of 12.9 points) between the class actively creating projects and the class that only received material one-directionally.

- **Pre-test Homogeneity:** The initial data pattern (pre-test) shows that the abilities of both classes were relatively equal (differing by <1 point), suggesting that the surge in the experimental class was purely influenced by the treatment provided.

The superiority of the PjBL model in this study occurred because the project creation process (such as bar and pie charts) forced students to activate their creative thinking indicators. According to (Sari, 2024) , physical and mental involvement in organizing projects ensures that students do not merely memorize

formulas but discover the logic behind data representation. As students design diagrams, they practice aspects of originality and elaboration that are not acquired in conventional learning.

Furthermore, the high cognitive learning outcomes were triggered by the students' sense of ownership toward their projects. Constructivism theory states that knowledge built independently through practical experience remains longer in long-term memory compared to passive information (Thomas, 2000). Therefore, the significance value of 0.001 is not just a statistical figure, but evidence that changing the student's role from a listener to a "creator" through the PjBL model effectively solves the problems of low motivation and learning outcomes in mathematics.

The implementation of the Project-Based Learning (PjBL) model in data representation materials at MIN 2 Pati provides significant practical implications for the transformation of teacher and student roles within the classroom. The use of PjBL shifts the classroom atmosphere from a passive environment into a laboratory of creativity, where students function not merely as consumers of information, but as producers of original work (Nababan et al., 2023). This aligns with the view that PjBL grants educators the opportunity to manage classroom learning by involving project work that deepens the understanding of mathematical concepts through direct experience (Mulyasa, 2023). From a sociological perspective, the interaction among students during group work enhances collaborative skills, which is a core requirement of the *Kurikulum Merdeka*. Pedagogically, these findings imply that student learning independence can be fostered when teachers provide structured spaces for exploration through clear project stages (Rosnaeni, 2021).

The drastic increase in creative thinking scores and learning outcomes in the experimental class is attributed to the structure of the PjBL model, which demands high-level cognitive engagement. This improvement occurs as a direct result of the PjBL syntax, particularly during the project design and completion stages, where students must think critically to solve real-world problems in data representation. This causal relationship is reinforced by the theory that project-based activities trigger holistic brain function, ensuring that the knowledge formed is permanent and not easily forgotten (Tahir, 2024). Conversely, the low achievement in the control class was caused by students' dependence on rigid teacher instructions, leaving the aspects of originality and flexibility in thinking underdeveloped. Consequently, when faced with questions requiring in-depth analysis, students in the control class tended to struggle because they were accustomed to rote learning patterns (Maryoto, 2018).

The process of knowledge appropriation observed in this study can be interpreted through Vygotsky's social constructivist perspective. Mathematical knowledge was not passively received by students but actively constructed through collaborative project activities. During project completion, students collected data, discussed findings, and presented results collectively. These experiences facilitated the internalization of mathematical concepts into students' cognitive structures, resulting in deeper conceptual understanding and stronger learning retention (Woolfson, 2025).

From an educational management perspective, the implementation of PjBL demonstrates the importance of instructional planning, classroom organization, and continuous supervision of learning activities. Teachers act as facilitators who coordinate learning resources, monitor student progress, and ensure project completion according to learning objectives. Therefore, successful implementation of PjBL requires institutional support through teacher professional development programs and effective instructional leadership (Bush, 2020).

The results support the implementation of Kurikulum Merdeka policies that emphasize student-centered learning and competency development. Educational leaders may utilize these findings as empirical evidence when designing school improvement programs, teacher professional development initiatives, and instructional supervision policies.

The findings of this study provide evidence for school leaders and madrasah administrators regarding the effectiveness of PjBL as a quality improvement strategy. Within the framework of Kurikulum Merdeka, instructional innovation is closely associated with school-based management initiatives aimed at enhancing student achievement. Therefore, integrating PjBL into teacher development programs and academic supervision systems may strengthen institutional capacity to achieve educational quality targets.

4. CONCLUSION

The findings of this study indicate that the implementation of Project-Based Learning (PjBL) significantly improves students' creative thinking skills and mathematics learning outcomes compared with conventional learning approaches. The PjBL model provides meaningful learning experiences that encourage students to actively construct knowledge through project-based activities.

Beyond its pedagogical benefits, this study demonstrates that PjBL has important implications for instructional management in madrasah education. The model supports student-centered learning, strengthens classroom organization, promotes collaborative learning culture, and contributes to educational quality improvement. Therefore, school leaders and madrasah administrators may consider integrating PjBL into teacher professional development programs, academic supervision activities, and school quality improvement initiatives as part of Kurikulum Merdeka implementation.

This study is limited by its relatively small sample size and focus on a single madrasah. Future studies are encouraged to involve larger samples and multiple educational institutions to enhance the generalizability of findings and further explore the relationship between innovative learning models and educational management practices.

REFERENCES

Abduh, M., & Istiqomah, A. (2021). Analisis Muatan Hots dan Kecakapan Abad 21 pada Buku Siswa Kelas V Tema Ekosistem di Sekolah Dasar. *Jurnal Basicedu2*, *5*(4), 2069–2081. https://doi.org/https://doi.org/10.31004/basicedu.v5i4.1124

Abduljabar, B. (2014). Memperkokoh Pendidikan Karakter Melalui Mediasi Aktivitas Jasmani Berbasis Nilai. *Jurnal Pendidikan Karakter*, *5*(2), 97–107. https://doi.org/10.21831/jpk.v0i2.2180

Alfadhilah, J. (2025). Filsafat pendidikan anak usia dini menurut Jean Piaget. *Alzam: Journal of Islamic Early Childhood Education*, *5*(1), 94–111.

