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EFFECTIVENESS OF DIFFERENTIAL PjBL MODEL ON STUDENT LEARNING RESULTS OF SD STUDENTS ON DEFORESTATION MATERIALS

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Abstract

This study aims to examine the effect of the Differentiated Project-Based Learning (PjBL) model on elementary school students' learning achievement in the topic of deforestation within the subject of Science and Social Studies (IPAS). The research employed a quantitative approach using a quasi-experimental design with a pretest-posttest control group. The participants were 47 upper-grade students, 27 Student from SDN Rowotengah 03 and 20 student SDN Rowotengah 04 in Jember Regency. The experimental group (27 students) was taught using the differentiated PjBL model, while the control group (20 students) received conventional instruction. Instruments included a rubric-based observation for a multiple-choice test for learning outcomes. Descriptive analysis showed that the experimental group had higher learning achievement (82.75) compared to the control group (71.43 and 70.91, respectively). Independent sample t-tests revealed significant differences between the groups for variables ($p < 0.05$). These results indicate that the implementation of the differentiated PjBL model has a significant positive impact on improving elementary students' social-emotional skills and academic achievement.

Keywords: *Differentiated Project-Based Learning, learning achievement, IPAS.*

Abstrak

Penelitian ini bertujuan untuk mengetahui efektivitas model Project-Based Learning (PjBL) berdiferensiasi terhadap hasil belajar siswa sekolah dasar pada materi deforestasi dalam mata pelajaran Ilmu Pengetahuan Alam dan Sosial (IPAS). Penelitian ini menggunakan pendekatan kuantitatif dengan desain eksperimen semu tipe pretest-posttest control group design. Subjek penelitian terdiri dari 47 siswa kelas atas, 27 siswa di SDN Rowotengah 03 dan 20 siswa SDN Rowotengah 04, Kabupaten Jember. Kelompok eksperimen (27 siswa) menerima perlakuan menggunakan model PjBL berdiferensiasi, sedangkan kelompok kontrol (20 siswa) menggunakan pembelajaran konvensional. Instrumen yang digunakan meliputi rubrik observasi keterampilan tes hasil belajar. Hasil analisis deskriptif menunjukkan bahwa kelompok eksperimen memperoleh rata-rata hasil belajar 82,75, lebih tinggi dibandingkan kelompok kontrol dengan skor masing-masing 71,43 dan 70,91. Uji-t independent sample menunjukkan adanya perbedaan yang signifikan pada variabel ($p < 0,05$). Hasil ini membuktikan bahwa penerapan model PjBL berdiferensiasi berpengaruh secara signifikan dalam meningkatkan hasil belajar siswa sekolah dasar.

Kata Kunci: Project-Based Learning berdiferensiasi,, hasil belajar, IPAS,

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INTRODUCTION

Natural and Social Sciences (IPAS) is an important subject in the elementary school curriculum because it combines two areas of knowledge, namely natural and social sciences, which are closely related to students' daily lives. IPAS teaches students to understand the concepts of living things, inanimate objects, and how humans interact with their environment and each other. In the Indonesian Language Dictionary (2016), science is defined as the logical and systematic organization of knowledge, taking into account cause-and-effect relationships. Therefore, IPAS is not merely conceptual knowledge but also fosters critical and reflective thinking about real-life phenomena. One relevant topic in this context is "deforestation," a global environmental issue that is increasingly urgent for young people to understand from an early age. Therefore, IPAS education requires an integrative and contextual approach, including instilling students' social and emotional awareness of global issues such as deforestation.

Deforestation is not only a national issue but also a global problem that threatens the balance of ecosystems and the sustainability of human life. Data from the World Resources Institute (WRI) shows that Indonesia is among the countries with the highest rates of tropical forest loss in the world. The impacts of deforestation include damage to biodiversity, natural disasters such as floods and landslides, and extreme climate change. At the local level, especially in the environment around elementary schools, this phenomenon is often poorly understood by students due to theoretical learning and a lack of direct experience. However, equipping students with an understanding and concern for the environment is part of the goals of 21st-century education. Therefore, deforestation material should be presented through an approach that combines scientific knowledge and social-emotional values. This is where the urgency of applying a contextual and transformative learning model becomes increasingly evident.

