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Development of Interactive Teaching Materials Based on Problem-Based Learning (PBL) in Indonesian Language Learning for Fifth Grade Elementary Students

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A B S T R A C T

This study was conducted due to the limited use of interactive and technology-based teaching materials in Indonesian language learning at the elementary school level, which often relies on printed materials and results in low student engagement. The research aimed to develop Problem-Based Learning (PBL)-based interactive teaching materials to encourage active learning, provide immediate feedback, and support collaborative problem-solving for fifth-grade Indonesian language instruction. This research applied a research and development method using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The analysis stage involved observations and interviews with teachers and students from three elementary schools. The design and development stages focused on producing interactive multimedia-based teaching materials using Articulate Storyline 3. The product was then validated by experts to assess its content, language, and media feasibility. The validation results indicated that the teaching materials were categorized as very valid. Practicality testing showed average scores of 92.33% from teachers and 94.18% from students, both classified as very practical. Furthermore, the effectiveness test produced an N-Gain value of 0.8 (77.60%), indicating that the teaching materials were effective in improving student engagement and learning outcomes in Indonesian language learning.

1. Introduction

Education is a key factor in improving the quality and progress of a nation. The success of education at the elementary level depends greatly on teachers' ability to create learning experiences that are engaging, relevant, and aligned with students' developmental needs. Teachers play a central role not only as transmitters of knowledge but also as facilitators who design innovative learning materials suitable

for the digital era (Ulfa & Nurmayani, 2023). The rapid development of science and technology urges teachers to enhance their competence and integrate digital resources to create interactive learning environments that foster motivation and active participation among students (Risdiany, 2021). Augmented Reality (AR) can assist in teaching human senses by providing interactive multimedia experiences that enhance student understanding and engagement (Khusnunnisa & Andriani, 2025).

The use of technology has transformed educational practices by introducing diverse learning modalities and digital media that promote interactive experiences. Indonesian language education, as one of the core subjects in elementary schools, has a vital role in developing students' literacy and communication skills. Its learning objectives include improving students' abilities to listen, speak, read, and write while fostering appreciation for language and literature as elements of national culture (Aslami, 2021). However, traditional instructional methodsdominated by teacher-centered approaches remain prevalent (Sagita & Hamzah, 2024). As a result, students often show low motivation, minimal participation, and limited critical thinking skills in applying Indonesian language concepts to real-life contexts. The development of AR-based Big Book media for plant structure and function materials has proven effective in making complex scientific concepts more concrete for elementary students (Zahro, Amalia, & Oktaviani, 2024).

The latest Merdeka Curriculum, introduced in 2022, emphasizes student-centered learning that develops the Profil Pelajar Pancasila (Kasli et al., 2022). To achieve these objectives, teachers must apply learning models that encourage active engagement and problem-solving. The Problem-Based Learning (PBL) model is among the recommended approaches, as it promotes inquiry, collaboration, and the development of independent learning skills (Darwati & Purana, 2021; Lestari, 2023). However, challenges remain in implementing PBL effectively, particularly the lack of high-quality, relevant teaching materials that align with digital pedagogy and students' learning needs. Many teaching materials used in classrooms are still conventional and text-based, which limits opportunities for students to learn actively and interactively (Priantini & Widiastuti, 2021). AR learning media in science lessons, particularly on plant body parts, helps students visualize abstract concepts and improves learning outcomes (Munawarah, 2025).

