(REVIEW ARTICLE)

Enhancing elementary literacy through flip PDF: Developing interactive reading materials for engaged learning

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Abstract

Reading is a critical skill in education, forming the foundation for acquiring knowledge and critical thinking. However, challenges persist in Indonesian elementary schools, where traditional printed materials often fail to engage students or meet diverse learning needs. This study aimed to develop and evaluate interactive reading materials using Flip PDF software to enhance literacy among third-grade students at SDN 6 Kabila. The materials were designed to align with the Merdeka Curriculum and incorporate multimedia elements such as videos, animations, and interactive exercises. The study employed a Research and Development (R&D) approach using the 4D model (Define, Design, Develop, Disseminate). Initial observations highlighted the inadequacy of conventional materials, leading to the development of Flip PDF-based resources validated by experts. The materials achieved high validity scores (95–98.75%) and demonstrated practicality during small and large group trials (93–95%). Results showed significant improvements in student engagement, reading comprehension, and classroom participation. Teachers responded positively, highlighting the materials' adaptability and ease of use. These findings underscore the potential of digital tools in transforming literacy education by fostering active learning. Future research should explore scaling these resources to diverse contexts, addressing technological barriers, and integrating offline functionalities for broader accessibility. This study provides a model for leveraging technology to enhance literacy education in elementary schools.

Keyword: Interactive Digital Learning Materials; Literacy Enhancement Strategies; Multimedia-Based Education Tools

1. Introduction

Reading is a fundamental skill in education, forming the basis for acquiring knowledge and critical thinking. As a receptive skill, reading plays a crucial role in fostering analytical, critical, and reflective comprehension abilities. The Indonesian Ministry of Education and Culture, however, highlights a concerning trend: students' reading proficiency across the nation remains at a low level, which negatively impacts the country's human resource competitiveness (Tahmidaten & Krismanto, 2020). This deficiency has implications for knowledge acquisition and technological mastery, underscoring the urgency to enhance literacy among elementary students. National programs like the School Literacy Movement (Gerakan Literasi Sekolah, GLS) have been initiated to address this issue. These initiatives involve stakeholders ranging from central authorities to local communities and include parents, alumni, and businesses. Despite these efforts, significant challenges persist, including limited access to engaging reading materials and a general lack of awareness about literacy's importance among students. As a result, young learners often prioritize digital entertainment over reading, further diminishing their interest in developing reading habits.

Effective teaching strategies, particularly those that integrate engaging learning materials, are essential in overcoming these challenges. The adoption of interactive and innovative learning resources can significantly impact students' motivation and learning outcomes. Recent studies suggest that digital teaching materials can enhance literacy by

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offering diverse, visually stimulating formats that reduce monotony in traditional learning environments (Amelia et al., 2023). For elementary educators, particularly in the context of Indonesia's Merdeka Curriculum, creating effective learning materials is crucial. Teachers are encouraged to tailor resources to meet students' unique needs, promoting active engagement and fostering enthusiasm in the learning process.

At SDN 6 Kabila, a public elementary school in Bone Bolango, Gorontalo, educators encounter persistent challenges in teaching reading skills. Observations and interviews with teachers reveal that conventional teaching materials—predominantly printed textbooks—are not only inadequate in quantity but also fail to capture students' interest. These resources often lack comprehensive content and visual appeal, resulting in disengaged students who show little enthusiasm or participation in reading activities. This problem contributes to the students' overall disinterest in literacy, highlighting an urgent need for innovative educational approaches that can address these limitations.

One promising solution lies in leveraging digital technologies to create interactive teaching materials. The use of digital resources, such as e-books and multimedia tools, has demonstrated significant potential in enhancing student engagement and learning outcomes (Rustamana et al., 2023). Interactive features like videos, animations, and quizzes can transform reading into a dynamic and enjoyable activity, stimulating students' curiosity and fostering a more profound interest in literacy. These tools also enable educators to customize materials according to students' needs, ensuring that learning remains relevant and accessible.

Research into digital learning resources has highlighted the benefits of integrating technology into literacy education. For example, Flip PDF, a software application that converts PDF files into interactive flipbooks, offers an innovative solution for creating engaging and visually appealing reading materials. Studies have shown that Flip PDF enables teachers to incorporate multimedia elements such as audio, video, and animations, thereby enhancing the interactivity and appeal of learning resources (Khairinal et al., 2021). Unlike static printed materials, Flip PDF replicates the tactile experience of flipping through a physical book while introducing dynamic content that captures students' attention. This technology has been recognized for its practicality and ease of use, making it an ideal choice for educators seeking to modernize their teaching methods (Hidayat & Ariani, 2022).