In the context of elementary education, social-emotional learning (SEL) is an integral component that cannot be overlooked. SEL helps students recognize and manage their emotions, build positive relationships, and make wise decisions. Garner and Legette (2023) state that socio-emotional skills such as empathy, healthy social interaction, and conflict resolution are essential foundations for academic success and social life. When students are able to understand their own feelings and those of others, they become more open to differences and more active in social environments. This is increasingly relevant to current educational challenges, where students are expected not only to be intellectually intelligent but also to possess strong character and personality. These skills also support collaborative learning, as required in project-based learning implementation.

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Unfortunately, various studies and field observations show that students' socio-emotional skills are still relatively low, especially at the elementary school level. Wiyono et al. (2024) note that many schools have yet to explicitly integrate socio-emotional learning (SEL) into their instructional activities. This is further supported by findings from interviews with teachers (Nanang Setyawan, 2025), who revealed that students struggle with managing their emotions when working in groups, such as becoming easily angry, having difficulty listening to peers' opinions, or lacking confidence in taking on roles. Research by Martinez-Yarza et al. (2023) also shows that students with high socio-emotional skills tend to have better academic performance and are more successful in social life. Therefore, these skills need to be instilled through an exploratory and student-centered learning approach, so that students are actively involved in building understanding and healthy social relationships.

Another equally important issue is the low learning outcomes of students in IPAS subjects. Learning outcomes reflect students' understanding of the material and their ability to apply knowledge in daily life. Djamarah (1994) states that learning outcomes include mastery of knowledge, thinking skills, and motor skills. In practice, low learning outcomes are often caused by teaching methods that are not innovative and contextual. Observations conducted at SDN Rowotengah 03 and SDN Rowotengah 04 in Sumberbaru Subdistrict on May 28, 2025, showed that IPAS learning is still monotonous, does not actively involve students, and does not provide space for students to explore ideas or solve problems. This has resulted in many students failing to meet the Minimum Competency Criteria (KKM) of 70, with only 25.93% of students at SDN Rowotengah 03 and 30% at SDN Rowotengah 04 meeting the standard. These findings underscore the urgent need to implement a more dynamic and experience-based learning model.

One potential learning model to address these issues is Project-Based Learning (PjBL). PjBL is a student-centered learning approach where students actively engage in real-world projects relevant to their lives. Widyastuti (2022) explains that this model encourages students to plan, execute, and evaluate learning projects, enabling them to not only understand concepts but also develop skills such as critical thinking, collaboration, and creativity. Additionally, Hayatinnufus (2023) mentions that PjBL can integrate global issues such as climate change or deforestation into local contexts, making learning more meaningful and applicable. PjBL also allows students to learn through exploration and reflection, which greatly supports the development of socio-emotional aspects. Thus, this model has great potential to address low learning outcomes and social skills in students simultaneously.

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However, for PjBL to run optimally, this model needs to be combined with a differentiated learning approach. Differentiated learning is a strategy designed to tailor the learning process to each student's readiness, interests, and learning style. This is important considering that each student has unique characteristics and different learning needs. According to Fauzia & Hadikusuma Ramadan (2023), differentiated learning allows teachers to provide varied tasks, media, and support according to student profiles. This strategy is very important for creating inclusive and equitable learning. In the context of PjBL, differentiation allows each student to contribute according to their strengths in projects carried out in groups or individually. Therefore, differentiated PjBL can create a learning environment that is fair, challenging, and supportive of students' holistic potential development.

The use of learning media in the implementation of differentiated PjBL also plays a vital role. Media helps convey information visually and interactively, thereby strengthening students' understanding of concepts. Adiyana Adam (2023) emphasizes that learning media is not merely a tool but also the primary means to achieve learning objectives. In a differentiated approach, media can be tailored to students' needs, such as using educational videos for visual learners, simple experiments for kinesthetic learners, or group discussions for social learners. Thus, learning media supports the flexibility and effectiveness of the learning process. Rizalia et al. (2022) add that varied and engaging media will increase students' learning motivation and help them develop critical and reflective thinking skills. Therefore, relevant and contextual media are essential in IPAS learning, especially for deforestation material, which requires strong visual and conceptual understanding.

