

A Systematic Study of the Application of Differentiated Project-Based Learning to Improve the Readiness and Learning Outcomes of Elementary Students

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Abstract

This study is a systematic literature review to analyse the implementation of the Project-Based Learning (PjBL) model combined with the Differentiated Learning approach to enhance learning readiness and outcomes among elementary school students. The review examines relevant empirical studies and theoretical frameworks from recent literature to understand how integrating these two learning models accommodates diverse student readiness and positively impacts competency achievement. Findings indicate that differentiated-based PjBL enables students to engage actively and creatively according to their learning styles and readiness levels, significantly improving motivation, critical thinking skills, and learning outcomes. Furthermore, teacher readiness in designing Lesson Plans (RPP) that respond to student diversity is crucial for successful implementation. This review recommends that educators and policymakers develop inclusive and effective learning strategies at the elementary education level.

INTRODUCTION

Primary education plays a critical role in shaping students' character, knowledge, and essential skills to meet the dynamic challenges of the 21st century. Beyond content mastery, education must cultivate critical thinking, creativity, collaboration, and communication (Saavedra & Opfer, 2012). In response to these demands, a significant body of research has emphasised the importance of adopting innovative and adaptive instructional models that align with the principles of Education 4.0 and Education 5.0, which promote contextual, personalised, and technology-integrated learning (González-Pérez & Ramírez-Montoya, 2022; Yusuf, Julianingsih, & Ramadhani, 2023). In Indonesia, these global shifts are reflected in the implementation of Kurikulum Merdeka, which underscores differentiated instruction, student autonomy, and pedagogical strategies tailored to learners' readiness, interests, and profiles (Rosa et al., 2024; Susilana et al., 2024).

Recent scholarship has highlighted the role of Project-Based Learning (PjBL) as a pedagogical model that empowers students to engage in real-world, meaningful tasks, thus fostering motivation, autonomy, and higher-order thinking skills (Saavedra & Opfer, 2012; Firdausih & Aslan, 2024). In diverse classroom contexts, PjBL has also been effective in enhancing college and career readiness, especially when projects align with students' interests and future aspirations (Mulcahy & Wertz, 2021). In Indonesia, PjBL supports the principles of Kurikulum Merdeka by promoting learner-centeredness and contextualised learning experiences (Rosa et al., 2024).

However, despite its benefits, implementing PjBL in primary education often encounters several challenges. Research has shown that varied student readiness, limited teacher capacity, and lack of

adequate learning resources may hinder its effectiveness in heterogeneous classrooms (Safitri et al., 2024; Maharani, Lestari, & Jannah, 2024). To address these obstacles, recent studies advocate for integrating Differentiated Learning (DL) within the PjBL framework. Differentiated instruction, as conceptualised by Tomlinson et al. (2003), involves adapting content, process, products, and the learning environment to meet learners' diverse needs based on their readiness, interests, and learning profiles.

The synergy between PjBL and DL is increasingly recognised as a promising approach to foster inclusive and equitable learning. Empirical evidence supports this combination for improving students' engagement, conceptual understanding, and academic outcomes in science and literacy education (Ghazouani, 2014; Firdausih & Aslan, 2024; Putri & Nuvitalia, 2024). Moreover, research shows that differentiated digital learning tools—such as e-LKPDs—can support project-based writing activities and accommodate diverse learners more effectively (Putri et al., 2025). In inclusive settings, teacher-facilitated reflective dialogue within PjBL activities has also been shown to deepen conceptual learning and support student self-regulation (Sormunen, Juuti, & Lavonen, 2020).

Furthermore, differentiated project-based learning environments not only address the needs of students with learning difficulties but also challenge high-ability students through tiered tasks, thereby promoting educational equity (Aprilia & Efendi, 2025; El Moutawaqil & Susanto, 2024). This dual responsiveness positions the PjBL-DL integration as a strategic instructional model in transforming toward inclusive, personalised, and future-oriented education. Therefore, this study aims to conceptualise and examine the integration of Project-Based Learning and Differentiated Instruction as a pedagogical model to support inclusive, autonomous, and competency-based learning in Indonesian primary schools, particularly in the context of Kurikulum Merdeka and the broader demands of Education 5.0.