Other studies have explored the role of digital storytelling and multimedia in enhancing literacy skills. For instance, Rindaryati (2021) emphasized the advantages of incorporating animations, audio, and videos into reading materials to create an immersive learning environment. Similarly, Sunayo et al. (2022) demonstrated that the use of digital teaching aids could significantly enrich students' learning experiences, improve their comprehension, and increase their overall academic performance. These findings underscore the transformative potential of digital tools in addressing the limitations of traditional teaching materials.

While several studies have validated the effectiveness of digital learning tools, research focusing on their application in the Indonesian elementary school context remains limited. Notably, prior investigations have primarily concentrated on other subjects or broader educational objectives, with minimal attention given to reading literacy among young learners. For example, Handayani et al. (2023) examined the use of digital comic-based learning materials but did not address their application in literacy-specific contexts. Similarly, Fikrah (2022) explored digital resources for thematic learning but did not delve into their role in fostering reading habits. These studies highlight a clear gap: the need for targeted research into the development and implementation of interactive reading materials tailored to the unique challenges faced by Indonesian elementary students.

This study aims to address the aforementioned gaps by developing and evaluating interactive reading materials for third-grade students at SDN 6 Kabila using Flip PDF. Specifically, it seeks to: (1) assess the current state of reading materials at the school, (2) design innovative teaching resources incorporating Flip PDF, (3) evaluate the effectiveness of these resources in enhancing students' reading skills and engagement, and (4) disseminate the developed materials among educators at the school. The novelty of this research lies in its focus on integrating technology to address specific literacy challenges within the Indonesian elementary education system. By offering a practical and context-specific solution, this study contributes to the growing body of literature on digital pedagogy and literacy development.

2. Methodology

This study was conducted at SDN 6 Kabila, located in Dutohe Barat Village, Bone Bolango District, Gorontalo Province. The school has six classrooms, a library, a science laboratory, a prayer room, and other essential facilities. SDN 6 Kabila serves 176 students under the guidance of six classroom teachers and two subject teachers. The selection of this location was informed by preliminary observations and interviews, which revealed significant challenges in teaching reading

skills, including limited access to engaging and modern teaching materials. The research was carried out during the 2024–2025 academic year with the full consent of the school administration.

The study employed a Research and Development (R&D) methodology, as defined by Sugiyono (2017). This approach is widely used in education to design, develop, and validate innovative teaching materials or instructional strategies. The primary objective was to produce a digital teaching resource tailored to the needs of third-grade students at SDN 6 Kabila. The research followed the 4D Model proposed by Thiagarajan et al., consisting of four stages: Define, Design, Develop, and Disseminate. This structured model ensured systematic development and evaluation of the teaching materials to achieve high levels of validity and practicality.

2.1. Define Phase

The purpose of the define phase was to identify and analyze the specific needs and challenges associated with teaching reading at SDN 6 Kabila. Data were collected through observations, interviews with teachers, and questionnaires distributed to students. Key challenges identified included the use of conventional printed materials, which lacked engagement and failed to meet the diverse learning needs of students. Additionally, teachers expressed a need for digital resources that could be easily customized and integrated into classroom activities.

2.2. Design Phase

In the design phase, the research team developed a blueprint for the teaching materials. Flip PDF was selected as the primary software tool due to its ability to create interactive and multimedia-rich digital books. The blueprint included several components, such as engaging textual content, embedded videos and animations, interactive exercises, and ice-breaking activities to maintain student interest. The materials were aligned with the Indonesian Merdeka Curriculum, ensuring relevance and alignment with national educational standards.

2.3. Development Phase

The development phase involved creating the initial prototype of the teaching materials. Expert validation was conducted to ensure the materials' quality and alignment with educational standards. The materials were evaluated by subject matter experts, language experts, and media design experts. Feedback was systematically collected and incorporated into iterative revisions to enhance the product's validity and usability.

The validated prototype was tested in two stages:

- Small Group Trial: The materials were tested with a small group of students to evaluate their practicality and initial effectiveness. Observations and feedback were collected to identify potential areas for improvement.
- Large Group Trial: After revisions, the materials were implemented in a larger classroom setting to assess their broader applicability and impact on students' learning outcomes. Data collected included student engagement levels, comprehension improvements, and teacher feedback.