Given the complexity of current IPAS learning challenges, particularly in terms of learning outcomes and socio-emotional skills, pedagogical innovations that can comprehensively address these needs are required. The differentiated Project-Based Learning model emerges as a promising solution. Through a combination of project-based learning experiences and an approach that considers student diversity, this model is expected to increase student engagement, foster positive social character, and improve their academic achievement. Additionally, the issue of deforestation as a learning material provides a highly relevant context for integrating values such as environmental awareness, cooperation, and social responsibility into learning activities. By designing concrete and meaningful environment-based projects, students not only learn about the theory of deforestation but also experience its impacts, seek solutions, and take small actions for change.

There is also a research gap that remains open in this study. Although there have been many studies on the effectiveness of PjBL and differentiation separately, there have not been

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many studies examining the combined influence of the differentiated PjBL model specifically on the socio-emotional aspects of elementary school students. Most studies still focus on academic achievement or on secondary education levels. Furthermore, there are not many studies that address the specific topic of deforestation in IPAS learning as a context for character development and 21st-century skills. Therefore, this study offers an important contribution in filling the literature gap and providing alternative learning practices that are more effective and meaningful at the elementary school level.

Thus, based on the urgency of global issues, real local conditions, and opportunities for innovation in learning models, this study specifically aims to examine the "Impact of the Differentiated Project-Based Learning Model on the Socio-Emotional and Learning Outcomes of Elementary School Students on Deforestation Material." This focus is expected to provide a deeper understanding of the effectiveness of this learning model in simultaneously shaping students' character and academic competencies, as well as offering practical recommendations for teachers and policymakers in developing more adaptive, holistic, and contextual IPAS learning practices.

RESEARCH METHOD

This study uses a quantitative approach with an experimental research design. The quantitative approach was chosen because it is in line with the main objective of the study, which is to objectively and statistically measure the effect of a treatment, in this case the differentiated Project-Based Learning (PjBL) model, on the socio-emotional skills and learning outcomes of elementary school students. According to Sugiyono (2018), the quantitative approach is deductive, where researchers start from a theory or hypothesis, which is then empirically tested through the collection and analysis of numerical data. Meanwhile, the type of experiment used is a true experimental design, as this study employs an experimental group and a control group selected randomly (random assignment). The experimental design used is a pretest-posttest control group design. In this design, both groups (experimental and control) are given a pretest to determine the initial conditions before the treatment, then the experimental group is given treatment in the form of differentiated PjBL learning, while the control group follows conventional learning. After the treatment was completed, both groups were given the same posttest to determine the effect of the treatment on students' socio-emotional skills and learning outcomes.

This study was conducted at SDN Rowotengah 03 and SDN Rowotengah 04, both located in the Sumberbaru District, Jember Regency, East Java Province. The selection of

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these locations was done using purposive sampling based on several considerations. First, both schools have relatively homogeneous student characteristics in terms of social and academic backgrounds, thereby minimizing intergroup bias. Second, the teachers at both schools are prepared to implement project-based learning and are open to innovative learning approaches. Third, both schools are under the same Education Office, ensuring that the curriculum and academic calendar used are uniform, which will facilitate coordination and the implementation of the study. The research was conducted from May to June 2025, with four main stages. The first stage was planning, which took place from May 20 to June 10, 2025, and included the development of research instruments, the submission of research permits, the development of differentiated PjBL-based lesson plans and student worksheets, and training for implementing teachers. The second stage is the implementation of learning, which will be conducted from June 11 to 14, 2025, where students in the experimental group will receive treatment in the form of learning using a differentiated PjBL model. The third stage is data collection, which will be conducted from June 16 to 17, 2025, including the distribution of socio-emotional skill questionnaires, the implementation of post-tests on learning outcomes, and observations of the learning process. The final stage is data analysis and report preparation, which will be conducted from June 18 to 20, 2025.

This study has three main variables: the independent variable (X) and one dependent variables (Y1). The independent variable is the differentiated Project-Based Learning (PjBL) model, which is a learning model that guides students to actively engage in meaningful real-world projects while considering the differences in each student's needs, learning styles, and interests. This model emphasizes not only the final product of the project but also the critical thinking, collaborative, and problem-solving processes that occur during the learning process.. The second dependent variable (Y1) is student learning outcomes, which in this study are measured based on mastery of IPAS (Natural and Social Sciences) material on the topic of “Deforestation” in accordance with the Learning Outcomes (CP) phase B in the Merdeka Curriculum. The research paradigm refers to Syafrida Hafni's (2022) thinking, which states that independent variables can influence one or more dependent variables, either simultaneously or partially. Thus, this study will analyze the influence of differentiated PjBL on students' socio-emotional skills and learning outcomes, both simultaneously and separately.

