



Augmented Reality-Based Learning Media Application for Introducing West Sumatran Culture

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ABSTRACT

The rapid development of information and communication technology has brought various innovations in the field of education, including the utilization of Augmented Reality (AR) for learning. This research aims to develop an Augmented Reality-based application for introducing the culture of West Sumatra, which can be used as an interactive learning medium. The method used in the development of this application employs Unified Modeling Language (UML) for system design. This research utilizes Marker-Based AR technology. The application is developed using Unity 3D and displays 3D objects that represent elements of West Sumatra's culture. In this study, the application was tested using the User Acceptance Test (UAT) method, yielding a result of 93%. This indicates that the application is helpful in understanding the culture of West Sumatra and is effective as a learning media tool.

Keyword: Augmented Reality, Educational Media, Culture, West Sumatra



INTRODUCTION

Indonesian culture is essentially the sum of all the local traditions found throughout the country's many regions. Over time, it has never stopped evolving. This shift happens because people naturally seek progress, and lately, our culture has been changing at a rapid pace—largely driven by the waves of globalization that have woven their way into Indonesian life (Nahak, 2019).

The rise of information and communication technology has really kicked globalization into high gear. As a result, this rapid shift is starting to create a lot of different problems for our cultural heritage (Aprianti et al, 2022). For instance, it's much easier now for people to get swept up in foreign trends through social media, movies, and music. This can actually threaten the survival of our local traditions, which are such a huge part of who we are as a nation.

Education plays a massive role in shaping a nation's character and identity, especially when it comes to keeping local culture alive. But honestly, trying to weave local values into the school system is becoming a real challenge. Since education today is so heavily influenced by global standards, it's easy for the focus to shift away from our own traditional wisdom (Ni Kadek, 2024) West Sumatra is one of those provinces in Indonesia currently grappling with the challenges of globalization, which could really threaten the survival of its culture a culture that's so incredibly rich in traditional values and customs.

Based on the research by Isral et al. (2023) which focused on developing an RPG-based learning tool for arts and culture to help boost the quality of education for elementary schoolers. Their work resulted in a game-based app that actually makes kids interested in their own culture again.

Based on the research by Sirumapea, et al. (2021) titled An Android-Based Learning App for Recognizing Traditional Houses in Java Using Augmented Reality. The study found that this app makes it much easier for students to learn about and identify the various traditional houses found across the island of Java.

Based on the research by Toyib, et al. which looked at using Augmented Reality to introduce traditional Rejang clothing through 3D virtual objects. This research resulted in an app that helps people get to know Rejang traditional attire while serving as a great way to promote it.

Based on the research by Anila, et al. (2022) titled Introducing Traditional Musical Instruments of West Sumatra Using Mobile-Based Augmented Reality. The study concluded that this app is a great tool for teaching students about traditional instruments in a way that actually grabs their interest.

Based on the research by Novitasari (2019) titled An Android-Based Augmented Reality App for Introducing Indonesian Traditional Weapons. This research produced a learning tool that has been well-received as an effective way to teach people about the various traditional weapons found across Indonesia.

That's why this study was done it's an effort within the education field to really boost students' interest and understanding when it comes to learning about culture. By using Augmented Reality on mobile devices, the hope is to make learning more exciting for students, help them grasp the material more easily, and get them to play an active role in class. This way, they aren't just memorizing facts about West Sumatran culture; they're also learning how to think critically and becoming genuinely curious about all the different cultures across Indonesia.



RESEARCH METHOD

Research Type

The research I conducted focuses on gathering relevant data specifically about West Sumatran culture. It also explores the use of Augmented Reality technology (Kustandi et al, 2021) so the material can effectively boost students' knowledge and understanding.

Data Collection Methods

To compile this data, I carried out several steps as follows:

1. Observation Method

Observation is a data collection technique involving direct monitoring and recording of the conditions or behaviors of the target subjects—specifically, the students at **SD Muhammadiyah 34 Cikupa (P. Hasibuan, 2023)**. By utilizing this method, I was able to conduct direct on-site analysis and evaluation regarding the students' understanding of culture

2. Interview Method

This method involves gathering data by talking directly to people to get the information needed. In this study, I sat down with teachers and school staff to really understand the challenges students face and what they actually need when learning about local culture. These conversations provided the kind of firsthand insights that help ensure the Augmented Reality app is actually useful and hits the mark (wijoyo, 2022). I conducted interviews to gather accurate data from the people directly involved in cultural education at the school. This approach involved having open dialogues with key stakeholders, specifically teachers and students.

3. *Research Method*

In this method, data is gathered by reviewing previous research related to the topic. This involves diving into available literature, such as journals, articles, and other library resources, to build a solid foundation for the study (hasanah, 2022).