METHOD

This study employs a Systematic Literature Review (SLR) method, a secondary research approach characterised by its systematic, structured, and transparent process for identifying, evaluating, and interpreting all relevant research findings related to a specific research question or topic. Unlike traditional literature reviews, the SLR method follows a clearly defined protocol and sequential stages to minimise subjective bias and enhance the validity of the literature synthesis. The approach integrates qualitative and quantitative techniques to analyse the collected literature data. Qualitative, narrative, and thematic synthesis methods are applied to interpret the research findings, while quantitative meta-analysis can be conducted if the data permit. According to Choifah, Suyitno, and Pujiastuti (2022), the SLR procedure includes the following stages: (1) Planning, which involves formulating research questions and developing a review protocol; (2) Data Collection, encompassing keyword-based literature searches, screening of titles and abstracts, selection according to inclusion and exclusion criteria, and systematic data extraction; (3) Analysis, which entails descriptive and thematic analysis of the gathered data; and (4) Synthesis, where the findings are compiled into conclusions and recommendations.

The data sources used in this research comprise international and national peer-reviewed journal articles indexed in reputable databases such as Scopus, Google Scholar, Web of Science, and official journal or publisher websites, focusing on differentiated learning, Project-Based Learning (PjBL) methods, and lesson planning (RPP). Additionally, classical and contemporary textbooks and references related to the theory of differentiated learning (e.g., Tomlinson, 2001) are included. The literature search was conducted through a structured search strategy that involved: defining specific and clear research questions; compiling relevant keywords and search terms including synonyms and variations from the last eight years; performing searches across multiple databases with filters on publication year, language, and document type; initial screening based on titles and abstracts to exclude irrelevant studies; full-text screening to confirm suitability and study quality; strict application of inclusion and exclusion criteria to ensure only valid and relevant studies were analysed; systematic

data extraction using forms or spreadsheets capturing key information such as research objectives, methods, results, and conclusions; and finally, assessment of study quality utilising standard instruments such as the Critical Appraisal Skills Programme (CASP) to evaluate validity and reliability.

The inclusion criteria for this review were empirical studies examining the implementation of Project-Based Learning and/or Differentiated Learning Programs at the primary school level, published between 2016 and 2024, written in either English or Indonesian, and employing quantitative, qualitative, or mixed methods designs. Only peer-reviewed articles with full-text availability were considered. Conversely, studies were excluded if they focused on education levels other than primary school (e.g., secondary or non-formal education), were non-empirical articles such as opinions, editorials, or narrative reviews, demonstrated poor methodological quality (e.g., lacking adequate controls), did not explicitly discuss PjBL or differentiated learning, or were duplicates or incomplete (e.g., abstract only).

The systematic and structured nature of the SLR methodology ensures a rigorous approach to identifying, evaluating, and synthesising relevant primary research. This approach aims to produce a balanced and robust evidence base by integrating findings from multiple published studies, which can then inform evidence-based practice and policy. Moreover, the reliance on credible data sources and strict selection criteria minimises bias and enhances the validity and reliability of the synthesised results. Consequently, this well-designed SLR process enables the production of a trustworthy and meaningful literature review that contributes scientifically to the field.

RESULTS AND DISCUSSION

Results

This systematic review was conducted through extensive literature searches across databases, including Google Scholar, Scopus, and indexed journals, using key terms such as "Project-Based Learning (PjBL)," "Differentiated Learning," "learning readiness," "elementary school," and "lesson plan (RPP) design." After rigorous screening and applying inclusion and exclusion criteria, 25 relevant articles meeting quality standards were selected for further analysis.

1. Effectiveness of Project-Based Learning (PjBL)

The findings consistently demonstrate that PjBL enhances active student engagement, motivation, critical thinking skills, collaboration, and learning outcomes in knowledge and skills domains (Sources: Wulandari, R., 2024; Yusri, R. et al., 2024; Rahman, I. et al., 2024; Thomas, JW, 2000).

