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Developing PBL-based E-LKPD to enhance elementary students' critical thinking in Pendidikan Pancasila

Rijal Sianturi[1], Daulat Saragi[2], Surya Dharma[3], Samsidar Tanjung[4], Yakobus Ndona[5], R. Mursid[6]
[1,2,3,4,5,6] Universitas Negeri Medan, Medan, Indonesia
rijalsianturi37@gmail.com[1], daulatsaragi@unimed.ac.id[2], suryappkn@unimed.ac.id[3], samsidartanjung@unimed.ac.id[4], yakobusndona@unimed.ac.id[5], mursid.tp@gmail.com[6]

ABSTRACT
The Problem-Based Learning (PBL) approach to Pancasila education in elementary schools positively impacts student engagement. However, the limited availability of interactive worksheets that facilitate and stimulate critical thinking remains a major obstacle in the field, so the development of innovative, cutting-edge teaching materials is urgently needed. This study aims to develop and test the feasibility, practicality, and effectiveness of a PBL-based E-LKPD on Indonesian diversity for fourth-grade students at SDN 066047 Medan Helvetia. Using the Research and Development (RnD) method with the ADDIE model, data were collected through observation, interviews, questionnaires, and tests. The results showed a high level of validity. This product proved to be very practical based on teacher and student responses. In addition, this E-LKPD significantly improved critical thinking skills. This PBL-based E-LKPD is very feasible, practical, and effective for application in learning. In its implementation, supporting infrastructure is still needed to facilitate the integration of E-LKPD as an interactive worksheet, so that students can also learn independently in the future.

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ABSTRAK
Pendekatan Problem-Based Learning (PBL) dalam pendidikan Pancasila di sekolah dasar berdampak positif terhadap keterlibatan murid. Namun, minimnya ketersediaan lembar kerja interaktif yang memfasilitasi dan merangsang nalar kritis masih menjadi kendala utama di lapangan, sehingga pengembangan inovasi bahan ajar mutakhir sangat mendesak untuk dilakukan. Penelitian ini bertujuan untuk mengembangkan serta menguji kelayakan, kepraktisan, dan kefektifan E-LKPD berbasis PBL pada materi keberagaman bangsa Indonesia untuk murid kelas IV di SDN 066047 Medan Helvetia. Menggunakan metode Research and Development (RnD) dengan model ADDIE, data dikumpulkan melalui observasi, wawancara, angket, dan tes. Hasil penelitian menunjukkan tingkat validitas yang tinggi. Produk ini terbukti sangat praktis berdasarkan respons para guru dan murid. Selain itu, E-LKPD ini secara signifikan meningkatkan kemampuan berpikir kritis. E-LKPD berbasis PBL ini sangat layak, praktis, dan efektif untuk diterapkan dalam pembelajaran. Pada implementasinya, tetap diperlukan infrastruktur pendukung untuk memfasilitasi integrasi penggunaan E-LKPD sebagai salah satu bentuk lembar kerja interaktif agar ke depan murid juga dapat belajar secara mandiri.

Kata Kunci: *berpikir kritis; e-lkpd; pendidikan Pancasila; problem-based learning; sekolah dasar*

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INTRODUCTION

Education in the twenty-first century requires students to develop higher-order competencies that enable them to adapt to rapid technological and social changes (Destiana et al., 2025). Alongside advances in information and communication technology, learning is expected to shift from teacher-centered instruction toward student-centered approaches that promote active participation and meaningful knowledge construction (Izzatunnisa et al., 2024). In Indonesia, the implementation of the Kurikulum Merdeka further emphasizes the development of essential twenty-first-century competencies, including critical thinking, communication, collaboration, and creativity (Nadiyah & Tirtoni, 2023). Among these competencies, critical thinking is considered fundamental because it enables students to analyze information, evaluate evidence, solve problems, and make reasoned decisions in both academic and real-life contexts (Maulidah, 2021).

