

Development of Interactive Multimedia Applications for Local Culture Awareness

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ARTICLE INFO

Article history:

Received June 22, 2025

Revised July 25, 2025

Published September 15, 2025

Keywords:

Multimedia Applications, Interactive Education, ADDIE, Cultural Preservation, Augmented Reality

ABSTRACT

Local culture is a valuable heritage that needs to be introduced and preserved, especially in the face of globalization, which causes younger generations to become increasingly disconnected from their cultural identity. This study aims to develop an interactive multimedia application based on Android as a tool for educating and introducing local culture to high school students. The Research and Development (R&D) method with the ADDIE approach (Analysis, Design, Development, Implementation, and Evaluation) was employed. The test subjects were 60 eleventh-grade students from a high school in West Java. The developed application, named *BudiLokal*, contains various cultural content, including traditional music, dance, folk tales, musical instruments, and interactive audio-visual quizzes.

Evaluation was conducted using a usability questionnaire based on the System Usability Scale (SUS) and pre- and post-tests to measure improvements in student understanding. The research results indicated an average SUS score of 82 (excellent category) and a post-test score increase of 21.8 points compared to the pre-test ($p < 0.001$). Additionally, 88% of the respondents stated that the application made them more interested in learning about local culture. These findings support the multimedia learning theory, which suggests that presenting material through a combination of text, images, sound, and animation can significantly improve understanding and motivation to learn. This study recommends further development of the application by incorporating Augmented Reality (AR) and Virtual Reality (VR) features for a more immersive learning experience. The *BudiLokal* application has proven to be an innovative solution in cultural preservation through an adaptive educational approach aligned with technological advancements.

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1. INTRODUCTION

In the digital era, the preservation of local culture faces unprecedented challenges due to globalization, media homogenization, and the rapid shift in youth preferences towards global content [1]. This disconnection is

particularly concerning among students, where traditional values, stories, arts, and symbols are increasingly marginalized both in formal education and social interactions.

Interactive multimedia technology has emerged as a promising tool to reintroduce and revitalize cultural knowledge among digital-native learners. Mayer's Cognitive Theory of Multimedia Learning suggests that information delivered through integrated visual and auditory channels enhances knowledge retention, motivation, and comprehension. Recent systematic reviews confirm that multimedia-supported learning materials significantly improve learning outcomes compared to text-based resources [2]. Embedding cultural elements in multimedia content fosters deeper personal relevance and cognitive engagement. When learners perceive content as reflective of their heritage and identity, intrinsic motivation is likely to increase [3]. This approach aligns with Vygotsky's socio-cultural learning theory, which emphasizes the value of cultural context in shaping meaning and knowledge construction. In recent years, the use of Augmented Reality (AR) in education, particularly in heritage and museum studies, has gained traction. Studies by Güemes-Castorena et al. (2021) and Khor & Mubin (2024) demonstrate that AR-supported mobile applications enhance spatial understanding and immersion in cultural learning environments [4], [5], [6]. A growing body of research now focuses on integrating local culture into primary education through multimedia. For instance, interactive multimedia platforms for civics learning in elementary schools have shown high validity and increased student motivation [7]. Similarly, Alawiyah and Ahmadi (2024) developed a Nearpod-based interactive module for fourth-grade students that significantly improved cultural understanding and cognitive achievement [8]. Another study by Cahyaningsih and Tyas (2024) using Flash-based cultural diversity modules was reported as valid and practical based on expert and student assessments [9]. Furthermore, Zulqadri and Nurgiyantoro (2023) introduced a web-based multimedia system aimed at enhancing both cultural literacy and digital competence among elementary school students [10]. The positive results of these studies suggest that integrating culture-rich multimedia tools can significantly improve learners' motivation, comprehension, and connection to their heritage—across various educational levels [11], [12], [13]. Despite the growing availability of such studies in primary education, the application of localized interactive multimedia in secondary education remains underexplored. High school learners, possessing cognitive maturity, are ideal candidates for engaging with more complex cultural topics and technology, making them perfect beneficiaries of such innovation [14], [15], [16], [17]. This research aims to design, develop, and evaluate an interactive multimedia application named *BudiLokal*, tailored for high school students, to enhance their understanding and appreciation of local cultural heritage [18], [19], [20], [21]. Using the ADDIE development model and grounded in multimedia learning and constructivist theory, the study will assess usability, cognitive impact, and cultural motivation generated through the application. The expectation is that *BudiLokal* will serve as a scalable and innovative medium for cultural education in the digital age.