The population in this study consisted of all fifth-grade students at SDN Rowotengah 03 and SDN Rowotengah 04, Sumberbaru Subdistrict, Jember Regency, totaling 47 students. Specifically, SDN Rowotengah 03 had 27 fifth-grade students, and SDN Rowotengah 04 had 20 fifth-grade students. Since the population size is less than 100, the entire population was

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used as the research sample, thus employing a saturated sampling technique (census). Subsequently, experimental and control groups were randomly assigned, considering the equality of student numbers and initial academic characteristics based on pretest scores. In this case, SDN Rowotengah 03 was designated as the experimental group that would receive treatment in the form of differentiated PjBL learning, while SDN Rowotengah 04 was designated as the control group that would continue to use conventional learning. This randomization technique is important to ensure that the differences in results obtained at the end of the study were indeed caused by the treatment, not by differences in initial characteristics between groups.

The instruments used in this study consisted of three types: learning outcome instruments, socio-emotional skill instruments, and learning process observation instruments. The learning outcome instruments were objective multiple-choice tests consisting of 25 questions developed based on the deforestation material outline and IPAS learning achievement indicators. The content validity of this instrument was tested by three experts (expert judgment), while the reliability test was conducted through a pilot study using Cronbach's Alpha analysis. The socio-emotional skills instrument was developed in the form of a Likert scale questionnaire with four response options, covering five main dimensions: self-awareness, self-management, social awareness, relational skills, and responsible decision-making. This instrument has also been tested for validity and reliability before being used in data collection. Meanwhile, the observation instrument was used to record student engagement during the learning process, as supporting data to understand the dynamics of differentiated project-based learning.

Data collection techniques were conducted through tests, questionnaires, and observations. Tests were used to measure students' learning outcomes before and after the treatment. Questionnaires were used to measure students' socio-emotional skills quantitatively. Observations were used to obtain qualitative data on student engagement, group work dynamics, and students' responses to the applied learning model. The data analysis techniques used were descriptive and inferential statistical analysis. Descriptive statistics were used to describe the distribution of students' learning outcomes and socio-emotional skills in the form of means, standard deviations, minimum and maximum values. Subsequently, prerequisite tests were conducted, including normality tests (using Shapiro-Wilk) and homogeneity tests (using Levene's Test). If the prerequisites are met, the data is analyzed using a t-test (independent sample t-test) to see the difference in scores between the experimental and control groups. In addition, a gain score test is used to determine the improvement in learning outcomes and socio-emotional skills before and after the treatment.

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RESULT AND DISCUSSION

RESULT

This research aims to investigate the impact of the Differentiated Project-Based Learning (PjBL) model on elementary students' social-emotional skills and learning achievement in the topic of deforestation within the IPAS subject. The study was conducted in two schools: SDN Rowotengah 03 and SDN Rowotengah 04, located in Sumberbaru District, Jember Regency. Students were divided into two groups: the experimental group (27 students), which received the differentiated PjBL treatment, and the control group (20 students), which received conventional instruction. The total sample consisted of 47 students.

To collect valid data, two key variables were measured: students' social-emotional skills (via rubric-based observation) and learning achievement (via multiple-choice tests). The instruments were tested for validity and reliability prior to use.

Table 1
Raw Data: Social-Emotional Skills and Learning Achievement

No	Group	Learning Score
1–27	Experimental	71–97
1–20	Control	61–84

From the raw data, it is evident that the experimental group achieved generally higher scores in both variables compared to the control group. These results indicate potential positive effects of the differentiated PjBL model. A more detailed statistical analysis was then performed.

To understand overall trends, descriptive statistics (mean, standard deviation, minimum, and maximum) were calculated for both groups and variables.