Critical thinking is particularly important in Pendidikan Pancasila because the subject not only develops students' knowledge of civic concepts but also encourages them to examine social issues, appreciate diversity, and make responsible decisions based on the values of Pancasila (Khairunnisa et al, 2024). Developing these competencies requires learning experiences that engage students in analyzing authentic problems rather than merely memorizing concepts (Rosmalinda et al., 2021). Therefore, instructional strategies and learning materials should facilitate higher-order thinking by encouraging students to investigate, discuss, evaluate, and reflect on real-world situations (Gunartha, 2024).

One instructional material that can support active learning is the Lembar Kerja Peserta Didik (LKPD). With advances in educational technology, conventional printed worksheets can be transformed into Lembar Kerja Peserta Didik Elektronik (E-LKPD), which integrates multimedia, interactive activities, and digital accessibility to improve students' engagement and independent learning (Puspita & Dewi, 2021). However, the effectiveness of E-LKPD depends not only on its digital format but also on the instructional approach embedded within it. Among instructional models, Problem-Based Learning (PBL) is widely recognized as an effective approach to promoting critical thinking by engaging students in solving authentic problems through investigation, collaboration, and reflective learning (Marpaung, 2021).

Previous studies have demonstrated that E-LKPD can improve students' motivation to learn and learning outcomes, while PBL has consistently been reported to enhance students' critical thinking skills across various subjects (Habsyi et al., 2022). Nevertheless, most previous studies have focused on science and mathematics learning, whereas studies integrating PBL-based E-LKPD in elementary Pendidikan Pancasila remain limited. Furthermore, only a few studies have comprehensively evaluated the validity, practicality, and effectiveness of such learning media in supporting elementary students' critical thinking. This gap indicates the need to develop innovative instructional materials specifically designed for Pendidikan Pancasila at the elementary school level.

Preliminary observations conducted at SDN 066047 Medan Helvetia revealed that the learning process still relied primarily on printed worksheets that contained lower-order cognitive tasks and on teacher-centered instructional practices. Consequently, students had limited opportunities to engage in analytical thinking and problem-solving during classroom

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activities. These conditions highlight the need to develop more interactive learning materials that integrate technology with student-centered learning approaches to better support critical thinking. The findings are expected to contribute to the development of technology-supported instructional media to facilitate meaningful learning and strengthen critical-thinking competencies in elementary education. Therefore, this study aims to develop a PBL-based E-LKPD for fourth-grade Pendidikan Pancasila and to evaluate its validity, practicality, and effectiveness in enhancing elementary students' critical thinking skills.

LITERATURE REVIEW

Pendidikan Pancasila in the Elementary School Context

Pendidikan Pancasila is a fundamental subject in Indonesia's elementary curriculum under the Kurikulum Merdeka, aiming to develop responsible, democratic, and ethical citizens who uphold the values of Pancasila and the 1945 Constitution (Agustiana et al., 2023; Nurgiansah, 2021). Beyond acquiring civic knowledge, students are expected to internalize these values and apply them in their daily interactions. Achieving this goal requires learning experiences that actively engage students in analyzing real-life social issues, making informed decisions, and appreciating Indonesia's cultural diversity (Nahdiyah et al., 2021).

However, the implementation of Pendidikan Pancasila in elementary schools continues to face several challenges. Learning is often dominated by conventional approaches that emphasize memorization over critical inquiry, limiting students' ability to connect civic concepts to authentic social contexts and reducing their learning outcomes (Hidayat & Putro, 2024). Although multicultural education has been recognized as an effective approach to fostering tolerance and appreciation of diversity, its implementation is constrained by limited teacher readiness and a lack of interactive learning resources (Haris & Mufidah, 2025; Zakiah, 2025). These challenges highlight the need for innovative learning media and instructional approaches that promote active learning while strengthening students' critical thinking and civic understanding.

E-LKPD Based on Flipbook Technology

Lembar Kerja Peserta Didik, or LKPD, has long served as a core structural component in primary classrooms, providing content summaries, operational learning guidelines, and targeted assessment tasks designed to stimulate learner participation (Pawestri & Zulfiati, 2020). In the standard paradigm, these materials are explicitly structured to guide students through specific knowledge-acquisition steps, helping them secure essential practical competencies while optimizing overall academic outcomes (Sapitri et al., 2022). However, the ongoing global evolution of educational technology requires a definitive shift from traditional print layouts toward flexible, digitally accessible E-LKPD that seamlessly adapts to modern classroom environments.