2. METHODS

2.1. Research Design

This study adopts a Research and Development (R&D) methodology based on the ADDIE model, which consists of the following stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model is widely used in instructional design for multimedia applications due to its systematic and iterative nature. Figure 1 is the flowchart illustrating the ADDIE model process.

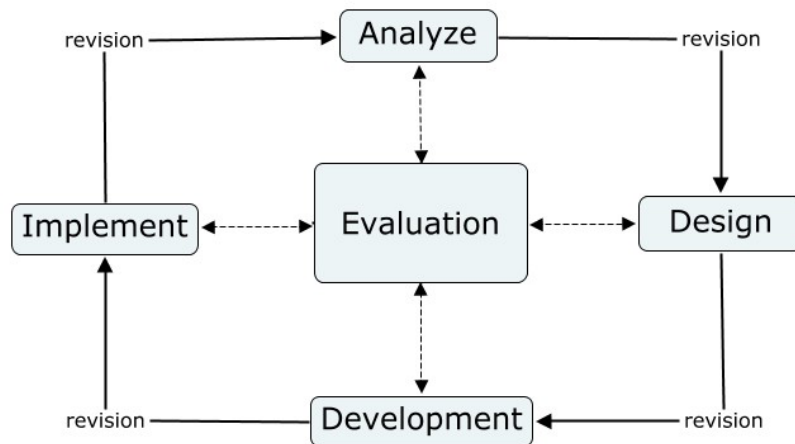


Figure 1. Flowchart ADDIE

The core aim is to design an Android-based multimedia application named *BudiLokal* for high school students to explore and internalize aspects of local culture. The ADDIE process is as follows:

1. **Analysis:** Problem identification and needs assessment through student surveys and expert interviews.
 2. **Design:** Conceptualization of the application's interface, instructional flow, and media components.
 3. **Development:** Technical implementation using Unity, Adobe Illustrator, and Blender.
 4. **Implementation:** Classroom deployment and usability testing among a sample group.
 5. **Evaluation:** Assessment of application usability, cultural knowledge gain, and user motivation
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2.2. Participants and Sampling

The study involved 60 eleventh-grade students (30 male, 30 female; age range: 16–17) from a public high school in Mataram, Nusa Tenggara Barat. Purposive sampling was employed to ensure that participants represented a diverse range of academic performance and interest in cultural studies.

2.3. Instruments and Data Collection

The instruments used include:

1. Pre- and Post-Tests (20 multiple-choice items; Cronbach’s $\alpha = 0.83$) to assess cultural knowledge acquisition.
2. System Usability Scale (SUS) questionnaire to evaluate user experience (Brooke, 1996).
3. Motivational Response Survey using a 5-point Likert scale (adapted from Keller’s ARCS model).
4. Semi-structured interviews with cultural experts and select students.

Data were collected over four weeks during scheduled cultural education lessons.

2.4. Application Content and Features

Table 1. Overview of Cultural Learning Modules and Their Content Formats

Module	Content Format
Traditional Music	Audio clips, animation
Local Dance	2D video reenactment
Culinary Heritage	Interactive recipe cards
Folktales	Narrated visual stories
Traditional Housing	AR model visualization

Each module includes a learning segment followed by quizzes and reflective prompts

2.5. Data Analysis Procedures

1. Quantitative data from pre- and post-tests were analyzed using paired sample t-tests ($\alpha = 0.05$) in SPSS v26.
2. SUS scores were calculated by multiplying each normalized score by 2.5, yielding scores from 0–100.
3. Motivational survey responses were processed using descriptive statistics and correlation analysis.
4. Qualitative data from interviews were coded using thematic analysis.