To address these issues, educators must develop interactive teaching materials that combine multimedia elements and are guided by modern pedagogical models like PBL. Interactive materials can enhance comprehension by providing engaging visual and auditory stimuli, interactive exercises, and self-paced learning opportunities (Ajoke, 2017; Rafi'y et al., 2023). In line with this, technological tools such as Articulate Storyline 3 offer significant potential. This software enables teachers to design digital modules that incorporate text, images, videos, animations, and quizzes, allowing students to learn anytime and anywhere (Rianto, 2020). The platform's features support interactivity, which can increase motivation and deepen understanding (Adetia et al., 2025; Aulia, 2025). Learning modules based on Augmented Reality can serve as effective tools for visualizing abstract IPAS

themes, supporting students' comprehension and engagement (Syahrir et al., 2025). Interactive multimedia assisted by AR for teaching the human visual sense can increase student motivation and learning achievement in elementary school (Febriyanti & Andriani, 2025). A preliminary study conducted in three schools SDN 04 Kampung Olo, SDN 18 Air Tawar Selatan, and SDN 04 Sabbihisma revealed that teachers primarily used printed textbooks and student worksheets (LKS) as the main learning resources. Classroom observations showed that 79.62% of students were passive, rarely asking questions or participating actively, while only 20.37% demonstrated engagement during lessons. Interviews with teachers further indicated interest in using technology-based materials but noted the absence of such resources in their schools. Although facilities like Wi-Fi, projectors, and laptops were available, they were not optimally utilized for digital learning activities. These findings highlight the urgent need for interactive, technology-integrated teaching materials aligned with PBL principles and the Merdeka Curriculum.

Problem-Based Learning provides a framework that encourages students to engage in authentic problem-solving, develop critical thinking, and construct knowledge collaboratively (Ramadhani et al., 2019). In this context, teachers serve as facilitators who guide students in exploring and reflecting on real-world issues related to lesson content (Rahmatullah et al., 2020; Zulvira & Desyandri, 2022). Integrating PBL into digital learning materials particularly through Articulate Storyline 3 can transform passive learning into active exploration and discovery. The software's intuitive design allows educators to create multimedia-rich lessons without programming skills, fostering an accessible and effective digital learning environment (Prayoga & Sunaryo, 2024; Jazuli et al., 2024). Previous studies have demonstrated the potential of Articulate Storyline 3 for science education (Septina & Erita, 2025; Heliyanja, 2023; Damanik & Yarshal, 2022), but research integrating PBL with Indonesian language instruction remains limited. This gap underscores the need for developing interactive teaching materials that not only present digital content but also embed inquiry-driven activities that cultivate students' literacy and problem-solving skills.

Therefore, this study aims to develop interactive teaching materials based on Problem-Based Learning (PBL) using Articulate Storyline 3 to support Indonesian language learning for fifth-grade elementary students. The developed materials are expected to enhance engagement, promote independent learning, and improve students' overall learning outcomes. Augmented Reality (AR) can assist in teaching human senses by providing interactive multimedia experiences that enhance student understanding and engagement (Khusnunnisa & Andriani, 2025).

2. Methodology

Type of Research

This study employed a Research and Development (R&D) design to produce a valid, practical, and effective product in the form of interactive teaching materials

based on the Problem-Based Learning (PBL) model. The development process followed the ADDIE model, consisting of five main stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was selected because it provides a systematic framework that ensures the product developed meets the required educational standards and learner needs.

Development Procedure

The ADDIE stages were implemented as follows :

a. Analysis Stage (Analyze)

This stage aimed to identify the problems, learning needs, and characteristics of the fifth-grade students. Observations and interviews were conducted with teachers and students at SDN 04 Kampung Olo, SDN 18 Air Tawar Selatan, and SDN 04 Sabbihisma. The results revealed that Indonesian language learning still relied heavily on printed textbooks and worksheets. Students appeared less engaged, with 79.62% showing low participation during lessons, and only 20.37% actively asking questions. Teachers also expressed a lack of digital teaching materials that align with the Merdeka Curriculum and support active learning.

b. Design Stage (Design)

At this stage, a prototype of the teaching material was created using Articulate Storyline 3. The design included several key components: learning objectives, indicators, learning activities based on the PBL model, practice exercises, and evaluation features. The content focused on Chapter 6 “Cinta Indonesia”, with the topic of narrative historical texts for fifth-grade students. Visual, audio, and interactive elements such as animations, videos, and quizzes were integrated to attract students’ attention and enhance learning engagement.

