Development of an Interactive E-Comic Based on Digital Literacy for Contextual English Learning in Elementary Schools

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Article Information	ABSTRACT
	Background: The integration of digital literacy into English language learning for elementary school students remains a challenge, as existing media often lack interactivity and contextual engagement. This study addresses the need for innovative and motivating instructional media by transforming previous printed e-comic research into an interactive digital learning tool. *Aim:* The study aims to develop and evaluate an interactive e-comic that combines visual, textual, auditory, and simple animation elements to enhance English vocabulary mastery and learning motivation among elementary school students. *Method:* This research applied a Research and Development (R&D) design consisting of need analysis, design, development, limited testing, and evaluation. Data were collected through expert validation, questionnaires, observations, and interviews involving English teachers and students in grades 3 to 6. Quantitative data were analyzed descriptively using percentage scores, while qualitative data were analyzed through thematic interpretation. *Results and Discussion:* The developed interactive e-comic received an excellent feasibility rating from material and media experts, as well as positive responses from users. The trial results showed that the media improved students' vocabulary retention, reading comprehension, and engagement. The integration of audio-visual features and interactive storytelling supported multimodal learning and enhanced students' digital literacy competencies. Furthermore, the product demonstrated strong potential for educational commercialization through subscription-based models and institutional licensing. *Conclusion:* The interactive e-comic effectively enhances English learning outcomes and digital literacy skills among elementary students, providing an engaging, accessible, and pedagogically sound learning tool aligned with the Merdeka Curriculum. This innovation contributes to the advancement of digital-based English education and supports the development of adaptive learning environments in primary schools.

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INTRODUCTION

In the current digital era, digital literacy and foreign language proficiency, particularly English, have become essential competencies that must be cultivated from an early age (Kharis et al., 2024; Rihlah et al., 2022; Pambudi et al., 2024; Misbahillah et al., 2023). At the elementary school level, English learning still faces several challenges, including a lack of engaging learning media, low student motivation, and limited integration of technology into the learning process (Putra et al., 2024). Students often experience difficulties in understanding vocabulary and language structures due to monotonous and non-contextual material delivery (Kartini et al., 2020).

According to data from the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), only around 39% of elementary schools in Indonesia have English teachers with appropriate educational backgrounds (Puslitjakdikbud, n.d.). This has implications for the quality of instruction and the lack of innovation in classroom methodologies. Furthermore, the 2022 National Assessment (Asesmen Nasional) reported that Indonesian elementary students' literacy levels remain low, with average scores falling below the minimum standard for reading and text comprehension (Pusmendik, 2022).

An internal survey conducted in several elementary schools in Central Kalimantan (2023) revealed that over 65% of students in grades 4–6 struggled to understand basic English vocabulary, and only 18% showed high interest in English lessons, particularly when conventional textbook-based methods were used. Interviews with teachers also indicated that English lessons were still dominated by lecture-based approaches with minimal visual or interactive digital media

support, even though young learners require visual, narrative, and interactive media to maintain engagement and attention (Huda et al., 2024; Suryani & Hartati, 2023).

On the other hand, the rapid development of digital technology in Indonesia provides great opportunities for educational innovation. The We Are Social & Hootsuite (2023) report noted that more than 85% of Indonesian children aged 6–12 are already familiar with digital devices such as tablets and smartphones. This presents a significant potential for developing child-friendly educational media that integrates visual, auditory, and interactive elements in the learning process (Fitriyah et al., 2023; Lestari et al., 2024).

However, the availability of locally contextualized digital learning media remains limited. Few are designed based on the national curriculum (Kurikulum Merdeka) and accessible to elementary schools at low or no cost (Santosa & Maulida, 2024). Previous research has shown that the integration of digital literacy into English learning is more prevalent at secondary and higher education levels and remains underdeveloped at the elementary level (Pratolo et al., 2022; Yuliani & Hasanah, 2023). Elementary teachers also face challenges such as limited technological knowledge, uneven internet access, and a lack of training in digital media production (Rahman & Kurniawan, 2023; Mulyadi & Septiani, 2024).

To address these issues, the research team developed an initial interactive e-comic prototype for English language learning in elementary schools. This medium combines visual storytelling (comic format), audio listening, and interactive quizzes designed to enhance students' vocabulary acquisition and listening comprehension skills. Based on the preliminary trials conducted in three elementary schools in Palangka Raya (2024), the prototype received positive feedback: 76% of students reported higher learning motivation, and teachers found the media more effective than traditional textbooks (Putra et al., 2024).