2. Role of Differentiated Learning Programs

Differentiated learning approaches incorporated into lesson plan design enable teachers to accommodate students' diverse learning readiness, styles, and individual needs, thereby fostering more equitable and inclusive learning outcomes (Sources: Wulandari, R., 2024; Ayu, HD. et al., 2023).

3. Student Learning Readiness

Variations in student readiness can be effectively addressed through differentiated PjBL, which increases learners' confidence and motivation throughout the learning process (Sources: Ferrero, M. et al., 2021; Walden University, 2020).

4. Teacher Readiness and Implementation

Teachers' preparedness to design and implement PjBL- and differentiation-based lesson plans is a crucial success factor. Professional development and ongoing support are necessary to enhance teachers' competencies in applying this pedagogical model (Sources: Rahman, I. et al., 2024; Walden University, 2020; Condliffe, Barbara, 2017). Berikut Penilaian Kualitas Penelitian dengan CASP:

Table 1. Table of Research Quality Assessment Checklist Instrument with Critical Appraisal Skills Programme (CASP)

Number	Assessment Aspect	Main Question	Answer (Yes/No/Unclear)	Remarks/Notes
1	Research objectives	Does the study have well-defined objectives?	Yes	Does the study have well-defined objectives?
2	Literature Search	Did the authors search the relevant literature comprehensively?	Yes	Did the authors search the relevant literature comprehensively?
3	Inclusion and exclusion criteria	Are the inclusion and exclusion criteria described?	Yes	Are the inclusion and exclusion criteria described?
4	Study quality	Was the quality of the included studies critically appraised?	Yes	Was the quality of the included studies critically appraised?
5	Study results	Are the study results appropriately synthesised?	Yes	Are the results of the study synthesised appropriately? Research objectives are described in detail.
6	Reporting of study results	Are the results of the study reported transparently and completely?	Yes	Databases and keywords are described
7	Identification of potential bias	Are potential biases identified and discussed?	Unclear	Criteria are described in the methods section
8	Data implications and limitations	Are the implications and limitations adequately discussed?	Yes	Quality assessment using the CASP instrument
9	Conclusion	Do the results and analyses support the conclusions?	Yes	Thematic synthesis and/or meta-analysis
10	Appropriateness to local context or practice	Are the results of the review relevant for the local context or practice?	Yes	Results are presented in tables and narrative

Based on the Critical Appraisal Skills Programme (2024). CASP Systematic Review Checklist [online]. Available at: https://casp-uk.net/casp-checklists/CASP-Systematic-Review-checklist_2022.pdf. Accessed: [12 Juni 2022])

Table 1. Study Data Extraction Table for SLR Research

Author	Year Study Title	Research Design	Sample	Main Variables	Key Findings	Quality of Study (CASP)	Additional Notes
Sari et al. (2023)	The Effect of Differentiated PBL on Elementary Students' Learning Readiness	Quantitative	120 elementary school students in Jakarta	PBL, DLP, Learning Readiness	DLP-based PBL significantly improves students' learning readiness	Good (8/10)	Control group present
Musday et al. (2023)	Implementation of Differentiated Learning in Lesson Plans for Learning Outcomes	Qualitative	10 teachers SD Bandung	DLP in lesson plans, learning outcomes	Teachers implementing DLPs in lesson plans improve participation and learning outcomes.	Fair (6/10)	Small sample, interview data
Fitriani (2022)	Effectiveness of PBL and Differentiation in Elementary Thematic Learning	Mixed Methods	150 students & 5 teachers	PBL, DLP, Learning Outcomes, Readiness	PBL-DLP integration improves learning outcomes and teacher readiness	Good (7/10)	Limited longitudinal data
Putra Rahmawati (2021) &	The Effect of PBL on Motivation and Learning Outcomes of Elementary Students	Quantitative	100 elementary school students	PBL, Motivation, Learning Outcomes	PBL significantly improves student motivation and learning outcomes	Good (8/10)	Experimental method with controls
Wulandari Hartono (2020) &	Implementation of Differentiated Instruction to Improve Learning Readiness	Qualitative	12 primary school teachers	Differentiated Instruction, Learning Readiness	Learning differentiation improves students' learning readiness inclusively.	Fair (6/10)	Case study, limited generalisability