c. Development Stage (Development)

The prototype was then validated by experts to ensure its quality in three aspects: content/material, language, and media design. Three validators were involved: a material expert, a language expert, and a media expert. The validation used a Likert scale assessment, and the overall validation result reached an average score of 96%, categorized as *very valid*. Suggestions from validators were implemented to refine the teaching material before field testing.

d. Implementation Stage (Implementation)

After revision, the interactive teaching materials were implemented in real classroom settings with fifth-grade students. During this stage, practicality tests were conducted using teacher and student response questionnaires,

while effectiveness tests were performed using pre-test and post-test instruments. The practicality test measured the ease of use, clarity, and attractiveness of the materials, whereas the effectiveness test aimed to determine learning improvement after using the developed product.

e. Evaluation Stage (Evaluation)

The evaluation focused on analyzing data from all previous stages to assess the product's validity, practicality, and effectiveness. Feedback from teachers and students, together with learning outcomes, was used to refine the final version of the teaching material. The evaluation results confirmed that the developed materials met the quality criteria for educational use.

Research Subjects

The research subjects consisted of fifth-grade students and teachers from three elementary schools in Padang City, Indonesia: SDN 04 Kampung Olo, SDN 18 Air Tawar Selatan, and SDN 04 Sabbihisma. The validators involved were university lecturers specializing in language education, instructional design, and educational media. The research subjects consisted of fifth-grade students and teachers from three elementary schools in Padang City, Indonesia: SDN 04 Kampung Olo, SDN 18 Air Tawar Selatan, and SDN 04 Sabbihisma. The validators involved were university lecturers specializing in language education, instructional design, and educational media.

Data Collection Instruments

Data were collected using clearly defined instruments, including:

- Validation instruments to assess the product's content, language, and media aspects.
- Practicality questionnaires for teachers and students to measure the usability and clarity of the teaching materials.
- Pre-test and post-test instruments to measure the improvement of students' learning outcomes.

Data Analysis Techniques

The data were analyzed using descriptive quantitative methods.

- **Validity** was determined by calculating the average percentage score from validators using the formula:

$$Validity = \frac{Total\ Score\ Obtained}{Maximum\ Score} \times 100\%$$

The results were categorized as *very valid*, *valid*, *fairly valid*, or *invalid* based on established criteria.

- **Practicality** was analyzed from teacher and student response questionnaires using the same percentage formula. The product was considered *very practical* if it achieved an average score above 90%.
- **Effectiveness** was measured through the N-Gain Score, comparing pre-test and post-test results:

$$N - Gain = \frac{Post - test\ Score - Pre - test\ Score}{Maximum\ Score - Pre - test\ Score}$$

The N-Gain value of 0.8 (77.60%) indicated that the teaching materials were *effective* in improving students' learning outcomes (Hake, 1999).

3. Results and Discussion

Overview of Product Development

The developed product is an interactive teaching material for Indonesian language learning designed using *Articulate Storyline 3* and based on the Problem-Based Learning (PBL) model. The final product contains learning objectives, instructions for use, multimedia-based materials, interactive quizzes, and evaluation components. It was created for Grade V students, specifically the topic *Narrative Historical Texts* in Chapter 6 "Cinta Indonesia." The material integrates text, images, audio, video, and animations to foster students' active participation and independent learning. In the analysis phase, a needs analysis was conducted through classroom observations and interviews with teachers to identify students' learning difficulties and the lack of interactive teaching materials in Indonesian language learning.

In the design phase, learning objectives, content structure, PBL learning scenarios, storyboards, and interface layouts were systematically planned. The development phase resulted in an interactive multimedia product that integrates text, images, audio, video, animations, interactive quizzes, and evaluation features using Articulate Storyline 3.In the implementation phase, the product was applied in Grade V Indonesian language learning on Narrative Historical Texts in Chapter 6, *"Cinta Indonesia,"* to observe usability and student responses during the learning process. The evaluation phase involved expert validation and user feedback to assess the feasibility, clarity, and effectiveness of the developed teaching material, which were then used for product revision.