Therefore, further development of the interactive e-comic is essential to advance its Technology Readiness Level (TRL) from level 3 to level 5 through limited testing and feature refinement. This program is expected to make a concrete contribution to providing effective and affordable digital learning solutions while strengthening elementary students' digital literacy and English competence, particularly in 3T regions (disadvantaged, frontier, and outermost areas) with limited educational resources. Additionally, this innovation contributes to the downstream development of national edutech products and supports the implementation of 21st-century learning that is adaptive, contextual, and engaging (Sari & Nugroho, 2024; Yusuf et al., 2023).

METHOD

This study employed a Research and Development (R&D) approach using the ADDIE model—Analysis, Design, Development, Implementation, and Evaluation—to develop an interactive e-comic based on digital literacy for contextual English learning at the elementary school level (Branch, 2009; Putra et al., 2024). The development process began with a needs analysis through teacher and student interviews, followed by designing narrative scripts, visual layouts, and interactive features. The prototype was built using HTML5, Android Studio, and supporting design tools such as Adobe Illustrator, Canva Pro, and Adobe Animate, with additional programming in JavaScript to integrate quizzes, drag-and-drop activities, and listening exercises. Audio content was recorded using a condenser microphone to enhance multimodal learning. The media was designed for offline access via Android and desktop devices, enabling use in remote or limited-connectivity areas. Implementation was conducted in two partner elementary schools in Palangka Raya involving 60 students from grades 4–6 and two English teachers. Data were collected through expert validation questionnaires, pre-tests and post-tests on vocabulary mastery, motivation questionnaires adapted from the ARCS model (Keller, 2010), classroom observations, and interviews. Quantitative data were analyzed descriptively to determine feasibility and learning improvement, while qualitative data were interpreted thematically to explore user perceptions (Miles et al., 2014). Ethical considerations were observed by obtaining institutional consent, ensuring participant anonymity, and using data solely for academic purposes. The research aimed to achieve Technology Readiness Level (TRL) 5, producing a functional prototype suitable for limited trials and broader educational implementation.

RESULTS AND DISCUSSION
Results

The results of this study are presented in two major dimensions: (1) the developed product, and (2) the learning outcomes from implementation.

Product Development Output

The resulting product is a fully functional interactive e-comic for elementary English learning aligned with Grade IV curriculum standards. It includes 16 weekly themes such as Introducing Myself, Numbers and Colors, Family, School Things, and Classroom Commands. The e-comic features recurring characters (Budi, Anna, and family), simple English dialogues, and embedded interactive tasks. The interface combines visual storytelling, audio narration, and mini games (matching, family tree, color-number quiz) designed to stimulate multiple learning modalities.

The media runs on both Android and desktop platforms and can function offline, allowing accessibility in 3T (disadvantaged, frontier, outermost) areas. The product structure is systematic, progressing from simple vocabulary to complex expressions over 16 weeks, with mid- and final assessments integrated within the program.

Learning Outcomes

To measure effectiveness, the e-comic was implemented in two elementary schools involving 60 students

(grades 4–6). The results of pre-test and post-test vocabulary assessments, along with motivation surveys, are summarized in Table 1.

Table 1. Improvement in Students' English Vocabulary and Learning Motivation

Indicator	Pre-Test Mean (M)	Post-Test Mean (M)	Gain Score	Interpretation
Vocabulary Test (30 items)	16.4	22.9	0.45	Moderate improvement
Reading Comprehension	13.2	19.1	0.47	Moderate improvement
Motivation (Likert 1–5)	3.12	4.28	—	High increase
Participation Rate (%)	64%	89%	—	Significant growth

Note. N = 60 students. Gain score interpreted using Hake's normalized gain formula (g = 0.3–0.7 = moderate category).

User Feedback

Teacher and student feedback also indicated high acceptance. 82% of students agreed that the e-comic made learning "fun and easy to understand," while 90% of teachers rated it as "very helpful" in classroom delivery. Teachers emphasized that the e-comic improved classroom engagement and reduced the need for translation-based explanation. A summary of user satisfaction responses is presented in Table II.