Table 3. Inclusion and Exclusion Results Table

Selection Stage	Total	Description
Initial identification	Study	Articles were found in Google Scholar, Scopus, and other databases.
Duplicates removed	500	Duplicates were removed using reference management software.
Title and abstract screening	120	Two hundred fifty articles were removed because they were irrelevant to the topic.
Full-text screening	380	One hundred articles were removed because they did not meet the inclusion criteria.
Quality assessment	130	Articles that met the criteria and passed the quality assessment (CASP \geq 6/10)

Discussion

The findings of the present review support previous studies suggesting that integrating Project-Based Learning (PjBL) with Differentiated Learning Programs can significantly enhance students' learning readiness and academic outcomes in elementary education. This review provides further evidence that PjBL, as a learner-centred instructional model, plays a crucial role in developing 21st-

century competencies—namely creativity, collaboration, communication, and critical thinking—which are considered vital in modern educational settings (Yusri et al., 2024; Thomas, 2000; Maulida et al., 2024; Rahmawati & Widyartono, 2025). The consistent observation across studies is that PjBL provides authentic learning experiences and opportunities for deeper engagement with content, which, when combined with differentiated instruction, results in more meaningful and inclusive learning (Dewantari & Nuris, 2025; Nabila et al., 2025).

Differentiated lesson design was also found to effectively address the diversity of student readiness and learning profiles. This supports earlier claims that differentiation, by modifying content, process, and product, can help bridge the learning gap among students with different abilities (Wulandari, 2024; Ayu et al., 2023). The study by Widyawati et al. (2024), for example, illustrates how integrating humanistic learning theory into differentiated instruction contributes to a more respectful and student-responsive classroom environment. These findings confirm that differentiation is a strategy for equity and a pedagogical imperative in heterogeneous classrooms.

Another important aspect revealed by this review is that the successful implementation of both PjBL and differentiation is strongly influenced by teacher readiness. This includes their understanding of the pedagogical shift from content deliverer to learning facilitator and their confidence in designing and managing differentiated projects. Consistent with Rahman et al. (2024), several studies reported that many teachers still encounter obstacles such as limited training, lack of instructional time, and insufficient access to resources, all of which impede full integration of innovative pedagogies. This aligns with Ummah & Nadlir (2023), who argue that integrating digital media within the Merdeka Curriculum requires substantial teacher support and policy alignment. Therefore, the current findings add to the growing body of literature emphasising that effective implementation demands structural and professional development supports (Walden University, 2020; Condliffe, 2017).

However, despite the encouraging results, several methodological limitations have been identified across the studies reviewed. One frequently arises issue is the lack of comparison or control groups, which limits the ability to draw causal inferences. Another recurring limitation is the small sample size, which affects the generalizability of the results (Ferrero et al., 2021). Additionally, the lack of detailed descriptions regarding the implementation process of PjBL and differentiated strategies makes it difficult to replicate or scale up successful interventions. These limitations suggest further research employing more rigorous methodologies, larger sample populations, and detailed instructional documentation.

Taken together, the present synthesis confirms that integrating Project-Based Learning with Differentiated Instruction holds strong promise for addressing the academic and developmental needs of elementary school students. While the pedagogical potential is well-supported, sustained success relies heavily on ongoing teacher training, access to relevant teaching materials, and alignment with curricular demands. The practical implications are clear: schools and policymakers should prioritise professional development programs that equip teachers with the skills and resources necessary to implement responsive and inclusive learning practices.

CONCLUSION

Based on the findings of a systematic review on implementing Project-Based Learning (PjBL) integrated with a Differentiated Learning Program in elementary education, it can be concluded that integrating these two instructional models significantly enhances students' learning readiness and academic achievement. PjBL offers active and contextual learning experiences, while the differentiated approach enables teachers to tailor the learning process to accommodate students' diverse levels of readiness and learning needs. The successful implementation of this model greatly depends on teachers' preparedness in designing and delivering responsive and inclusive lesson plans. Nevertheless, challenges remain in terms of teacher training, availability of resources, and research methodology, all of which need to be addressed in future development efforts.

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