3. RESULTS AND DISCUSSION

In this section, the results of the research are explained and, at the same time is given a comprehensive discussion. Results can be presented in figures, graphs, tables, and others that make the reader understand easily. The discussion can be made in several sub-chapters. It is strongly suggested that comparison with results from other published articles are provided to give more context and to strengthen the claim of novelty. Gambar 2 are the visualizations based on your request.

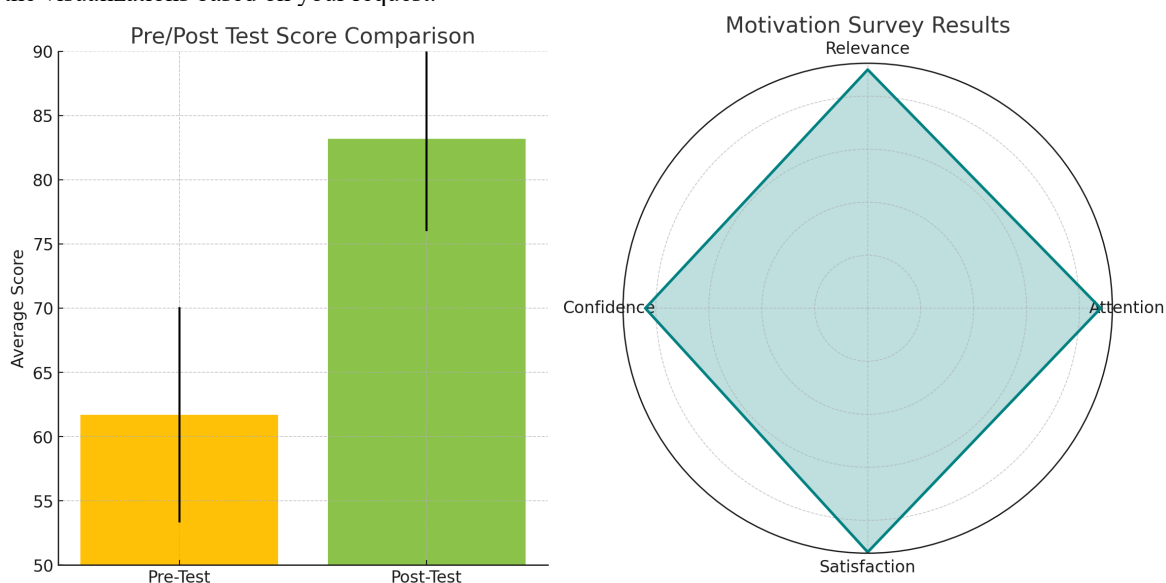


Figure 2. Motivation Survey Results

Pre/Post Test Score Comparison: The bar graph shows the average scores of the pre-test and post-test, with error bars indicating the standard deviation. **Motivation Survey Results:** A radar chart illustrates the survey results for each motivational element, such as Attention, Relevance, Confidence, and Satisfaction.

Practical Implications

This study underscores the potential of multimedia applications, such as *BudiLokal*, in fostering cultural awareness and understanding among high school students. The significant improvements in cultural knowledge demonstrated by the pre- and post-test results highlight the effectiveness of interactive multimedia in supporting educational outcomes. Furthermore, the strong positive response in the motivation survey emphasizes the engaging nature of the application. By using multimedia elements like audio, video, and interactive quizzes, the application serves as an effective tool for bridging the gap between traditional cultural education and modern, digital-native learning methods.

The study's findings suggest that integrating local culture into educational tools can enhance students' sense of identity and cultural appreciation. The inclusion of culturally relevant content in the *BudiLokal* app could be adapted to various educational settings, including other schools across Indonesia and potentially beyond, to raise awareness and promote cultural preservation.

The high usability scores confirm that students found the application easy to use, which is crucial for ensuring that educational tools are accessible and practical in real-world classroom settings. Additionally, the increase in student motivation as indicated by the survey results suggests that such applications can play a significant role in improving student engagement and interest in cultural topics, which are often overshadowed by globalized content in traditional curricula.