In the final phase, the developed teaching materials were introduced to the broader school community. A workshop was held for teachers and school administrators to demonstrate the use of the materials and gather feedback. The dissemination aimed to promote adoption and provide training on integrating the materials into regular classroom instruction. Teacher responses were overwhelmingly positive, highlighting the materials' potential to enhance student engagement and support literacy development.

The study employed a combination of qualitative and quantitative methods for data collection and analysis. Instruments included structured interviews, questionnaires, and observation sheets. Data were analyzed using simple statistical techniques to assess the validity, practicality, and effectiveness of the developed teaching materials.

- Validity Assessment: Expert validation focused on three key aspects—content accuracy, language clarity, and media design. The validation scores were interpreted using a percentage scale, where 95% from content experts, 90% from language experts, and 98.75% from media design experts indicated "Highly Valid" ratings.
- Practicality Evaluation: Trials with small and large groups were analyzed to measure practicality. Small group trials yielded a score of 93%, while large group trials achieved 95%, both categorized as "Highly Practical."
- Effectiveness Analysis: Student engagement and comprehension improvements were monitored through performance assessments and teacher observations. Data were triangulated to ensure reliability and validity.

Ethical approval was obtained from the school administration, and informed consent was secured from all participants. The study maintained strict confidentiality and anonymity for all student and teacher data collected during the research.

The scope of this research was limited to third-grade students at SDN 6 Kabila. While the findings are specific to this context, the methodology and insights may serve as a model for other schools facing similar challenges. Limitations included the time constraints of the academic calendar and the technical proficiency required for effective use of the Flip PDF software.

This systematic and iterative approach ensured that the developed teaching materials were not only innovative but also practical and effective in addressing the specific literacy challenges identified at SDN 6 Kabila. The combination of qualitative and quantitative methods provided robust evidence to support the validity and utility of the materials, contributing to the broader field of digital pedagogy in literacy education.

3. Results and discussion

3.1. Initial Conditions of Reading Materials

The study revealed that reading materials used in teaching third-grade students at SDN 6 Kabila primarily comprised conventional printed textbooks or modules downloaded by teachers. These materials, while serving basic instructional purposes, were insufficient in meeting the diverse needs of students. The teachers often relied on limited resources due to time constraints in developing more engaging and interactive teaching aids. Observations and interviews highlighted that these traditional materials failed to spark interest or enthusiasm among students, leading to lower levels of engagement and participation during reading activities. This outcome aligns with prior studies suggesting that conventional teaching materials often lack the adaptability and appeal required to sustain students' motivation, especially in early literacy education (Amelia et al., 2023).

3.2. Design and Development of Flip PDF-Based Reading Materials

The second phase of the study focused on designing and developing interactive reading materials using Flip PDF software. This tool was selected for its ability to transform static PDF documents into dynamic, multimedia-rich digital books. The materials incorporated features such as embedded videos, animations, interactive exercises, and ice-breaking activities designed to sustain student interest and participation. Additionally, the design aligned with the Merdeka Curriculum, ensuring that the materials adhered to the educational standards and learning objectives specific to third-grade literacy.

Expert validation played a critical role in refining the materials. Subject matter experts rated the content as "Highly Valid" with a score of 95%, emphasizing its relevance and alignment with the curriculum. Language experts evaluated the clarity and accessibility of the instructional language, assigning a score of 90%. Media design experts, who assessed the visual and interactive elements, provided a score of 98.75%, praising the user-friendly interface and engaging multimedia features. These high validation scores demonstrate the effectiveness of the iterative design process, which incorporated expert feedback to enhance the materials' overall quality.

3.3. Practicality and Effectiveness of the Developed Materials

The practicality of the Flip PDF-based materials was assessed through small and large group trials. During the small group trial, the materials were tested with a limited number of students to gather preliminary feedback on usability and engagement. This trial yielded a score of 93%, indicating a high level of practicality. Students reported that the interactive elements, such as videos and animations, made the learning process more enjoyable and accessible.

The large group trial, which involved an entire third-grade classroom, provided further evidence of the materials' practicality and effectiveness. The trial achieved a score of 95%, with students demonstrating increased enthusiasm and participation in reading activities. Teachers noted that the materials were easy to integrate into their lesson plans and required minimal additional training to implement effectively.