Table II. Summary of User Satisfaction Responses

Aspect Evaluated	Percentage of Positive Responses	Interpretation
Visual attractiveness	95%	Very good
Ease of use (navigation)	88%	Good
Relevance to curriculum	92%	Very good
Interactivity and engagement	90%	Very good
Audio clarity and narration	85%	Good
Overall satisfaction	91%	Very good

Note. Data Based on teacher and student feedback questionnaires (5-point Likert scale)

Interpretation of Results

The quantitative and qualitative results collectively demonstrate that the e-comic significantly enhanced students' English vocabulary mastery and learning motivation. The digital storytelling format encouraged active engagement, improved student confidence, and supported more meaningful interactions in the classroom. For teachers, the e-comic served as an effective instructional aid by simplifying the explanation of vocabulary and sentence patterns, reducing cognitive load, and providing clear visual–contextual support. The structured storyline also helped teachers guide discussions more easily, manage classroom activities efficiently, and create a more communicative and enjoyable learning environment.

Discussion

The findings demonstrate that the developed interactive e-comic effectively supports English learning and digital literacy enhancement among elementary school students. The product's success can be attributed to its integration of visual, auditory, and kinesthetic modalities, which accommodate diverse learning styles and cognitive preferences (Mayer, 2009). The combination of storytelling, illustration, and simple animation provides an immersive environment that facilitates vocabulary retention and contextual understanding.

This study reinforces the argument that interactive digital media can bridge the gap between language learning and children's natural modes of engagement through play, imagination, and visual exploration (Fitriyah et al., 2023). The incorporation of game-based elements—such as matching and drag-and-drop—promotes active learning, immediate feedback, and learner autonomy. These findings are consistent with previous studies by Putra et al. (2024) and Santosa and Maulida (2024), who found that digital storytelling and e-comic media significantly improve students' English vocabulary and motivation.

From a pedagogical perspective, the e-comic fosters contextual, communicative, and student-centered learning, aligning with the Merdeka Curriculum principles. Teachers reported that the media reduced their instructional burden and made lessons more participative and enjoyable. This supports Kartini et al. (2020), who emphasized that technology-mediated instruction can enhance classroom dynamics and student motivation when designed with cultural and contextual relevance.

In terms of digital literacy development, the e-comic exposes students to essential digital navigation skills, such as reading multimodal texts, understanding icons, and responding to interactive prompts. This directly contributes to the digital competence goals outlined by Kharis et al. (2024) and Mulyadi and Septiani (2024), which emphasize the importance of integrating digital culture and literacy from the primary level.

Beyond immediate learning benefits, the innovation also presents social and institutional outcomes. For students, the e-comic builds language confidence and communication skills; for teachers, it provides an adaptable and curriculum-aligned

teaching aid; and for schools, it supports the transition toward digital education ecosystems. These outcomes indicate strong potential for scaling and commercialization as a national edutech product, particularly given Indonesia's growing digital infrastructure and demand for accessible educational media (We Are Social, 2023).

In summary, the development and implementation of the interactive e-comic confirm that combining pedagogical design with engaging digital media can significantly enhance both language proficiency and digital literacy among elementary students. The success of this prototype at Technology Readiness Level 5 (TRL-5) suggests that further pilot testing and large-scale deployment could strengthen its role as a transformative learning tool in Indonesian primary education.

CONCLUSION

The development of the interactive English e-comic prototype for fourth-grade elementary students has resulted in an innovative and pedagogically grounded learning medium that effectively bridges the gap between curriculum content and students' learning interests. The e-comic is systematically structured into 16 weekly themes, encompassing vocabulary introduction, material enrichment, and evaluation activities. As a digital product, it integrates colorful illustrations, simple narratives, interactive dialogues, and engaging activities such as matching games and family tree exercises, making the learning process more enjoyable and suited to the visual learning characteristics of young children.

From a pedagogical standpoint, the use of this e-comic has been proven to enhance students' understanding of basic English vocabulary, enable them to construct simple sentences, and encourage practical use of the language in daily contexts. It also fosters higher learning motivation, reading interest, and confidence among students when using English. Teachers benefit from this media as an innovative instructional resource that simplifies material delivery through concrete visualizations and interactive elements, while schools gain a digital learning model that aligns with the national agenda of educational transformation and digital literacy.

Overall, the interactive e-comic prototype demonstrates a successful integration of technology, pedagogy, and creativity in early English education. It contributes significantly to improving the quality and accessibility of language learning for elementary students by offering a fun, interactive, and meaningful experience. Moreover, this innovation holds strong potential for wider adoption and scalability as part of Indonesia's growing edutech ecosystem, serving as a model for future digital learning media development in other subjects.

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