4. Questionnaire

This is a data collection tool used to gather information from a large group of people. It consists of a systematically organized series of questions that allow respondents to share their experiences, knowledge, or opinions. This structure makes it much easier to process and analyze the data later (pranatawijaya, 2019). By using this approach, I can collect information quickly from many different people and then analyze the results using the **User Acceptance Test (UAT)** method.

Research Object

I conducted my research at **SD Muhammadiyah 34**, located on Jl. Raya Serang KM 12.5, Cikupa, Tangerang. Through firsthand observation and interviews, I met with the principal and teachers to discuss how they currently teach local culture, specifically focusing on West Sumatra.

I found that the teaching process hasn't been as effective as it could be because there is very little use of technology in the classroom. As a result, students tend to get bored quickly, and the overall learning experience feels less impactful.



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Analysis of the Current System

To illustrate how the learning process works for this research, I'm using **Unified Modeling Language (UML)**. Specifically, I've created a **Use Case Diagram** to show exactly how the system and the users interact.

Here is the breakdown of that process:

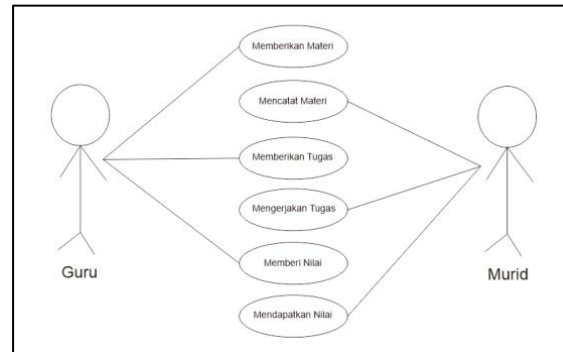


Figure 1.

Use Case Diagram of the Current System at SD Muhammadiyah 34 Cikupa

This diagram illustrates how the current cultural learning process is structured, showing the interactions between the teachers and the students within the existing classroom framework.

Explanation of the Use Case Diagram for the Current System at SD Muhammadiyah 34

Table 1.
Use Case Diagram Description

Use Case	Explanation
Providing Material	In this step, the teacher delivers the lesson content to the students. Currently, this is done manually using printed books or oral presentations, where the teacher explains the history, traditions, and characteristics of West Sumatran culture.
Taking Notes	As the teacher explains the lesson, students follow along by writing down the key points in their notebooks. This traditional "listen and write" approach is the primary way students capture and store information for later study.
Assigning Tasks	Once the material has been explained, the teacher gives out assignments or exercises to test the students' understanding. These tasks are usually paper-based and designed to see how much of the lecture information the students have managed to retain.
Completing Tasks	Students work on the assignments given by the teacher



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	based on the material they've just learned. This typically involves answering questions or completing exercises in their workbooks to demonstrate their knowledge of the topic.
Grading	After the students submit their work, the teacher reviews and evaluates the assignments to provide a grade. This serves as the final step in the current cycle, measuring the students' academic performance and their mastery of the cultural material taught in class.
Receiving Grades	In the final stage of the process, students receive the results of their work. These grades provide feedback on their performance and reflect their level of understanding regarding the cultural material presented during the lesson.

The Three Stages of Development

- **Stage 1: Problem Identification** In this initial phase, the specific challenges and needs of the users (both teachers and students) are analyzed. Based on the previous research, this stage focuses on the lack of technological integration and the resulting decline in student engagement during cultural studies.
- **Stage 2: Problem Solving (Concept & Design)** This stage involves formulating a digital solution to overcome the identified issues. It includes:
 1. **Concept Definition:** Deciding how the West Sumatran cultural material will be presented.
 2. **System Design:** Creating the architecture, navigation flow, and UI/UX design to ensure the media is user-friendly and interactive.
- **Stage 3: Production Process** The final stage focuses on the actual build and implementation of the media, which includes:
 1. **Content Creation:** Developing digital assets such as graphics, audio, and text.
 2. **Multimedia Integration:** Combining elements like animation, video, and interactivity into a cohesive platform.
 3. **Testing:** Conducting functional and effectiveness tests to ensure the media runs smoothly and successfully enhances the learning experience.

1. Identified Problems

Based on the research conducted, several key issues were identified:

- a. **Ineffective Learning Media:** Learning about West Sumatran culture through textbooks is considered ineffective because students are limited to reading text and viewing static 2D images.
- b. **Overwhelming Content:** The material presented in books is often too lengthy, causing students to lose interest and become bored quickly.
- c. **Time Constraints:** The time allocated for classroom material delivery is relatively insufficient. These time limitations often prevent the comprehensive delivery of the required subject matter.



