Development of Interactive Digital Comics Based on Gamification to Improve Komering Cultural Literacy in Junior High Schools of OKU Timur

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Abstract

This study aims to develop an interactive digital comic based on gamification to enhance Komering cultural literacy among junior high school students in Ogan Komering Ulu Timur Regency. The research employed a Research and Development (R&D) method using the ADDIE model, encompassing the stages of analysis, design, development, implementation, and evaluation, involving 35 students as trial participants. The digital comic product was presented in an interactive video format equipped with gamified quizzes. The results indicated a significant improvement in cultural literacy, with an average pre-test score of 2.21 and a post-test score of 3.23. Paired-sample t-test results showed t = 12.4; df = 34; p < 0.001, with a Cohen's d effect size of 2.09 (very large). These findings suggest that the gamification-based interactive digital comic is valid, practical, and effective as a learning medium for Komering local culture content. This study has implications for cultural preservation through interactive media utilization and provides a development model that can be replicated in other regional cultural contexts.

Keywords: *Interactive Digital Comic; Gamification; Cultural Literacy; Komering; Junior High School*

Introduction

Cultural literacy plays a crucial role in preserving national identity while safeguarding regional heritage amidst the forces of globalization. In the modern era, the penetration of global culture increasingly dominates the daily lives of young generations. This phenomenon is evident in Indonesia, where many students are more familiar with global popular culture, such as K-pop music and Korean dramas,

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than with traditional Indonesian arts (Alhamid, 2023). If left unaddressed without innovative strategies, young generations' attachment to local culture may diminish, posing a threat to the sustainability of regional cultural preservation as part of the nation's heritage.

To maintain and preserve local culture, the government of Ogan Komering Ulu Timur Regency has enacted Regent Regulation No. 35 of 2021 concerning the Komering Local Cultural Curriculum, mandating schools to teach Komering culture as part of the curriculum (Pemkab OKU Timur, 2021). However, field observations indicate that the policy has not been fully effective. Observations at SMP Negeri 02 Belitang Mulya showed that over 75% of students experienced difficulties in understanding Komering culture, despite its inclusion in the Merdeka Curriculum, and only about one-quarter of students could correctly identify more than three elements of Komering culture. These findings indicate low levels of Komering cultural literacy among students.

Several factors contribute to this low cultural literacy, including limited availability of innovative teaching materials tailored to the local context, the predominance of conventional lecture-based and textbook-based learning methods, minimal use of visual media, and low learning motivation exacerbated by insufficient integration of technology in the learning process (Tahmidaten & Krismanto, 2020; Suja'i & Sholehah, 2024; Siringoringo & Alfaridzi, 2024). Research has shown that the use of interactive digital media, including digital comics and gamification, can enhance both learning effectiveness and student engagement (Hakeu, Pakaya, & Tangkudung, 2023).

The development of digital technology offers significant opportunities for educational innovation. Digital comics have been proven to improve student comprehension by up to 52.46% compared to conventional text-based learning, while gamification can increase student motivation by 33.38% through interactive elements such as quizzes, achievement systems, and immediate feedback (Narestuti, Sudiarti, & Nurjanah, 2021; Supyan, Dasuki, & Sa'idah, 2024). These findings underscore the importance of developing learning media that integrate the visual appeal of digital comics with the engaging features of gamification.

Previous literature indicates that research on digital comics has been widely conducted. For instance, Damayanti, Setiawan, and Hartiningsari (2024) developed interactive e-comics for English learning based on local wisdom, while Faisal et al. (2022) developed interactive e-modules grounded in local culture. Dewi, Astawan, and Trisna (2024) also explored the use of digital comics based on Tri Hita Karana to enhance social and cultural literacy in elementary school students. However, these studies are limited to static digital comics without the integration of gamification and interactive video elements.

Prior research by the authors and their team has also developed digital learning media based on comics, such as digital comics for teaching descriptive text (Zulaikah et al., 2023), e-modules based on local wisdom (Pratami et al., 2023), and

e-comics for teaching negotiation texts (Pratami et al., 2024). Nonetheless, these studies were confined to static digital comics without gamification elements. Therefore, there is a research gap in developing interactive digital comics that combine visual narratives, audio, and game elements to enhance cultural literacy.

The novelty of this study lies in the development of gamification-based interactive digital comics specifically featuring Komering culture as local content in junior high schools. The integration of multimodal elements—text, visuals, audio, and interactivity—makes this media more immersive than previous studies, allowing students to learn through play, thereby improving motivation, engagement, and understanding.