As the main output of this research is an interactive digital product, the developed teaching material was realized in the form of a complete multimedia learning package. The product interface includes a main menu page, learning objectives page, problem orientation page, content exploration pages, interactive quizzes, and evaluation pages. Each component was designed to visually represent the stages of the PBL model and to support students' interaction with the learning content. Screenshots of the developed media, including the main interface and sample

learning activities, are presented in the Results section to illustrate the final form of the product.

Validation Results

The validation process involved three experts: a material expert, a language expert, and a media expert. The validation focused on content accuracy, language clarity, design quality, and alignment with PBL principles. Each aspect was assessed using a five-point Likert scale, and the validity coefficient for each aspect was calculated using the Aiken's V index. The results of the expert validation are presented in Table 1, which summarizes the Aiken's V values for each assessed aspect of the interactive teaching materials. This table provides a clear overview of the validity level and supports the conclusion regarding the feasibility of the developed product

Table 1. Validation Results of the Interactive Teaching Materials

Aspect	Aiken's V
Material	0.96
Language	0.96
Media Design	0.96
Overall Average	0.96 (Very Valid)

The overall Aiken's V coefficient of **0.96** indicates that the interactive teaching materials fall into the *"very valid"* category. Experts agreed that the materials were suitable for implementation, as they effectively integrated the PBL model and multimedia elements to enhance learning motivation. Minor revisions suggested by validators included simplifying several instructions and adjusting color contrast for improved readability. After revisions were applied, the product was approved for classroom use. These findings support the idea that well-designed digital materials that integrate interactive features and constructivist approaches can significantly enhance students' engagement and conceptual understanding (Kosasih, 2021). The use of Articulate Storyline 3 enabled teachers to implement modern digital learning without requiring programming skills, while students benefited from both visual and auditory stimulation throughout the learning process.

Practicality Test Results

The practicality test measured teachers' and students' perceptions regarding the usability, clarity, and attractiveness of the developed materials. The practicality score was calculated using a percentage formula based on the total obtained score divided by the maximum score, then multiplied by 100. Data were collected using response questionnaires distributed after classroom implementation. The overall results are shown in Table 2.

Table 2. Practicality Test Results (Teacher and Student Responses)

Respondent	Average(%)
Teacher Responses	92.33
Student Responses	94.18
Overall Average	93.25 (Very Practical)

The practicality results show that both teachers and students rated the product as very practical, with average scores above 90%. Teachers found the materials easy to operate, compatible with classroom technology, and suitable for use within the curriculum structure. Students reported that the materials were interesting, interactive, and helped them understand narrative texts more easily. The high practicality scores indicate that the materials can be implemented effectively in real classroom settings without significant technical or pedagogical barriers. This feedback provides confidence that the developed materials are both user-friendly and relevant to students' learning needs.

This supports the notion that interactive learning media can improve students' focus and motivation, especially when designed to encourage self-exploration (Nurdyansyah & Fahyuni, 2016). The PBL-based approach allowed students to actively discuss and solve problems related to historical texts, promoting critical thinking and collaboration skills. Moreover, the positive responses from students suggest that the combination of PBL and interactive media can foster sustained engagement and deeper comprehension of learning content. These findings reinforce the importance of integrating digital tools into student-centered learning models.

Effectiveness Test Results

To determine the effectiveness of the developed materials, learning outcomes were measured using pre-test and post-test scores. The improvement in students' achievement was analyzed using the N-Gain Score, which measures the normalized gain in learning. The N-Gain was calculated using the formula:

$$N - Gain = \frac{Post - test\ Score - Pre - test\ Score}{Maximum\ Score - Pre - test\ Score}$$

The results are summarized in Table 3.