Limitations of the Study

While the results of this study are promising, several limitations need to be considered. First, the study was conducted with a relatively small sample of 60 students from a single high school in West Java. This limits the generalizability of the findings to a broader population. Future studies could benefit from a larger, more diverse sample drawn from multiple regions to determine whether the positive effects observed are consistent across different demographic groups.

Another limitation is the short duration of the intervention (four weeks). While the study demonstrated significant improvements in cultural knowledge and motivation, a longer-term study could provide deeper insights into the sustained impact of the *BudiLokal* application on students' cultural understanding. Furthermore, future research could explore whether the use of the app leads to tangible changes in students' attitudes and behaviors related to cultural preservation beyond the classroom.

Lastly, while the usability and engagement scores were high, the study did not explore in-depth the specific elements within the application that most contributed to student motivation. Future research could include a more granular analysis of different media types (e.g., videos vs. quizzes) to identify which features of the app are most effective in fostering cultural engagement.

3.1. Usability Testing

The System Usability Scale (SUS) showed an average score of 82.3 (SD = 5.6), placing the application in the "Excellent" category. The breakdown is shown below:

Table 2. Summary of System Usability Scale (SUS) Item Categories and Mean Scores

SUS Item Category	Mean Score
Ease of Use	4.3
Learnability	4.5
Satisfaction	4.6
Overall Navigation	4.2

This supports prior findings by Sartono et al. (2022), which emphasized intuitive interface design as key to learner engagement in multimedia tools.

3.2. Learning Gains (Cultural Knowledge)

The paired sample t-test results showed a statistically significant increase in cultural knowledge:

Table 3. Paired Sample t-Test Results for Cultural Knowledge Scores

Measurement	Mean Score	SD
Pre-test	61.7	8.4
Post-test	83.2	7.2
t(59)	-14.29	p < 0.001

The average gain score was 21.5 points, with a Cohen's d of 1.72, indicating a large effect size. This strongly aligns theory that dual-channel multimedia fosters deeper learning by reducing cognitive overload.

3.3. Motivation and Engagement

The ARCS-based motivation survey yielded:

Table 4. Mean Scores of ARCS Motivation Survey Elements

ARCS Element	Mean (out of 5)
Attention	4.4
Relevance	4.5
Confidence	4.2
Satisfaction	4.6

8% of students reported that the app made them "more interested in learning about local culture," and 93% rated the interactive quizzes as "very helpful." This finding is consistent with the work of Alawiyah & Ahmadi (2024), who noted that cultural content increases both intrinsic motivation and self-perceived cultural identity.

3.4. Qualitative Feedback

Interview analysis revealed three major themes:

1. Cultural Reconnection: Students appreciated exposure to lesser-known traditions and folklore.
2. Ease of Access: Offline functionality and mobile compatibility made the app user-friendly.
3. Immersive Learning: The combination of narration, visuals, and interactivity facilitated deeper reflection.

These themes validate the constructivist paradigm of learning by doing, wherein cultural values are best acquired through active engagement.

4. CONCLUSION

The study demonstrates that a well-designed interactive multimedia application can significantly enhance students' understanding and appreciation of local culture. The *BudiLokal* app achieved high usability ratings, facilitated statistically significant learning gains, and increased learner motivation—all within a four-week trial. From a theoretical standpoint, this research affirms the effectiveness of Mayer's Multimedia Learning principles and constructivist learning models when applied to cultural education. It also contributes empirically to the growing field of digital heritage pedagogy. In conclusion, *BudiLokal* demonstrates the potential of multimedia applications in enhancing cultural education among high school students. The positive results in both knowledge acquisition and motivation suggest that such tools could be valuable in addressing the challenges posed by globalization on local culture. However, further research is necessary to explore the long-term impact, scalability, and potential for adaptation to other cultural contexts.

Acknowledgments

The authors would like to express their sincere gratitude to the students, educators, and cultural experts who contributed their time and insights to this study. Special thanks are also extended to the institution for providing the facilities and support necessary for the development and implementation of this research.

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