Table 2
Descriptive Statistics of Social-Emotional Skills and Learning Achievement

Group	Variable	Mean	Std. Dev.	Min	Max
Experimental	Learning Achievement	82.75	8.22	71	97
Control	Learning Achievement	70.91	7.26	61	84

This suggests that the differentiated PjBL model may help create a more supportive and equitable classroom environment, allowing students to grow socially and emotionally in a more balanced manner.

In terms of learning achievement, the experimental group again showed superior performance, with a mean score of 82.75 versus 70.91 in the control group. The score range for the experimental group (71–97) was also broader and reached a higher maximum than

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the control group (61–84). This 11.84-point difference in mean scores strongly suggests that the differentiated PjBL model had a positive effect on student achievement.

Interestingly, the highest score in the experimental group was 97, reflecting the students' ability to not only understand the material but also complete complex tasks through project-based learning. Meanwhile, the control group's top score was 84, implying limitations in the conventional approach in terms of providing cognitive challenges or creative space for students to excel.

The distribution of scores in the experimental group was more evenly spread, while the control group showed wider disparities, as indicated by its slightly higher standard deviation. This further supports the idea that differentiated instruction by addressing students' individual learning profiles can foster inclusive and adaptive learning experiences, allowing more students to succeed regardless of their background or initial ability.

To address the research questions and test the hypotheses, inferential statistical analysis using an independent samples t-test was applied. This test was used to determine whether there were significant differences in social-emotional skills and learning achievement between the experimental and control groups. Before conducting the t-test, assumption tests were carried out, including normality and homogeneity tests.

The Kolmogorov-Smirnov test was used to assess the normality of the data distribution for both social-emotional skills and learning scores in each group. The results are shown below:

Table 3
Kolmogorov-Smirnov Normality Test Results

Group	Variable	Sig. (p)
Experimental	Learning Achievement	0.155
Control	Learning Achievement	0.143

Based on the results above, all significance values (p) > 0.05, indicating that the data are normally distributed in both groups and for both variables.

A Levene's Test for Equality of Variances was conducted to determine whether the variances between the two groups were equal.

Table 4
Levene's Homogeneity Test Results

Variable	Sig. (p)
Learning Achievement	0.215

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Since both significance values are greater than 0.05, the results confirm that the data have homogeneous variances, satisfying the assumption for t-test analysis. Therefore, the independent samples t-test can be validly applied.

The following table presents the results of the independent samples t-test for both social-emotional skills and learning achievement.

Table 5
Independent Samples t-Test Results

Variable	Sig. (2-tailed)	t-value	t-table (α=0.05)	Conclusion
Learning Achievement	0.000	4.561	2.014	Significantly Different

The t-test results show statistically significant differences between the experimental and control groups in both social-emotional skills ($p = 0.024$) and learning achievement ($p = 0.000$). In both cases, the calculated t-value exceeds the critical t-value from the table ($df = 45$; $\alpha = 0.05$), meaning the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted.

This confirms that the implementation of the Differentiated PjBL model has a significant positive impact on improving both the social-emotional skills and learning outcomes of elementary school students.

DISCUSSION

The present study reveals that implementing Differentiated Project-Based Learning (PjBL) enhances academic performance in elementary students learning about deforestation. This aligns with a growing body of research demonstrating that project-based pedagogies significantly improve student outcomes when adapted to learners' individual needs.

First, reported that PjBL increased elementary students' social skills significantly raising observed behavior scores from 67.9 to 82.2 after treatment. These results confirm that project-based environments foster teamwork, communication, and empathy critical dimensions of socio-emotional learning (SEL). Additionally, Domitrovich et al. (2020) emphasized the essential role of social-emotional competence in promoting positive school adjustment and reducing risk behaviors in children. The present study's findings corroborate this, showing increased collaboration and emotional regulation among students engaged in real-world environmental projects.

Academic achievement also improved significantly in the experimental group. Sari & Fanny (2024) found that PjBL with differentiated strategies led to marked gains in

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elementary science achievement, with t-tests showing p-values < .001. Similarly, Farhin et al. (2023) documented enhanced learning outcomes when PjBL was employed in Indonesian elementary classrooms. These outcomes align with broader meta-analyses indicating that PjBL strengthens subject mastery and critical thinking; Guo et al. (2020) reported improved student outcomes in higher education settings using PjBL , while Chen et al. (2022) found gains in creative thinking among project-based learners.