An interactive E-LKPD leverages the functional capabilities of digital devices to integrate rich multimedia elements, including instructional videos, audio narratives, hyperlinks, and dynamic animations, thereby transforming a flat document into an immersive learning portal (Kholifahtus et al., 2021). By embedding these digital worksheets within a 3D-simulated

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flipbook layout, authors can replicate the natural page-turning familiarity of a physical textbook while eliminating hardware storage constraints and ensuring cross-device responsiveness (Arisandhi et al., 2022). The educational integration of interactive flipbooks systematically boosts classroom engagement, simplifies abstract academic illustrations, and expands student motivation by offering highly structured pathways for both autonomous self-study and collaborative team exploration (Qomah & Khosiyono, 2022).

The transition from conventional printed materials to flipbook-based E-LKPDs is largely driven by the inherent limitations of print, such as its linear presentation and inability to represent motion or provide interactive guidance (Endaryati et al., 2021). By integrating applications like Kvisoft Flipbook Maker or Heyzine Flipbook, educators can create dynamic teaching materials that combine audio, visual, and interactive elements to significantly improve students' conceptual understanding of complex or abstract phenomena. Furthermore, the use of such digital worksheets has been shown to enhance critical thinking and collaboration skills, especially when combined with active pedagogical models such as PBL (Prasasti & Anas, 2023). Consequently, replacing manual worksheets with these electronic formats not only makes the learning process more practical and efficient but also facilitates independent student exploration in the 21st-century classroom (Endaryati et al., 2021).

Problem-Based Learning (PBL)

Problem-Based Learning (PBL) represents a highly innovative, student-centered instructional design that centers the entire educational process around authentic, real-world dilemmas (Kurniawan et al., 2023). Within a PBL environment, elementary students do not merely memorize prepackaged answers; instead, they independently construct underlying conceptual principles by engaging in structured inquiries, investigations, and collaborative group problem-solving tasks (Wardani, 2020). This systematic approach empowers young learners to take absolute ownership of their learning styles, activate their existing cognitive schemas, and work cooperatively within structured peer teams to resolve the immediate socioeconomic or civic challenges presented to them (Hartina & Permana, 2022).

The strategic integration of a PBL model within a primary classroom significantly optimizes student cognitive engagement while sharpening collaborative team dynamics. By presenting authentic situational cases that reflect local environmental or societal issues, the classroom teacher effectively transitions from a traditional knowledge transmitter to an active facilitator who provides structural scaffolding and essential digital resources (Alawiyah et al., 2023). This experiential pedagogical framework is highly recommended under modern curriculum standards because it successfully enhances long-term knowledge retention, builds a robust foundation for autonomous lifelong learning, and ensures that primary students can confidently apply abstract civic principles to resolve practical, real-world issues.

Elementary Students' Critical Thinking Skills

Cultivating critical thinking skills within primary education is essential for preparing young learners to navigate complex real-world challenges independently. As a vital pillar of Higher Order Thinking Skills (HOTS), critical thinking goes beyond mere retention of text. It requires

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students to actively deconstruct, analyze, connect, and synthesize information before drawing logical, evidence-based conclusions. This reflective process demands an active, continuous, and highly cautious evaluation of incoming data rather than an immediate, uncritical acceptance of superficial facts (Rahim, 2023). Operationally, developing robust analytical capabilities in young learners involves systematic training across five specific primary indicators: focus-oriented clarification, baseline support analysis, logical inference deduction, advanced contextual clarification, and strategic tactical execution (Wardani et al., 2024).

To effectively nurture these high-level cognitive capabilities, modern primary schools must systematically move away from conventional, lecture-heavy teaching methodologies that induce student passivity and dependence. Educational research confirms that critical thinking can be developed deeply through active, discovery-based instructional settings where children explore variables, identify hidden conceptual biases, and solve structured problems within a supportive peer network (Rahim, 2023). Furthermore, structuring classroom activities to include rigorous group discussions and analytical assessments enables primary students to examine problems from multiple perspectives, manage emotional biases, and develop logical, innovative solutions (Panca & Parisu, 2025). The primary objective of driving this critical mindset is to empower young students to become self-reliant truth-seekers who can confidently resolve complex issues in their daily lives (Kusuma et al., 2024).