2. Problem Solving

- a. **Augmented Reality Application:** Developing a West Sumatran cultural learning application using **Unity** and **Augmented Reality (AR)** technology. This provides a realistic 3D impression of the objects described, thereby increasing student engagement and interest.
- b. **Digital Literacy Guidance:** Providing direct guidance to students on how to utilize digital media effectively as a modern learning tool.

3. Production Process Stages

Production is a process that determines the success of a project. The production process encompasses various critical steps that ensure all planned and designed elements are implemented effectively (nurul, 2023). Stages of the Production Process:

- a. Pre-production
The Pre-production stage is crucial as it serves as the planning phase for the entire sequence of production activities. When this stage is executed with thoroughness and precision, the desired results are more easily achieved and remain consistent with the initial planning (effendi et al, 2023). This stage encompasses concept definition, research and information gathering, and scheduling to ensure a more structured production process.
- b. Production
This stage involves creating the design for the application. Several design alternatives are initially developed, encompassing interface layouts, color schemes, and other visual elements. Subsequently, the best design is selected based on functional and aesthetic criteria that best align with the application's goals. The chosen design is then implemented into the application media, ensuring that the visual interface and user interactions run smoothly and according to plan (masnuna, 2020).
- c. Post-production
Once the production phase is complete, the next step is post-production. This stage includes testing to ensure the application runs smoothly. This is followed by revision and refinement, where improvements or adjustments are made based on test results to resolve any existing bugs. The post-production stage is crucial for ensuring that the developed application not only functions properly but also fully meets the users' needs

RESULTS AND DISCUSSION

A. Proposed New Procedure

Based on the problem analysis conducted on the existing systems and learning methods at **SD Muhammadiyah 34**, located on Jl. Raya Serang KM 12.5, Sukadamai, Cikupa, Tangerang, Banten, a new approach is proposed.

The recommendation is to develop a learning application that introduces Indonesian culture specifically the **culture of West Sumatra** by utilizing **Augmented Reality (AR)** technology. This application is designed to help students become more enthusiastic and prevent boredom while studying West Sumatran heritage.

The system functions by displaying **3D objects** on a smartphone screen, effectively merging the physical world through **image markers** of West Sumatran culture and their



corresponding information with a virtual world powered by Augmented Reality on the **Android platform**.

B. Use Case Diagram

A Use Case Diagram is a UML (Unified Modeling Language) diagram used to represent the expected functional requirements of a system. It provides a concise visual summary of who uses the system (the actors) and what actions they perform (the use cases) (T.J.S. , 2020)

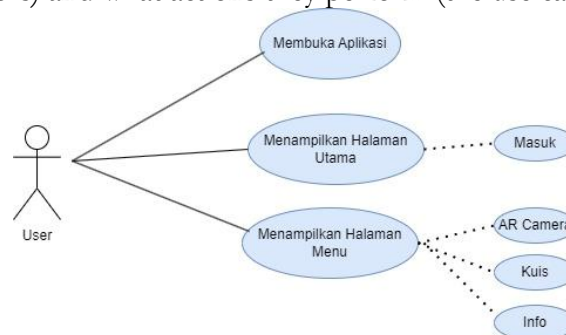


Figure 2.
Use Case Diagram

Figure 2. The Use Case Diagram above illustrates the interactions within the Augmented Reality application. There are several use cases performed by the user. First, the user opens the application and proceeds to the Main Menu. From the menu, the user can select various activities, such as using the AR Camera, answering quiz questions, and reading the available cultural information.

C. Object Creation

The creation of 3D objects used as learning assets is performed using Blender. The Augmented Reality application is developed using the Unity 3D engine integrated with the Vuforia SDK. Additionally, Adobe Illustrator is utilized to design the application background and create the high-quality markers required for AR tracking.

D. Implementation of Application Results

1. Home Screen



Figure 3.
Home Screen

Figure 3. This is the primary interface of the application, featuring a 'Start' or 'Enter' button. Upon launching the application, traditional music plays automatically and continues to run as a background score throughout the user experience.



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2. Menu Page Interface



Figure 4.
Main Page Interface

Figure 4. illustrates the Menu Page, which features three primary interactive buttons. The first is the 'AR Camera' button, which enables the user to view 3D objects through the camera interface. The second is the 'Quiz' button, designed to sharpen the user's knowledge through interactive assessment. The third is the 'Info' button, which serves as a comprehensive information reference for the user regarding cultural content.