This study seeks to answer the following research questions:

1. How is the process of developing gamification-based interactive digital comics for Komering cultural learning?
2. How feasible is the media based on expert validation?
3. How practical and effective is the media in improving students' cultural literacy?

By addressing these questions, this study aims to enhance Komering cultural literacy among junior high school students while providing practical contributions to the implementation of the Merdeka Curriculum, which emphasizes contextual learning and character strengthening based on local wisdom (Kemendikbudristek, 2022).

Method

This study employed a Research and Development (R&D) approach using the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The ADDIE model was chosen due to its systematic approach in producing valid, practical, and effective learning products (Branch, 2009). The study focused on developing a gamification-based interactive digital comic to enhance Komering cultural literacy among junior high school students.

Subjects and Sampling Technique

The research subjects were students of SMP Negeri 02 Belitang Mulya, Ogan Komering Ulu Timur Regency. Purposive sampling was used to select the school because it had implemented the Komering local cultural curriculum according to Regent Regulation No. 35 of 2021, yet students still experienced difficulties in understanding the cultural material. The trials were conducted in two stages:

1. Limited test (pilot test): involving 7 students to assess initial responses to the media and perform improvements.
2. Large-scale test (final test): involving 35 new students, separate from the pilot test, to evaluate the media's effectiveness.

Research Duration

The study was conducted over four months, from June to September 2025, with the allocation of each ADDIE stage as follows: analysis (1 month), design (1 month), development (1 month), and implementation and evaluation (1 month).

Research Instruments

Several instruments were employed to measure the feasibility, practicality, and effectiveness of the media:

1. Expert validation questionnaire: covering content, language, design, and gamification aspects, validated by media experts, language experts, and cultural experts.
2. Student and teacher response questionnaires: to assess the practicality of the media.
3. Cultural literacy test: including pre-test and post-test (multiple-choice and short-answer questions) aligned with Komering cultural literacy indicators. A pilot test indicated instrument reliability with Cronbach's alpha = 0.85.
4. Observation sheets and interview guidelines: used to collect qualitative data on student engagement during learning activities.

All research procedures obtained approval from the school authorities and parents, and informed consent was obtained from all participants.

Development Procedure

The media development followed the five stages of ADDIE:

1. Analysis: Identifying the initial condition of cultural literacy through literature review, observation, interviews with teachers, and curriculum analysis to determine Komering cultural materials.
2. Design: Developing storylines, storyboards, character designs, backgrounds, and gamification elements in the form of interactive quizzes using Wordwall.
3. Development: Creating illustrations using CorelDRAW X7, designing characters with Pixton, preparing visual and audio narratives using Adobe Premiere Pro CS6, and recording dubbing with the Dolby On application. The product was an interactive digital comic video lasting 6–7 minutes, integrated with gamified quizzes.
4. Implementation: Conducted through a pilot test (7 students) to obtain initial feedback, followed by a large-scale test (35 students) to evaluate the media's effectiveness.
5. Evaluation: Based on expert validation, response questionnaires, observation, and analysis of cultural literacy test results.

A research flowchart (Figure 1) illustrates the ADDIE stages and the research timeline.
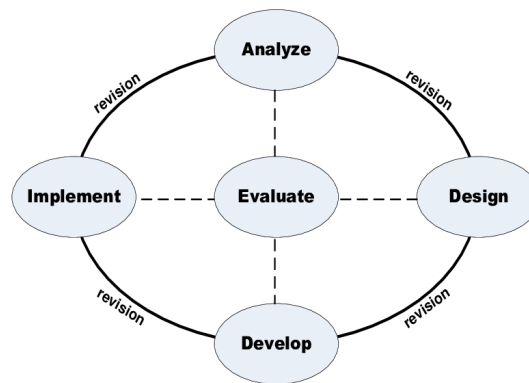
Figure 1. ADDIE Development Model

Data Analysis

1. Expert validation data were analyzed quantitatively using descriptive statistics and feasibility percentages:

$$\text{Feasibility Percentage} = \frac{\text{Obtained Score}}{\text{Maximum Score}} \times 100\%$$

Table 1. Media Feasibility Criteria

Achievement Level	Description
81–100%	Very Feasible
61–80%	Feasible
41–60%	Quite Feasible
21–40%	Less Feasible
0–20%	Not Feasible

2. Student and teacher response data were analyzed descriptively to evaluate the practicality of the media.
3. Student learning outcomes: Normality test using Shapiro-Wilk → paired-sample t-test → Cohen's d calculation to measure media effectiveness.
4. Qualitative data from observations and interviews were analyzed through data reduction, data presentation, and conclusion drawing to complement quantitative analysis.