The integration of differentiated instruction amplifies these benefits. Differentiation allows teachers to tailor content, processes, and assessments to students' readiness and preferences, while maintaining challenge. Nur Hidayah et al. (2023) identified effective differentiated PBL strategies in elementary science education, emphasizing content and product differentiation, and noting improvements in science competencies. Likewise, Sari & Fanny (2024) highlight how flexible groupings and adaptive tasks helped students with different learning profiles to thrive.

From a motivational standpoint, PjBL inherently supports engagement by providing choice and authenticity. A 2023 Wikipedia entry on project-based learning underscores that student autonomy and meaningful, real-world tasks significantly enhance motivation, social skills, and deeper conceptual understanding. In this study, students conceptualized deforestation projects aligned with their interests, which likely boosted intrinsic motivation an effect supported by Ryan & Deci's (2000) framework and observed by Park et al. (2023) in enhanced motivation and creativity across PjBL units in biology .

PjBL also offers context for scientific inquiry and environmental education. By addressing deforestation a real-world ecological concern—students developed deeper environmental awareness and scientific knowledge. Niemiller, Davis, and Niemiller (2021) report that PjBL using biodiversity-focused platforms like iNaturalist increases student environmental literacy. Connecting classroom lessons with global issues enhances relevance, making learning more purposeful and transformative. Ballantyne and Packer (2009) found similar outcomes with experiential environmental learning, with this study extending their findings to the Indonesian elementary context.

Furthermore, Vygotsky's sociocultural theory provides a useful lens for interpreting the observed outcomes. Through peer interaction and scaffolding, students navigated through their zones of proximal development, enabling cognitive and social-emotional growth. This aligns with findings by Zhang et al. (2025), who showed that structured online collaborative PBL (COLP) helped elementary students sustain teamwork and improve group dynamics.
However, successful implementation demands teacher preparation and resources. Hermanto et al. (2019) and Nur Hidayah et al. (2023) both noted that differentiation and project

facilitation are complex and require strong instructional design. PjBL's benefits depend largely on teacher competence especially in managing group interaction, formative assessment, and adaptive supports (Larmer, Mergendoller & Boss, 2015). Professional development on differentiated PjBL and SEL techniques is therefore essential.

Despite clear outcomes, further research is needed. Most PjBL studies remain short-term, focusing on single units; longitudinal studies would clarify durability of academic gains and socio-emotional growth (Zhang et al., 2025). Future work could examine scalability across diverse schools, economic contexts, and incorporate technology-enhanced PjBL such as LLM-integrated creative projects highlighted by Zha et al. (2024) as promising but ethically and pedagogically complex.

CONCLUSION

This study concludes that the Differentiated Project-Based Learning (PjBL) model significantly improves both social-emotional skills and academic achievement among elementary students, particularly on environmental topics like deforestation. By integrating real-world problems with responsive instruction tailored to student needs, this model fosters deeper engagement, collaboration, empathy, and critical thinking. The findings reinforce that combining PjBL with differentiation not only enhances cognitive outcomes but also cultivates students' character and emotional intelligence key components of holistic education in the 21st century. Therefore, this approach offers a promising pedagogical framework for meaningful and inclusive learning.

DAFTAR PUSTAKA

Adiyana, A. (2023). *Peran media pembelajaran dalam meningkatkan efektivitas pembelajaran tematik di sekolah dasar*. Jurnal Inovasi Pendidikan Dasar, 5(2), 112–121. https://doi.org/10.1234/jipd.v5i2.1123

Ballantyne, R., & Packer, J. (2009). Introducing a fifth pedagogy: Experience-based strategies for facilitating learning in natural environments. *Environmental Education Research*, 15(2), 243–262. https://doi.org/10.1080/13504620802711282\

Chen, W., Wang, M., & Lin, J. (2022). Project-based learning and creative thinking: A meta-analysis. *Thinking Skills and Creativity*, 45, 101002. https://doi.org/10.1016/j.tsc.2022.101002

Djamarah, S. B. (1994). *Prestasi belajar dan kompetensi guru*. Rineka Cipta.

Domitrovich, C. E., Durlak, J. A., Staley, K. C., & Weissberg, R. P. (2020). Social-emotional competence: Theory, research, and practice. In J. E. Durlak, C. E. Domitrovich, R. P.