Tampilanhalaman AR Camera

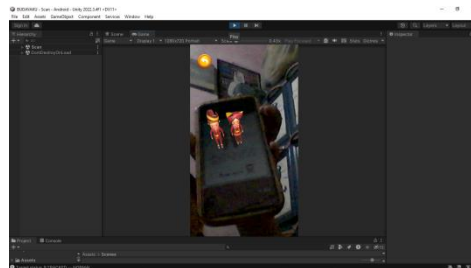


Figure 5.
AR Camera Interface

Figure 5. This represents the output of the AR Camera interface. When a user directs the smartphone camera toward a physical marker card, the corresponding 3D object is instantly rendered and displayed on the screen

3. Quiz Page Interface

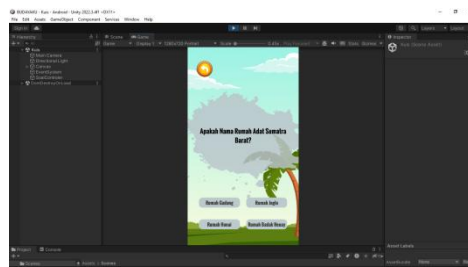


Figure 6.
Quiz Page Interface

Figure 6. This interface displays the interactive assessment module of the application. The Quiz Page is designed to evaluate the user's understanding of West Sumatran culture after they have explored the material through the AR Camera and Information sections. It



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features multiple-choice questions or interactive challenges that provide immediate feedback, serving as a tool to sharpen the students' knowledge and track their learning progress

4. Information Page Interface



Figure 7.
Information Page Interface

Figure 7. This section displays the Information page, which features two primary buttons. These buttons function as navigation points, leading the user to the 'User Guide' (how to use the app) and the 'About West Sumatra' (general cultural knowledge) pages.

5. Page Interface About West Sumatra

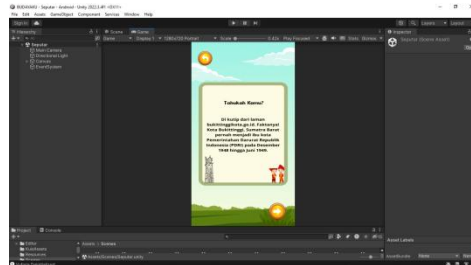


Figure 8.
Page Interface About West Sumatra

Figure 8. This interface displays the 'About West Sumatra' (Seputar Sumbar) page, which acts as the primary educational gallery within the application. It provides a comprehensive overview of West Sumatran cultural heritage, including detailed descriptions of traditional houses, regional costumes, and local musical instruments. The content is curated to provide students with a deeper understanding of the values and history behind the 3D assets they interact with

6. User Acceptance Test (UAT) Results

The User Acceptance Test (UAT) stage is a phase of application testing that directly involves the end-users. In this study, the users consist of 27 third-grade students from SD Muhammadiyah 34. To conduct this evaluation, a questionnaire method featuring five specific questions was utilized. The results of the testing are as follows:

Tabel 1.
User Acceptance Test (UAT) Results

No	Questionnaire	Skoring				Summary	Presentase
		A	B	C	D		
1	Is the learning method	84	15	2	0	101	92%



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	using this application engaging?						
2	Is the use of this West Sumatran cultural recognition application easy?	80	15	4	0	99	90%
3	Is the display of 3D objects in this application clear enough?	96	9	0	0	105	97%
4	Is the visual interface of this West Sumatran cultural recognition application attractive?	92	6	4	0	102	92%
5	Does this Augmented Reality learning application help students understand West Sumatran culture more quickly?	92	12	0	0	104	95%

The author derived a conclusion from the analysis of the five questions by aggregating the percentage results from each, totaling 466%. Consequently, the author calculated an overall average percentage of 93.2%. Broadly, these results indicate that the 'West Sumatran Cultural Recognition Application' based on Augmented Reality serves as a highly effective alternative for teaching students to recognize and study Indonesian heritage.

CONCLUSION

1. Innovation in Cultural Education

- To effectively attract the interest of students in studying Indonesian culture, specifically that of West Sumatra, it is necessary to create learning alternatives using Augmented Reality (AR) technology.
- Students demonstrate a higher level of engagement with this method because the 3D objects used as learning media appear more realistic than those in traditional textbooks.

2. Enhancing Learning Media Engagement

- The primary goal of developing the "West Sumatran Cultural Recognition Application" is to provide a viable alternative to conventional learning media, which is often limited to 2D images and text.
- By implementing this application, students have become significantly more interested and enthusiastic during the learning process regarding West Sumatran heritage.

3. Modern Educational Alternative

- This application serves as a novel educational medium that introduces the culture of West Sumatra through a visually appealing and interactive interface for students.



- The integration of high-quality 3D assets and intuitive design ensures that cultural preservation remains engaging for the younger generation.

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