Aliftika, O., Purwanto, P., & Utari, S. (2019). Profil Keterampilan Abad 21 Siswa SMA pada Pembelajaran Project Based Learning (PjBL) Materi Gerak Lurus. *WaPFi (Wahana Pendidikan Fisika)*, *4*(2), 141–147. https://doi.org/10.17509/wapfi.v4i2.20178

Arikunto, S. (2021). *Dasar-dasar evaluasi pendidikan edisi 3*. Bumi aksara.

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The clearing house*, *83*(2), 39–43.

Bush, T. (2020). *Theories of educational leadership and management* (5th ed.). Sage.

Creswell, J. W., & Creswell, J. D. (2025). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Hera, T., & Elvandari, E. (2021). Pengaruh Model Pembelajaran Explicit Instruction Pada Pembelajaran Tari Daerah

Sebagai Dasar Keterampilan Menari Tradisi. *Jurnal Sitakara*, *6*(1), 40–54. https://doi.org/10.31851/sitakara.v6i1.5286

Maryoto, G. (2018). Pengaruh Pembelajaran Kooperatif Tipe Think-Pair-Share (Tps) Dan Numbered-Heads-Together (Nht) Terhadap Motivasi Dan Hasil Belajar Matematika. *Jurnal Pendidikan*, *17*(2), 121–128. https://doi.org/10.33830/jp.v17i2.271.2016

Mcleod, S. (2025). *Piaget ' s Theory and Stages of Cognitive Development*. 1–52. https://doi.org/10.5281/zenodo.15241970

Muhammad Rafik, Vini Putri Febrianti, Afifah Nurhasanah, & Siti Nurdianti Muhajir. (2022). Telaah Literatur: Pengaruh Model Pembelajaran Project Based Learning (PjBL) terhadap Kreativitas Siswa Guna Mendukung Pembelajaran Abad 21. *Jurnal Pembelajaran Inovatif*, *5*(1), 80–85. https://doi.org/10.21009/jpi.051.10

Mulyasa. (2023). *Implementasi Kurikulum Merdeka* (A. Ulinnuha (ed.); 1 ed.). PT Bumi Aksara.

Nababan, D., Marpaung, A. K., & Koresy, A. (2023). Strategi pembelajaran project based learning (PJBL). *Jurnal Pendidikan Sosial dan Humaniora*, *2*(2), 706–719.

Ramadianti, A. A. (2021). Efektivitas Model Pembelajaran Project Based Learning Terhadap Hasil Belajar Matematika Sekolah Dasar. *Primatika : Jurnal Pendidikan Matematika*, *10*(2), 93–98. https://doi.org/10.30872/primatika.v10i2.668

Rosnaeni, R. (2021). Karakteristik dan Asesmen Pembelajaran Abad 21. *Jurnal Basicedu*, *5*(5), 4341–4350. https://doi.org/10.31004/basicedu.v5i5.1548

Rukmana, M., Watung, F. A., Hasmiati, H., Agustina, T. P., & Utami, A. R. P. (2024). Development of General Biology Learning E-Modules Based on Constructivism. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *14*(2), 167–176.

Sallis, E. (2014). *Total quality management in education*. Routledge.

Sari, wina milya. (2024). *Pengunaan Model Project Based Learning Terhadap Kemampuan Berfikir Kreatif Dan Hasil Belajar Ilmu Pengetahuan Alam Materi Siklus Air Kelas V MI Tarbiyatul Banin Banat Alasdowo kecamatan Dukuhseti Tahun Ajaran 2023/2024*. institute pesantren mathali'ul falah.

Sugiono. (2011). *Sugiono, Metode Penelitian Kuantitatif, Kualitatif, dan R&D , (Bandung : Alfabeta, 2011). John W. Best, Research In Education, fourth edition (America: Prentice-Hall, 1981). 3 1*. 1–24.

Tahir, M. I. T. (2024). BAB 3 Pemecahan Masalah. *Mengeksplorasi Kecakapan-Kecakapan Penting Abad 21 Dalam Perspektif Pendidikan Dan Ekonomi*, *82*(1), 31.

Thomas, J. W. (2000). *A review of research on project-based learning*. California.

Wicaksono, B., Sagita, L., & Nugroho, W. (2017). Model Pembelajaran Group Investigation (Gi) Dan Think Pair Share (Tps) Terhadap Kemampuan Berpikir Kritis. *Aksioma*, *8*(2), 1. https://doi.org/10.26877/aks.v8i2.1876

Widana, I. W., & Septiari, K. L. (2021). Kemampuan Berpikir Kreatif dan Hasil Belajar Matematika Siswa Menggunakan Model Pembelajaran Project-Based Learning Berbasis Pendekatan STEM. *Jurnal Elemen*, *7*(1), 209–220. https://doi.org/10.29408/jel.v7i1.3031

Wijanarko, A. G., Supardi, K. I., & Marwoto, P. (2017). Keefektifan Model Project Based Learning Terbimbing untuk Meningkatkan Keterampilan Proses Sains dan Hasil Belajar IPA. *Journal of Primary Education*, *6*(2), 120–125.

Woolfson, L. M. (2025). *Key topics in educational psychology*. Taylor \& Francis.

Wulandari, R. M., Zumrotun, E., & Wiranti, D. A. (2024). Pengaruh Model Pjbl Berbantuan Media Quizizz Terhadap Hasil Belajar Bahasa Indonesia Di Kelas V Sd. *Jurnal Holistika*, *8*(1), 45. https://doi.org/10.24853/holistika.8.1.45-53

Yogica, R., Muttaqiin, A., Fitri, R., & others. (2020). *Metodologi pembelajaran: strategi, pendekatan, model, metode pembelajaran*. IRDH Book Publisher.