However, implementing such active learning strategies in elementary classrooms is not without significant obstacles. Recent evaluations reveal that students' critical thinking skills often remain alarmingly low due to both student-related and teacher-related factors. From the students' perspective, an over-reliance on memory rather than genuine comprehension, coupled with frequent misconceptions and an inability to formulate systematic answers, severely hampers analytical development (Sarwanto et al., 2021). Furthermore, this deficiency is frequently exacerbated by teachers who continue to dominate the classroom with direct, lecture-based methods and rely exclusively on textbooks, leaving little room for active exploration (Sarwanto et al., 2021). To counteract these passive learning habits, consistent exposure to higher-order thinking tasks is required. Systematically familiarizing elementary students with HOTS-based questions, particularly in subjects such as science, has been shown to effectively elevate their critical-thinking capacities in key areas, including analysis, inference, evaluation, induction, and deduction (Sidiq et al., 2021). By shifting from rote memorization to habituating complex problem-solving, educators can overcome existing systemic barriers and better equip young learners with the essential analytical tools needed for future success.

METHODS

This study employs an educational Research and Development (RnD) methodology designed to develop, validate, and test the overall instructional efficacy of an interactive learning product. The developed product is a PBL-based E-LKPD designed to enhance the critical thinking skills of fourth-grade students in Pendidikan Pancasila. The procedural design of this study strictly adapts the systematic framework of the ADDIE instructional model, which comprises five interactive operational phases: Analysis, Design, Development, Implementation, and Evaluation. Field research was conducted from February to March 2026

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at SD Negeri 066047 Medan Helvetia, with fourth-grade students as the primary research subjects, along with classroom teachers and expert validators. The core objective of this investigation is to evaluate the validity, feasibility, practicality, and pedagogical effectiveness of the PBL-based E-LKPD on Indonesian national diversity (Keberagaman Bangsa Indonesia).

The operational research execution followed a highly detailed, step-by-step ADDIE development sequence modified to meet the practical classroom p constraints. During the initial Analysis phase, field needs, curriculum frameworks, and student performance gaps were assessed, confirming that the school used the Kurikulum Merdeka yet relied on printed worksheets lacking critical-thinking triggers. The Design phase focused on creating blueprint frameworks, layout storyboards, assessment instruments, and a flipbook-assisted multimedia interface, mapping out key learning goals. In the Development phase, the physical digital product was generated and evaluated by a team of material, language, and design experts to establish internal validity through iterative validation feedback loops. The Implementation phase subjected the refined E-LKPD to field testing across individual, small-group, and operational phases, involving 24 active students. Finally, the Evaluation phase integrated all feedback and empirical data to measure final learning outcomes. The complete sequential flowchart mapping this operational development process is illustrated in **Figure 1**.