Table 3. Effectiveness Test Results (N-Gain Score)

Test Type	Avarage Score
Pre-test	59.33
Post-test	82.70
N-Gain	0.8 (77.60%)
Category	Effective (N-Gain=0.8)

The results indicate an N-Gain value of 0.8 (77.60%), categorized as "effective." This means that the use of interactive teaching materials significantly improved students' learning outcomes. The findings demonstrate that the integration of multimedia content and problem-solving activities can facilitate deeper conceptual understanding in Indonesian language learning. his highlights the potential of combining digital media with PBL to achieve measurable improvements in students' academic performance.

Students' responses during the implementation phase also reflected increased enthusiasm and participation. They were actively engaged in group discussions, asked questions, and interacted with the digital content independently. Teachers observed that the materials helped students connect learning content with real-life contexts, which is one of the core goals of the Merdeka Curriculum. The active involvement of students suggests that such interactive materials can foster both cognitive and affective engagement, making learning more meaningful and enjoyable. These findings are consistent with previous studies showing that interactive and problem-based digital materials enhance motivation, self-directed learning, and literacy outcomes (Rafi'y, 2023; Rahmatullah, 2020). The combination of visual, auditory, and interactive elements encourages meaningful learning experiences where students can construct knowledge through exploration and reflection. Overall, these results provide strong evidence for the effectiveness of integrating multimedia and PBL approaches in elementary-level Indonesian language instruction.

Discussion

The development process using the ADDIE model proved to be effective for designing digital instructional materials. Each stage analysis, design, development, implementation, and evaluation played a crucial role in ensuring product quality. The results of validity, practicality, and effectiveness tests confirm that the developed product meets the essential criteria for educational media: validity (accuracy of content), practicality (usability), and effectiveness (impact on learning outcomes). The high validation score (96%) demonstrates that the integration of PBL and *Articulate Storyline 3* aligns with pedagogical and technical standards. The practicality results indicate that both teachers and students found the product accessible and beneficial for classroom learning. Furthermore, the significant improvement in students' post-test scores validates that interactive, problem-based materials can enhance literacy and critical thinking skills in Indonesian language learning.

This study demonstrates that the development of interactive learning media is not limited to conceptual design but results in a tangible digital product that can be directly implemented in classroom learning. The visual structure, interactive features, and multimedia elements embedded in the developed teaching materials reflect the practical realization of the PBL model in Indonesian language learning. Therefore, this research not only proposes an instructional model but also presents a concrete learning medium that supports active, meaningful, and technology-integrated learning in elementary schools.

4. Conclusion

This research was conducted to address the problem of limited interactive and student-centered teaching materials in Indonesian language learning for fifth-grade elementary students, which has an impact on students' engagement and learning outcomes. Accordingly, the objective of this study was to develop interactive

teaching materials based on the Problem-Based Learning (PBL) model that are valid, practical, and effective in supporting Indonesian language learning.

The development process followed the ADDIE model, encompassing analysis, design, development, implementation, and evaluation stages. The validation results showed that the developed materials achieved a high validity coefficient, indicating that the content, language use, and media design met expert standards and were appropriate for classroom use. This finding confirms that the product successfully addressed the initial problem related to the quality and suitability of instructional materials.

Furthermore, the practicality test demonstrated very high user acceptance, as reflected in teacher response scores of 92.33% and student response scores of 94.18%, both categorized as very practical. These results indicate that the interactive teaching materials were easy to use, attractive, and supportive of classroom learning activities. The effectiveness test also showed a high N-Gain score of 0.8, confirming that the materials effectively improved students' mastery of Indonesian language skills.

Overall, the findings indicate that integrating the PBL model into digital teaching materials using Articulate Storyline 3 effectively enhances student motivation, participation, and learning outcomes. The developed product aligns with the principles of the Merdeka Curriculum, which emphasizes active, meaningful, and student-centered learning, and contributes to the development of critical and creative thinking skills in elementary school students.

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