TUNAS
JURNAL PENDIDIKAN GURU SEKOLAH DASAR
http://journal.umpr.ac.id/index.php/tunas
Vol. 11, No. 1, December 2025, PP. 13-16
ISSN: 2477-6076 (print); 2685-8169 (online), DOI: 10.33084/tunas.v11i2.11282

Development of an Interactive Animation-Based Learning Media Using Central Kalimantan Folktales to Improve Primary School Students' Literacy and Numeracy Skills

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Article Information
Received:
November 2025
Accepted:
November 2025
Published:
December 2025

ABSTRACT
Background: The low level of literacy and numeracy among primary school students in Indonesia highlights the need for contextual and engaging learning media that reflect local culture. Conventional teaching methods often fail to capture students' interest and do not integrate local wisdom effectively. *Aim:* This research aims to develop and test an interactive animation-based learning media using Central Kalimantan folktales to enhance students' literacy and numeracy skills in primary education. *Method:* The study employed a research and development (R&D) approach by designing, validating, and testing a digital prototype that combines animation, narration, and interactivity. Expert validation was conducted to refine the prototype, followed by pilot testing in selected partner schools in Central Kalimantan. Data were collected through observations, questionnaires, and learning assessments, and an alyzed descriptively to evaluate the media's effectiveness in improving learning outcomes. *Results and Discussion:* The results indicated that the interactive animation media successfully increased students' engagement and motivation, leading to higher literacy and numeracy achievement compared to traditional learning tools. Teachers reported that the integration of local folktales provided meaningful and enjoyable learning experiences while reinforcing students' cultural identity. The discussion emphasizes the potential of culturally grounded digital media to support the thematic learning approach in the Merdeka Curriculum and contribute to the preservation of local culture. *Conclusion:* The research concludes that the developed interactive animation learning media based on Central Kalimantan folktales is effective in enhancing primary school students' literacy and numeracy skills. It also demonstrates significant potential for large-scale implementation, commercialization, and collaboration with the creative industry, reaching Technology Readiness Level 5 as a foundation for sustainable dissemination.

Keywords: Interactive Learning Media, Animation, Folktales of Central Kalimantan, Literacy, Numeracy, Primary Education, Local Culture, Educational Technology

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Citation Information: Bulkani, B., Putra, C. A., Putra, A. R. B., & Setiawan, M. A. Development of an Interactive Animation-Based Learning Media Using Central Kalimantan Folktales to Improve Primary School Students' Literacy and Numeracy Skills. *Tunas: Jurnal Pendidikan Guru Sekolah Dasar*, 11(2), 13–16. https://doi.org/10.33084/tunas.v11i2.11282

INTRODUCTION

Elementary education is the foundation for developing students' character and essential competencies (Muliadi, Badarudin, & Padlurrahman, 2023; Maesaroh & Nurahayu, 2023). However, numerous assessments reveal that Indonesian primary school students' learning outcomes remain below expectations, particularly in literacy and numeracy (Hafizha & Rakhmania, 2024). The 2021 National Assessment conducted by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) found that more than 50% of elementary students struggle to comprehend reading materials and solve reasoning-based problems (Naely et al., 2022). Similarly, results from the Programme for International Student Assessment (PISA) show that Indonesia ranks 74th out of 79 participating countries in reading literacy, underscoring the urgent need for more effective and contextual learning innovations (Suparya, Suastra, & Arnyana, 2022; OECD, 2022).

At the local level, especially in Central Kalimantan, observations indicate that learning processes in elementary schools remain dominated by conventional teaching methods with minimal use of innovative media. Meanwhile, the region's rich cultural heritage and folktales hold significant potential to be integrated into meaningful and enjoyable learning resources (Kanya, Martadi, & Ruci, 2021). Integrating local wisdom into learning not only enhances student engagement but also strengthens cultural identity and character education (Khusyairin, Sutama, & Rachmawati, 2022).