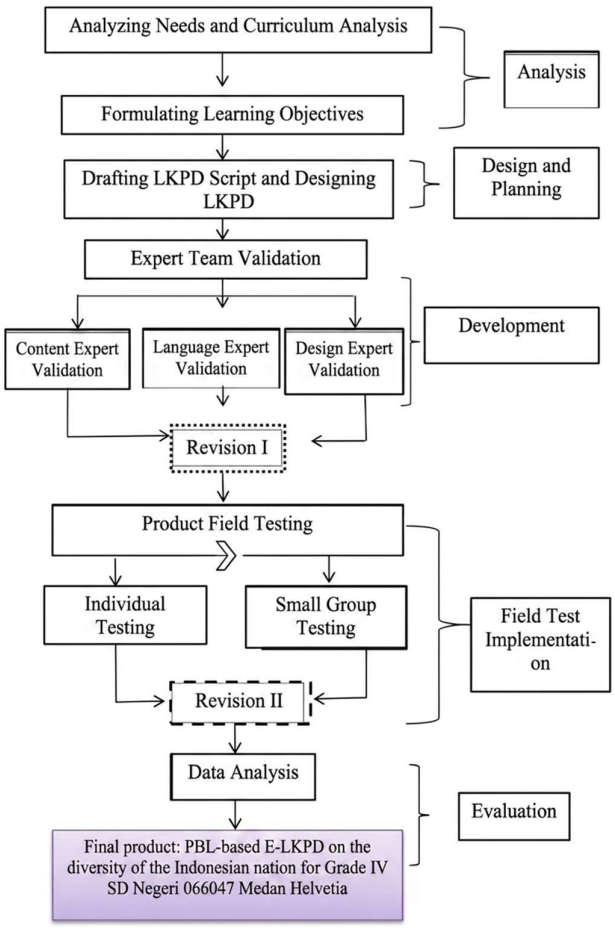

Figure 1. Operational Flowchart of the PBL-based E-LKPD Development Model
Source: Modified from Borg & Gall and Dick & Carey as cited in Sitorus, 2024

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Data collection techniques employed a comprehensive multi-method approach consisting of direct observations, unstructured interviews, expert-validation questionnaires, and written pretests and posttests. The internal instrumentation was strictly calibrated before field execution.

Data analysis methods in this study combined descriptive, qualitative, and quantitative procedures to assess feasibility, practicality, and effectiveness systematically. Qualitative data from expert advice and teacher critiques served as guidelines for design modifications. To measure empirical effectiveness in improving critical thinking skills based on Ennis's indicators, the quantitative progression of student achievement scores from pretest to posttest was analyzed using a one-group pretest-posttest experimental design and a one-sample t-test. Furthermore, pedagogical gain progression was measured using Hake's normalized gain equation (N_{gain}).

The product is pedagogically effective when cumulative field test outcomes meet the success parameters: a normalized gain threshold of ≥0.3 or an implementation benchmark of 75%. The core operational metrics used to evaluate item quality prior to the final effectiveness testing are synthesized in **Table 1**.

Tabel 1. Summary of Instrument Calibration and Item Metric Properties

Metric Evaluation Type	Computational Method / Software	Empirical Findings / Values	Operational Classification	Status
Item Internal Validity	Point-Biserial Correlation (r_{tabel}= 0.4227)	10 Items Valid $r_{hit} > r_{tabel}$	High Kesetaraan	Approved
Instrument Reliability	Cronbach's Alpha / SPSS 26	Alpha Value = 0.715	Moderate/ Sedang	Reliable
Item Difficulty Level	Essay Index Formula ($P = B/JS$)	Balanced Proportion	Easy, Medium, Hard	Balanced
Item Discrimination Power	Upper/Lower Group Index (D)	6 Items "Cukup", 4 Items "Baik"	Satisfactory/ Terima	Accepted

Source: Synthesized from internal field validation data, adapted from metrics by Sugiyono, 2025; Arikunto, 2024; and Ennis.

RESULTS AND DISCUSSION

Analysis Stage

The initial phase of the development process focused on analyzing the baseline requirements for engineering the PBL-based E-LKPD. This stage involved three core investigative activities: curriculum analysis, needs analysis, and student profiling. Field observations and interviews with the fourth-grade homeroom teacher at SD Negeri 066047 Medan Helvetia revealed that the school had fully implemented the Kurikulum Merdeka. However, instructional practices remained heavily centered on conventional lecture methods, rote memorization, and static textbooks. This textbook-dependent approach led to low student engagement and passivity throughout the learning process.

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The curriculum analysis successfully mapped out specific learning goals (*Alur Tujuan Pembelajaran*) under Phase B of the Kurikulum Merdeka, focusing on enabling students to analyze real-world civic issues and demonstrate behaviors that respect national diversity (Keberagaman Bangsa Indonesia). The needs assessment confirmed the complete absence of interactive digital teaching aids in the classroom. Both the educator and the students expressed a critical requirement for supplementary digital resources that support student-centered, self-regulated learning. Consequently, these findings provided the foundational justification for developing a technology-integrated, PBL-based E-LKPD to cultivate students' higher-order critical-thinking skills systematically.