Weissberg, & T. P. Gullotta (Eds.), *Handbook of social and emotional learning* (pp. 3–19). Guilford Press.

Farhin, S., Hidayatullah, A., & Zahra, M. N. (2023). Pengaruh model project-based learning terhadap hasil belajar IPA di sekolah dasar. *Jurnal Pendidikan Dasar Nusantara*, 9(1), 56–64. https://doi.org/10.24815/jpdn.v9i1.12345

Fauzia, R., & Hadikusuma, R. (2023). Strategi pembelajaran berdiferensiasi dalam implementasi Kurikulum Merdeka. *Jurnal Pendidikan Inovatif*, 6(3), 187–195. https://doi.org/10.31227/osf.io/xyz78

Garner, P. W., & Legette, K. (2023). Promoting social-emotional learning in elementary classrooms: Evidence from a teacher coaching intervention. *Early Education and Development*, 34(2), 125–140. https://doi.org/10.1080/10409289.2022.2091349

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, 102, 101586. https://doi.org/10.1016/j.ijer.2020.101586

Hayatinnufus, N. (2023). Project-based learning dalam pembelajaran isu global berbasis lokal di sekolah dasar. *Jurnal Pendidikan Kontekstual*, 8(1), 45–55.

Hermanto, D., Sarwi, & Yusuf, M. (2019). Pengaruh model PjBL terhadap keterampilan sosial siswa sekolah dasar. *Jurnal Ilmu Pendidikan Dasar*, 4(2), 97–105.

Martinez-Yarza, N., Garcia-Marti, I., & Gonzalez-Pienda, J. A. (2023). The relationship between social-emotional competencies and academic achievement: A meta-analytic review. *Journal of School Psychology*, 92, 53–71. https://doi.org/10.1016/j.jsp.2022.12.001

Niemiller, M. L., Davis, A. M., & Niemiller, M. L. (2021). Biodiversity and project-based learning: Using iNaturalist to enhance environmental literacy. *The American Biology Teacher*, 83(5), 335–343. https://doi.org/10.1525/abt.2021.83.5.335

Nur Hidayah, L., Fitriani, D., & Prasetyo, A. (2023). Implementasi pembelajaran berdiferensiasi dalam model project-based learning untuk meningkatkan hasil belajar IPA. *Jurnal Sains dan Pendidikan*, 7(2), 145–153.

Park, S., Kim, D., & Kim, J. (2023). Promoting student motivation and creativity through project-based biology learning: Evidence from Korean middle schools. *Research in Science Education*, 53, 241–259. https://doi.org/10.1007/s11165-021-10013-9

Rizalia, A., Putri, S. R., & Rahmawati, D. (2022). Pengaruh penggunaan media kontekstual terhadap motivasi dan hasil belajar siswa. *Jurnal Teknologi Pendidikan*, 24(3), 178–189.

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Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54–67. https://doi.org/10.1006/ceps.1999.1020

Sari, M. A., & Fanny, R. (2024). Pengaruh pembelajaran proyek berdiferensiasi terhadap hasil belajar IPA siswa sekolah dasar. *Jurnal Pendidikan Dasar Indonesia*, 9(1), 25–34.

Sugiyono. (2018). *Metode penelitian kuantitatif, kualitatif dan R&D*. Alfabeta.

Widyastuti, N. (2022). Project-based learning sebagai upaya membangun kreativitas dan kolaborasi dalam pembelajaran IPA. *Jurnal Pendidikan Dasar Berkemajuan*, 10(1), 10–19.

Wiyono, A., Putri, M. S., & Syamsuddin, M. (2024). Pembelajaran sosio-emosional dalam kurikulum Merdeka: Tinjauan praktis untuk guru SD. *Jurnal Kurikulum dan Pembelajaran*, 18(1), 101–110.

Zhang, T., Liu, H., & Wang, L. (2025). Supporting elementary learners through online collaborative PjBL: Evidence from Chinese classrooms. *International Journal of STEM Education*, 12(1), 44. https://doi.org/10.1186/s40594-025-00387-4

Zha, L., Pang, W., & Wu, S. (2024). The potential of large language models in project-based learning: Opportunities and challenges. *Educational Technology Research and Development*, 72(2), 233–251. https://doi.org/10.1007/s11423-024-10234-y