With this design, the gamification-based interactive digital comic is expected to be valid, practical, and effective in improving Komering cultural literacy among junior high school students.

Results

This study resulted in the development of gamification-based interactive digital comics through the ADDIE model stages. The findings are presented from the analysis stage to the evaluation stage.

Analysis Stage

Interviews with Komering local content teachers revealed that cultural materials were still taught conventionally through lectures and textbooks. This condition affected students' understanding of local traditions. Documentation of the

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interview activities can be seen in Figure 2.

Figure 2. Documentation of interviews with Komering local content teachers at SMP Negeri 02 Belitang Mulya showing students' difficulties in understanding Komering culture through conventional methods.

Design Stage

The design stage produced storyboards, character designs, and background illustrations representing Komering culture. Main characters, including students, teachers, and elders, were created using Pixton, while background illustrations such as Perjaya Dam and Komering traditional wedding ceremonies were designed using CorelDRAW X7.

Figure 3. Digital comic character design themed Perjaya Dam and Adok Meaning.
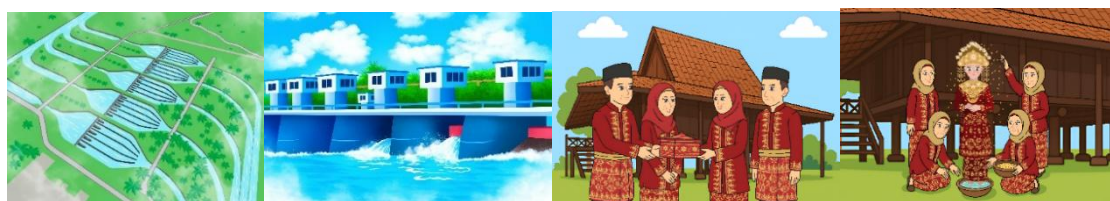

Figure 4. Digital comic background illustration design themed Perjaya Dam and Adok Meaning.

Development Stage

The final product consisted of two episodes of video-based digital comics lasting 6–7 minutes, enriched with audio narration, traditional music, and gamified

quizzes created using Wordwall. The developed stories were *"Perjaya Dam: Traces of Komering Water"* and *"Adok Meaning: Honorary Titles in Komering Traditional Weddings."*

Figure 5. Digital comic interface themed Perjaya Dam.

Figure 6. Digital comic interface themed Adok Meaning.

Gamification elements were integrated in the form of Wordwall-based quizzes. Students could scan QR codes to access quizzes in Matching Game and Maze Chase formats.
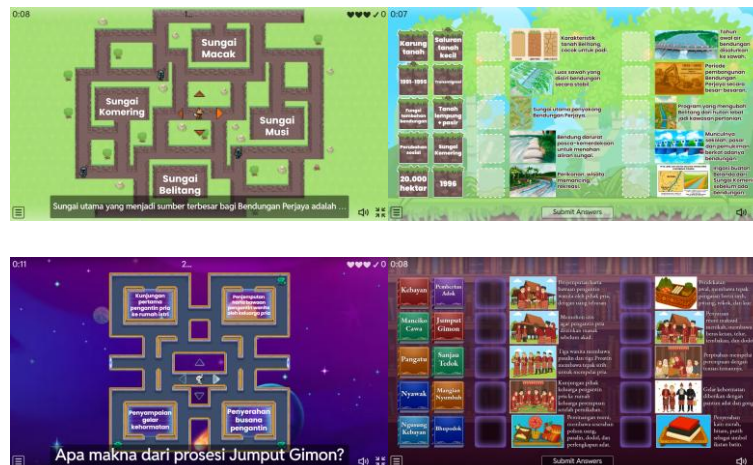

Figure 7. Gamified quiz page based on Wordwall.

Media Validation

Media validation was conducted by three experts (language, culture, and learning media) and two local content teachers. Assessed aspects included content, language, media appearance, and gamification integration. The evaluation results showed an average feasibility percentage of 89.9%, categorized as *Very Feasible* according to Sugiyono (2024).

Table 2. Expert and Practitioner Validation Results

Validator	Assessed Aspect	Average (%)	Category
Cultural Expert	Material content and cultural relevance	90.4	Very Feasible
Language Expert	Language accuracy and fluency	90.0	Very Feasible
Media Expert	Visual and multimedia presentation	88.0	Very Feasible
Practitioner Teacher	Gamification integration and classroom practicality	91.2	Very Feasible
Overall Average	—	89.9	Very Feasible

Implementation Stage

The trials were conducted in two scales: limited (7 students) and large-scale (35 students). In the limited trial, students showed high enthusiasm when engaging with the digital comic and completing gamified quizzes. They commented:

"It is so fun to learn Komering culture with this quiz; it feels like playing a game." – Student

"This media helps students understand traditional procedures faster." – Local content teacher

Figure 8. Documentation of the limited trial showing student engagement in accessing gamified quizzes.