To address these challenges, combining digital technology with local cultural elements is a strategic approach to improve educational quality. Interactive animation-based

learning media that incorporate local folktales have been shown to effectively enhance student motivation and learning outcomes (Thayeb et al., 2022). Previous research by Bulkani, Fatchurahman, and Adella (2022) successfully developed a preliminary prototype of an animation-based learning media grounded in Central Kalimantan's local wisdom, which significantly improved student learning performance. However, this prototype remains at Technology Readiness Level (TRL) 3–4, necessitating further testing and validation to prepare for large-scale educational application.

The "Research Downstreaming Program – Model and Prototype Testing" provides a strategic opportunity to extend this research beyond academic publication into a practical, market-ready educational innovation. Through this program, the prototype development process can be conducted systematically and sustainably until it reaches a higher readiness level, enabling integration into elementary education across Indonesia. Therefore, this study aims to develop and test an interactive animation-based learning media using Central Kalimantan folktales to enhance elementary students' literacy and numeracy, while exploring its scalability and sustainability potential.

METHOD

This study employed a Research and Development (R&D) approach to design and test an interactive animation-based learning media grounded in the local wisdom of Central Kalimantan folktales. The development process followed the Technology Readiness Level (TRL) framework, progressing from TRL 3 to TRL 5 through stages of needs analysis, content design, prototype development, expert validation, and limited field testing. The media integrates digital animation, narration, and simple interactivity to support thematic learning and improve students' literacy and numeracy. Data were collected through pre-tests and post-tests to measure learning achievement, as well as observations, teacher interviews, and student questionnaires to assess engagement and usability. Quantitative data were analyzed descriptively to determine learning gains, while qualitative data were thematically analyzed to interpret user experiences. The validated prototype was then refined based on feedback to produce an interactive educational product ready for broader implementation.

RESULTS AND DISCUSSION

Main Results (Output)

The primary output of this innovation project is an interactive animation-based learning media prototype inspired by the folktale Legenda Batu Suli from Central Kalimantan. The media was designed to enhance elementary students' literacy and numeracy skills by integrating digital technology with local cultural content. The prototype features animated storytelling with narration, traditional Dayak background music, and simple interactive elements such as reflection quizzes, cultural context-based numeracy challenges, and learning activity choices. It includes a child-friendly interface and can be accessed both offline and online through web or Android platforms.

The content integrates local cultural values such as cooperation, honesty, responsibility, and environmental awareness, aligned with the Profil Pelajar Pancasila (Pancasila Student Profile) within the Merdeka Curriculum. Validation by three experts—media, language, and subject matter—was conducted to ensure the accuracy, clarity, and usability of the media. A limited field trial was then implemented in three partner elementary schools in Central Kalimantan, involving 90 students and six teachers to evaluate usability, visual appeal, and learning effectiveness.

Table 1. Expert Validation Scores

Validation Aspect	Mean Score	Category	Summary Comment
Content Accuracy	4.7	Very Feasible	Curriculum-aligned and culturally relevant
Language and Narration	4.6	Very Feasible	Clear, age-appropriate, and engaging
Media Design and Interactivity	4.8	Very Feasible	Visually attractive and user-friendly
Cultural Integration	4.9	Very Feasible	Excellent incorporation of local values
Overall Mean	4.75	Highly Feasible	—

The validation results show that the media prototype is highly feasible across all aspects. The content is accurate, curriculum-aligned, and culturally relevant, while the language used is clear, age-appropriate, and engaging for students. The design is visually attractive and user-friendly, offering effective interactivity that supports learning. In addition, the media integrates local cultural values very well. Overall, the prototype meets the required quality standards and is highly suitable for thematic learning under the Merdeka Curriculum.

Field Test Results

During the field test, students completed 20 test items consisting of literacy and numeracy questions designed to measure their learning progress. The selection of control and experimental classes was carried out using a purposive sampling technique, in which classes with similar academic characteristics, teacher profiles, and school conditions were chosen to ensure fairness. One class was assigned as the experimental group, where students used the interactive media, while another class with equivalent characteristics was assigned as the control group, following conventional teaching methods. This approach ensured that differences in learning outcomes were influenced by the use of the media rather than by external factors.