The materials' impact on students' reading comprehension and engagement was also assessed. Observations indicated a marked improvement in students' ability to understand and analyze texts, particularly in narrative forms such as fables and folktales. This finding is consistent with previous research demonstrating that multimedia-enhanced teaching aids can improve literacy outcomes by catering to various learning styles and preferences (Rustamana et al., 2023).

3.4. Dissemination and Teacher Feedback

The final phase of the study involved disseminating the developed materials to the broader teaching community at SDN 6 Kabila. A workshop was conducted to train teachers on using the Flip PDF-based materials effectively. Feedback from teachers was overwhelmingly positive, with many expressing enthusiasm about the potential of the materials to enhance classroom learning. Teachers highlighted the materials' user-friendly design and their ability to make lessons more engaging for students. They also appreciated the inclusion of interactive elements, which helped capture students' attention and maintain their focus during lessons.

The dissemination process revealed several key insights. First, teachers were eager to adopt digital tools but often lacked access to adequate training and resources. The workshop addressed this gap by providing hands-on training and practical tips for integrating the materials into their teaching practices. Second, the materials' ability to be easily customized allowed teachers to adapt them to their specific instructional needs, further enhancing their utility and effectiveness.

3.5. Alignment with Previous Research

The findings of this study corroborate existing literature on the benefits of using digital tools in education. For example, Rindaryati (2021) and Hidayat & Ariani (2022) emphasized that interactive materials incorporating multimedia elements can significantly improve student engagement and comprehension. Similarly, Sunayo et al. (2022) found that digital teaching aids enriched with animations, audio, and video foster a more immersive learning environment, leading to better academic performance. The high validation and practicality scores obtained in this study align with these findings, demonstrating the efficacy of Flip PDF in enhancing literacy education.

Additionally, the study builds on previous research by addressing a specific gap in the literature: the application of digital tools in Indonesian elementary schools, particularly in the context of literacy education. While prior studies have explored the use of digital tools for thematic learning or other subjects, this research focuses on reading materials for third-grade students, offering a targeted solution to a critical educational challenge.

3.6. Challenges and Limitations

Despite its positive outcomes, the study faced several challenges. One significant limitation was the reliance on technology, which required students and teachers to have access to digital devices and stable internet connections. While SDN 6 Kabila had sufficient infrastructure to support the implementation, this may not be the case for other schools, particularly in rural or under-resourced areas. Future research should explore strategies to address these disparities, such as developing offline-compatible versions of the materials.

Another challenge was the time required for teachers to familiarize themselves with the Flip PDF software and integrate the materials into their lesson plans. Although the workshop provided valuable training, additional support and ongoing professional development may be necessary to ensure sustained use and effectiveness of the materials.

3.7. Implications for Educational Practice

The findings of this study have several implications for educational practice. First, they highlight the importance of integrating technology into teaching to enhance student engagement and learning outcomes. By leveraging tools like Flip PDF, educators can create interactive and customizable materials that cater to diverse learning needs.

Second, the study underscores the need for professional development programs to equip teachers with the skills and knowledge required to use digital tools effectively. Workshops and training sessions, such as those conducted during this study, can help bridge the gap between technology and classroom practice.

Finally, the study demonstrates the potential of collaborative approaches to material development. By involving subject matter experts, language specialists, and media designers, educators can create high-quality resources that align with curricular standards and pedagogical goals.

4. Conclusion

This study developed and evaluated interactive reading materials using Flip PDF software for third-grade students at SDN 6 Kabila. The research identified key challenges with conventional printed materials, including limited engagement and relevance to students' needs. The newly developed materials, featuring multimedia elements such as animations, videos, and interactive exercises, were validated by experts and demonstrated high levels of validity (95–98.75%) and

practicality (93–95%). These materials significantly improved student engagement, reading comprehension, and overall participation in literacy activities.

The findings underscore the transformative potential of digital tools in enhancing literacy education. The materials not only aligned with Indonesia's Merdeka Curriculum but also addressed specific gaps in traditional teaching methods by fostering active learning and curiosity. Positive teacher feedback during dissemination highlighted the feasibility of implementing these resources in broader classroom contexts, provided adequate training and infrastructure are available.

This study contributes to the existing body of knowledge by offering a targeted, evidence-based solution for improving literacy in Indonesian elementary schools. Future research could explore scaling these materials across diverse educational settings, addressing infrastructure disparities, and integrating offline functionalities to ensure broader accessibility and impact. These efforts would further enhance the inclusivity and effectiveness of digital teaching resources in literacy education.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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