Design Stage

The design stage focused on drafting the structural blueprint, content architecture, and instrument parameters for the digital worksheet. The content layout was aligned with the core topic of Indonesian national diversity, specifically focusing on the definitions and societal expressions of regional, cultural, and religious diversity. Authentic contextual data and visual elements were gathered from educational e-books, the Kemendikbud fourth-grade Civic Education textbook, and verified online digital archives.

The technical blueprint for the product was structured using Microsoft PowerPoint to generate a highly engaging, child-friendly animated user interface. The structural sequence of the draft E-LKPD was mapped to include a formal cover page, a preface, user guidelines, learning objectives, instructional material sections, collaborative group project tasks, localized case studies, assessment exercises, and a bibliography. Concurrently, evaluation instruments were designed using a 5-point Likert scale (ranging from 5 for "highly feasible" to 1 for "unfeasible") to evaluate internal validity across content, design, and language properties during the subsequent expert appraisal.

Development Stage

During the development stage, the physical prototype of the PBL-based E-LKPD was engineered by compiling the designed PowerPoint layouts, supporting visual graphics, and localized instructional videos into a unified digital document. This compiled file was converted to PDF format and embedded in a 3D flipbook application. This integration produced an interactive, multi-dimensional electronic worksheet capable of rendering text, images, video paths, and dynamic page-turning animations. Figure 2 shows the design interface of the E-LKPD content layout during the product development phase.

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Figure 2. Microsoft PowerPoint Product Development and Content Design Interface
Source: Research, 2026

The engineered digital prototype underwent formative evaluation by a panel of expert validators to assess its internal feasibility prior to classroom implementation. The experts provided constructive feedback, which included deepening the contextual analysis of civic cases and incorporating explicit Higher Order Thinking Skills (HOTS) questions into the evaluation segments. After addressing these revisions, quantitative ratings from the validation instruments were calculated. Content validation achieved 78% ("feasible"), language validation reached 93% ("highly feasible"), and design validation scored 95% ("highly feasible"). Table 2 outlines the specific scoring breakdown from the design expert evaluation.

Tabel 2. Feasibility Evaluation Metrics from Instructional Design Validation

Instructional Validation Indicators	Maximum Scale Score	Assigned Expert Rating	Percentage Value	Feasibility Classification
Curricular Alignment with Phase B Outcomes	5	5	100%	Highly Feasible
Explicit Integration of Learning Objectives	5	5	100%	Highly Feasible
Structural Design Alignment with PBL Stages	5	5	100%	Highly Feasible
Feasibility as a Digital Project Resource Tool	5	5	100%	Highly Feasible
Adequacy of Multimedia and Contextual Content	5	4	80%	Feasible

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Instructional Validation Indicators	Maximum Scale Score	Assigned Expert Rating	Percentage Value	Feasibility Classification
Capacity to Stimulate Peer-Group Collaboration	5	5	100%	Highly Feasible
Capacity to Enhance Student Critical Thinking	5	4	80%	Feasible
Capacity to Cultivate Student Creative Thinking	5	5	100%	Highly Feasible
Analytical Quality of Embedded Evaluation Items	5	5	100%	Highly Feasible
Structuring of Inductive Learning Conclusions	5	5	100%	Highly Feasible
Clarity of Contextual Diversity Illustrations	5	5	100%	Highly Feasible
Integration of Problem-Solving Response Triggers	5	4	80%	Feasible
Cumulative Operational Evaluation Score	**60**	**57**	**95%**	**Highly Feasible**

Source: Research, 2026

Implementation Stage

The implementation phase tested the refined E-LKPD prototype in real classroom environments to evaluate its operational practicality. Field trials progressed through three successive stages: individual testing, small-group testing, and full operational field trials. Individual trials with three students recorded an initial practicality rating of 90.37%. This was followed by small-group trials with nine students, which yielded an increased score of 95.11%. Concurrently, the fourth-grade homeroom teacher completed a practical response questionnaire to assess the flipbook interface's utility. This evaluation recorded a final utility rating of 91.58%, confirming that the resource fell under the "highly practical" category for elementary education.