Based on the limited trial data, the average cultural literacy score of students was 3.59 (SD = 0.09, SE = 0.03). The Shapiro-Wilk normality test indicated a normal distribution ($p > 0.05$), and a one-sample t-test showed a significant increase ($t = 105$, $p < 0.001$). These results were used to refine the media before the large-scale trial.

In the large-scale trial, the average pre-test score was 2.21 and the post-test score was 3.23, indicating an increase of 1.01 points. Paired-sample t-test results showed $t = 12.4$; $df = 34$; $p < 0.001$, with Cohen's d = 2.09 (very large). The 95% confidence interval ranged from 0.845 to 1.18.

Figure 9. Documentation of the large-scale trial at SMP Negeri 02 Belitang Mulya.

Paired Samples T-Test

			statistic	df	p	Mean difference	SE difference	95% Confidence Interval			Effect Size
								Lower	Upper		
Post	Pre	Student's t	12.4	34.0	< .001	1.01	0.0819	0.845	1.18	Cohen's d	2.09

Note. $H_a \mu$ Measure 1 - Measure 2 $\neq 0$

Normality Test (Shapiro-Wilk)

			W	p
Post	-	Pre	0.979	0.733

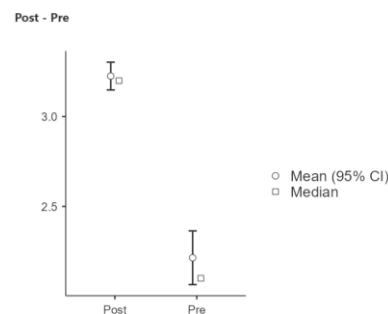*Note.* A low p-value suggests a violation of the assumption of normality

Figure 10. Graph showing pre-test and post-test score improvements, illustrating the effectiveness of the gamification-based interactive digital comic.

Summary of Limited vs. Large-Scale Trials

Table 3. Comparison of Limited and Large-Scale Trial Results

Trial Scale	Number of Students	Average Score	SD	SE	Significant Result
Limited	7	3.59	0.09	0.03	Yes (p < 0.001)
Large-Scale	35	Pre-test 2.21 → Post-test 3.23	0.31	0.05	Yes (p < 0.001)

Evaluation Stage

Overall, the gamification-based interactive digital comic was proven to be valid, practical, and effective in improving Komering cultural literacy among junior high school students. The media not only strengthened students' understanding of local icons such as Perjaya Dam and Adok traditions but also increased learning motivation through gamification elements. Additionally, student engagement was high, as indicated by the number of quizzes completed and active responses to interactive questions.

Discussion

The findings of this study indicate that gamification-based interactive digital comics developed through the ADDIE model were valid, practical, and effective in improving Komering cultural literacy among junior high school students. This section discusses the research findings by relating them to relevant theories, previous studies, and the contribution of this study to the development of technology-based learning media.

Media Validity

Validation conducted by language experts, cultural experts, media experts, and practitioner teachers showed an average feasibility percentage of 89.9%, categorized as *Very Feasible*. This indicates that the media met the requirements in terms of content, language, visual presentation, and gamification integration. The alignment of the comic's content with local traditions, such as the Adok ceremony in traditional weddings and the depiction of regional icons like Perjaya Dam, demonstrates the media's relevance to the local cultural curriculum (Pemkab OKU Timur, 2021).

These validation results are supported by Damayanti, Setiawan, and Hartiningsari (2024), who reported that e-comics based on local wisdom have high feasibility because they present contextual content that is closely related to students' lives. Therefore, media validity not only lies in technical aspects but also in the contextual value that strengthens students' connection with local culture.

Media Practicality

Positive responses from students and teachers during the implementation stage confirmed that the interactive digital comic was practical for classroom use. Students expressed higher enthusiasm because the media presented content through visuals, audio, and interactivity, which facilitated understanding of cultural meanings. This aligns with the principles of multimodal learning, where the integration of text, images, and sound enhances information absorption compared to text alone (Mayer, 2021).

Practicality was further reinforced by the integration of gamification elements through Wordwall quizzes. Game features such as Matching Game and Maze Chase fostered students' intrinsic motivation, consistent with Supyan, Dasuki, and Sa'idah (2024), who reported that gamification in learning can increase students' learning motivation by up to 33.38%. Thus, the practicality of the media is not only technical but also psychological, facilitating student interest and engagement.