Table II. Student Learning Improvement

Learning Aspect	Pre-Test Mean	Post-Test Mean	Improvement (%)	Remarks
Literacy (Reading Comprehension)	68.4	86.7	+26.7%	Significant improvement
Numeracy (Problem Solving)	64.9	83.2	+28.2%	Significant improvement
Overall Mean	66.7	84.9	+27.5%	Effective in enhancing learning outcomes

Literacy (Reading Comprehension) was measured using a set of reading comprehension test items based on the folktale used in the media. Students were provided with short texts and asked to answer questions that assessed their ability to identify main ideas, interpret information, understand vocabulary in context, and draw simple conclusions. The literacy score was obtained from the total number of correct answers divided by the maximum score, then converted into a mean score.

Numeracy (Problem Solving) was measured through contextual numeracy questions related to the storyline of the folktale. These items required students to perform basic calculations, compare quantities, interpret simple data, and solve reasoning-based problems. Students' numeracy performance was calculated from the total correct responses and converted into a mean score similar to the literacy assessment.

The quantitative data reveal a 27.5% increase in overall learning performance. Observations during classroom implementation also indicated higher student engagement, enthusiasm, and collaborative participation. Teachers noted that the media facilitated thematic learning by combining literacy, numeracy, and character education in a cohesive and enjoyable way.

Discussion

The findings demonstrate that the interactive animation-based learning media integrating local wisdom effectively improves literacy and numeracy outcomes among elementary students. The use of familiar cultural contexts helped students understand learning materials more deeply and relate them to real-life situations. This aligns with previous studies by Bulkani et al. (2022) and Suparya et al. (2022), which found that culturally grounded digital learning media enhance both cognitive and affective engagement in young learners.

In terms of literacy, the storytelling format allowed students to build reading comprehension, vocabulary, and moral reasoning through exposure to local narratives. Numeracy skills were strengthened through culturally relevant problem-solving tasks that encouraged logical thinking and contextual understanding. These outcomes also support Wardani et al. (2023), who emphasized that local-culture-based learning fosters both academic and character development.

Beyond cognitive outcomes, this innovation significantly contributes to cultural preservation and identity formation. By integrating traditional Dayak folktales into digital media, the project not only revitalizes cultural storytelling traditions but also instills pride and awareness among students about their regional heritage. Teachers benefited from the innovation by gaining an accessible and engaging instructional tool aligned with the Merdeka Curriculum's emphasis on contextual learning and student agency.

Overall, the prototype represents a successful model of local-culture-based educational technology (edutech) that bridges cultural heritage and digital innovation. Its success was driven by three key factors: (1) interactive and visually appealing design that sustained student attention, (2) contextual relevance that connected learning to local experiences, and (3) teacher involvement that ensured pedagogical alignment. With these outcomes, the media has reached Technology Readiness Level (TRL) 5, validating its feasibility for broader implementation and commercialization through collaboration with educational institutions and creative industries.

CONCLUSION

This study successfully developed an interactive animation-based learning media prototype inspired by the *Legenda Batu Suli* folktale of Central Kalimantan, aimed at improving elementary students' literacy and numeracy skills. The integration of digital storytelling with local cultural values proved effective in enhancing students' engagement, comprehension, and problem-solving abilities. Expert validation confirmed the media's high feasibility for classroom use, while field testing showed a 27.5% improvement in students' learning outcomes and a noticeable increase in motivation and participation. The innovation not only supports the goals of the Merdeka Curriculum by providing contextual and enjoyable learning but also contributes to preserving local culture and strengthening students' character through values such as cooperation, honesty, and environmental care. Having reached Technology Readiness Level 5, the prototype is ready for broader implementation and commercialization, offering both educational and socio-economic benefits by involving local creative industries and promoting culturally grounded digital education in Indonesia.

ACKNOWLEDGMENTS

The authors would like to express their deepest gratitude to the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi / Kemendikbudristek) for the grant support in the Prototype Development Program (Hibah Prototipe). This research and development project of the interactive English e-comic could not have been completed without the financial and institutional support provided through this program. The authors also extend appreciation to the Directorate General of Higher Education, Research, and Technology (Ditjen Diktiristek) for the guidance and monitoring during the implementation process.

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