The full operational field trial was implemented with 24 active fourth-grade students at SD Negeri 066047 Medan Helvetia. Students used digital worksheets on their own devices to navigate authentic case problems, organize collaborative teams, and present structural solutions on civic diversity. Objective assessment metrics tracking student performance showed a substantial quantitative shift between pretest and posttest intervals. **Figure 3** illustrates the comparative progression of class performance scores during the field trials.

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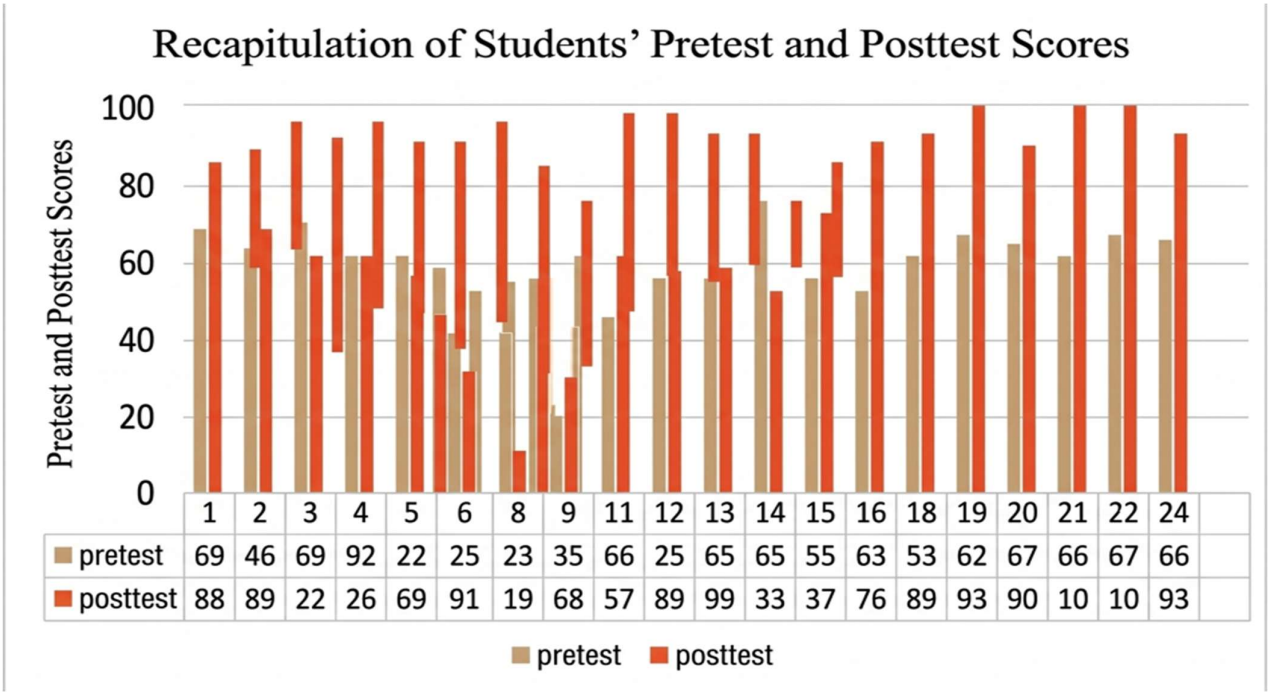

	1	2	3	4	5	6	8	9	11	12	13	14	15	16	18	19	20	21	22	24
pretest	69	46	69	92	22	25	23	35	66	25	65	65	55	63	53	62	67	66	67	66
posttest	88	89	22	26	69	91	19	68	57	89	99	33	37	76	89	93	90	10	10	93

Figure 3. Comparative Distribution Chart of Pretest and Posttest Field Trial Scores
Source: Research, 2026

Evaluation Stage

The evaluation stage involved both formative adjustments and summative statistical testing to verify product efficacy. Formative data, derived from validation notes, guided final micro-adjustments, while summative assessment tracked students' critical-thinking skills across the field sample. Descriptive analysis of the 24 field research subjects recorded a posttest mean score of 91.75% compared to a baseline pretest mean score of 61.00%. To verify the statistical validity of this data, a Lilliefors test was performed via IBM SPSS Statistics 26. This analysis confirmed a normal distribution across both the pretest ($p = 0.155 > 0.05$) and posttest ($p = 0.090 > 0.05$) datasets.