Media Effectiveness

Data analysis showed a significant increase from pre-test (M = 2.21) to post-test (M = 3.23), with t = 12.4, p < 0.001, and Cohen's d = 2.09, indicating a very large effect. This confirms the effectiveness of gamification-based interactive digital comics in enhancing Komering cultural literacy among junior high school students. The large effect size suggests that this intervention not only produced statistically significant results but also had a meaningful practical impact on students'

understanding.

These findings are in line with Narestuti, Sudiarti, and Nurjanah (2021), who found a 52.46% increase in students' understanding using digital comics compared to conventional text, and Dewi, Astawan, and Trisna (2024), who reported an improvement in socio-cultural literacy through digital comics based on Tri Hita Karana. This study reinforces evidence that interactive and gamified digital comics are effective in supporting cultural literacy.

Integration of Gamification and Cultural Literacy

The success of this media is closely linked to the proportional integration of gamification. Based on Self-Determination Theory (Ryan & Deci, 2020), students' intrinsic motivation can be enhanced by fulfilling basic psychological needs: competence, autonomy, and relatedness. Gamification elements provided through interactive Wordwall quizzes allowed students to experience healthy competition, have control over the learning process, and interact with peers.

Additionally, Hakeu, Pakaya, and Tangkudung (2023) emphasize that gamification in digital learning significantly increases student engagement. This study adds a local cultural dimension by including Komering cultural content, which not only enhances motivation but also strengthens students' cultural identity.

Contribution to the Merdeka Curriculum and Local Content

This media contributes significantly to the implementation of the Merdeka Curriculum, which emphasizes contextual learning and character development based on local wisdom (Kemendikbudristek, 2022). The interactive digital comic addresses the challenge of low cultural literacy by providing enjoyable and meaningful learning experiences. Teachers can utilize this media as an innovative teaching material alternative, reducing reliance on lectures and textbooks alone.

Moreover, the media supports regional policy in implementing the Komering Local Cultural Curriculum, enabling more effective and impactful learning of Komering culture in schools throughout Ogan Komering Ulu Timur Regency.

Novelty of the Study

The novelty of this study lies in the development of a 6–7 minute interactive digital comic video, enriched with audio narration, traditional music, and Wordwall-based gamified quizzes. Previous studies were limited to static digital comics without gamification (Faisal et al., 2022; Zulaikah, Sari, & Akhodiyah, 2025). Therefore, this study fills a research gap and provides a new contribution to educational technology, particularly in the development of learning media based on local culture.

Limitations and Future Research Directions

The limitations of this study include:

1. The trial was conducted in only one school with a limited sample, so generalization should be expanded.
2. The media is still video-based with external quizzes (Wordwall) and not fully integrated into a single platform.
3. Long-term effects on students' retention of cultural knowledge have not been

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assessed.

Future research is recommended to develop the media within integrated LMS platforms (e.g., Moodle or Google Classroom), involve more schools, and explore other technologies such as AR or AI to enhance local cultural learning experiences. Longitudinal studies are also suggested to evaluate the sustainability of cultural literacy improvement.

Overall, the development of gamification-based interactive digital comics is an effective innovation to enhance Komering cultural literacy among junior high school students. The media is valid, practical, and provides a fun, contextual, and meaningful learning experience. Supported by multimodal learning theory, gamification principles, and curriculum policy relevance, this study makes an important contribution to educational technology and the preservation of local culture.

Conclusion

This study concludes that the development of gamification-based interactive digital comics is valid, practical, and effective in enhancing Komering cultural literacy among junior high school students in Ogan Komering Ulu Timur Regency. Through the ADDIE model stages, the developed media not only presents local cultural visualization in the form of interactive comic videos but also enriches students' learning experiences through the integration of gamified quizzes, which increase motivation and engagement.

Validation by experts and practitioner teachers indicated a very high feasibility level, while both limited and large-scale trials demonstrated a significant improvement in students' understanding of Komering culture, particularly regarding icons such as Perjaya Dam and the Adok tradition. Therefore, the study successfully achieved its objective of producing an innovative, contextual, and engaging learning media that also supports the preservation of local culture.

This study opens opportunities for further development, including:
1. Integration of the media into an integrated digital learning platform.
2. Expansion of the research sample to include multiple schools and educational levels.
3. Exploration of emerging technologies, such as augmented reality (AR) or artificial intelligence (AI), to further strengthen cultural literacy in the digital era.

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