Discussion

The theoretical feasibility of the PBL-based E-LKPD on Indonesian national diversity demonstrates that the product successfully integrates core curricular demands with modern educational technology. The instructional design aligns with the cognitive developmental stages of fourth-grade students, who operate within Jean Piaget's concrete operational stage and require logical, systematic, yet contextualized lesson triggers. By embedding barcode technology that links Android devices to localized civic videos, the digital worksheet bridges abstract diversity concepts with concrete social interactions. This multi-dimensional layout is consistent with previous findings that multi-expert-validated electronic worksheets effectively fulfill pedagogical needs as accessible multimedia learning resources (Salsabila & Susantini, 2022). Furthermore, the validation parameters are consistent with previous R&D

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findings, indicating that structurally aligned PBL materials are highly valid for supporting active learning in primary education (Wijayanti & Rosie, 2024). The inclusion of localized case studies and collaborative poster projects (rekayasa ide) systematically triggers active pen-and-paper modeling, ensuring that language clarity and structural mechanics work together to foster high student engagement.

In practical terms, the field trial results demonstrate that the interactive digital framework operates effectively under typical elementary school conditions. According to Nieveen's quality criteria, instructional interventions achieve high practicality when users find the system accessible, usable, and engaging within standard classroom parameters. The consistent "highly practical" ratings across individual, group, and practical teacher responses demonstrate that the embedded multimedia elements, visual layouts, and responsive videos effectively support classroom instruction. This operational success is consistent with previous findings showing that user-friendly digital layouts enhance time efficiency and improve instructional utility (Faizah & Jamila, 2022). It also matches previous findings that PBL-centered electronic platforms achieved excellent teaching implementation metrics alongside highly positive student feedback (Sari et al., 2024). By reducing manual overhead and organizing structured learning paths, the interactive platform converts traditional teacher-centered lectures into flexible, student-centered learning activities.

The empirical evidence demonstrates a significant shift in students' critical-thinking performance before and after using the tool. This cognitive progression is supported by Lev Vygotsky's constructivist learning theory, which states that structured instructional scaffolding within a student's Zone of Proximal Development triggers spontaneous, recurring analytical behaviors that help young learners internalize complex concepts. By converting conventional rote exercises into real-world civic investigations, the framework creates an active-learning environment in which students can systematically develop higher-order analytical skills. The high normalized gain index (N-Gain=0.79) achieved in this study indicates strong cognitive development and confirms the performance trend toward the positive impact of problem-based projects compared to traditional controls. Furthermore, the significant improvement across all five critical thinking indicators, particularly in elementary clarification and strategic-tactical execution, is consistent with previous findings that structurally designed digital learning environments effectively promote critical thinking skills in primary education (Hapsari & Prasetyaningtyas, 2023; Saputri et al., 2026).

CONCLUSION

This study successfully developed PBL-based E-LKPD using the ADDIE framework, which proved highly valid, practical, and effective for enhancing the critical thinking skills of fourth-grade students in Pendidikan Pancasila. Expert validations and field evaluations confirmed that the digital resource is highly feasible and exceptionally practical for elementary school instruction. Furthermore, empirical testing demonstrated that the use of this interactive E-LKPD significantly elevated students' higher-order cognitive capacities, with their overall performance substantially surpassing the school's minimum mastery criterion and achieving a high normalized gain index. Based on these findings, school administrators and educators are encouraged to facilitate the integration of such interactive, problem-based digital workflows into the Kurikulum Merdeka to support the transition of young learners toward

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self-regulated inquiry, provided that stable internet infrastructure is maintained to optimize multimedia features. For future researchers, it is recommended to expand this pedagogical framework by broadening the implementation scope across diverse student demographics and multiple schools. Subsequent investigations should also explore the development of similar PBL-based E-LKPDs for other thematic units, integrating broader operational variables such as student learning motivation, digital literacy levels, or long-term knowledge retention.

AUTHOR'S NOTE

The author declares that there is no conflict of interest regarding the publication of this article. The author confirms that the data and content of the article are free from plagiarism.

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