

Implementation of Augmented Reality Technology as a Media for Introducing Cultural Diversity in Indonesia

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ABSTRACT

Augmented Reality (AR) technology is a type of interactive technology combining real and virtual objects that will produce 3D objects that will be displayed on the screen. Augmented Reality is widely used in various fields, one of which is education. In the field of education, Augmented Reality is used as a medium of introduction and as a tool to make it more interesting. This Augmented Reality technology can be applied in the introduction of culture in Indonesia, one of which is the introduction of traditional houses. The use of Augmented Reality technology is expected to display custom house objects in 3D using Maps images that are used as Markers. Traditional houses in Indonesia have a considerable number, and when learning Social Sciences all students see are 2D images. So that students can see the overall shape of the traditional house building and the uniqueness of each traditional house, students need to make observations on the traditional house. Usually, students can see the entire traditional house through dioramas in the museum, but by using Augmented Reality technology, students only need a smartphone.

General Terms

"Enhancing Cultural Understanding with Augmented Reality in Indonesia".

Keywords

Augmented Reality Technology, Traditional House, Culture, 3D, Learning

1. INTRODUCTION

In Indonesia there are many tribes, religions, cultures, and others. In many differences, Indonesia is a country that is very broad in diversity. Currently we have lived in an age where all use technology, we cannot be separated from technology, as well as in Education today also uses technology as a learning medium and as a tool. Because it can affect the process of students in learning.

However, not many schools make full use of technology, most schools still use teacher-centered learning methods that only deliver material verbally with the help of media such as books, and searching the internet. The information obtained by students through books is only limited to text and pictures of traditional houses so that students find it difficult to know how the original shape of the entire traditional house is. In addition to information books through the internet also only display text and images, there are not many videos about how traditional houses look like. Therefore, so that students and the community can see the shape of the traditional house as a whole and real and students can learn in detail the traditional house to help students learn easily about traditional houses, therefore the use of Augmented Reality (AR) technology is very useful to help teachers as a learning medium. According to Augmented Reality is a technology that combines 2D or 3D virtual objects

into a 3D real environment and then projects these virtual objects in real time (Wolfgang Hohl, 2009)[1]. With Augmented Reality technology, it is expected to increase the interest in learning students and the community in the introduction of traditional houses in Indonesia.

Based on the description of the problem above, it is necessary to use a Mobile application as a learning medium and introduction to traditional houses based on Augmented Reality Technology to make it easier to convey information about traditional houses in Indonesia and create an interesting atmosphere and learning methods. There is research that has been made with a journal entitled Traditional House Learning Using Augmented Reality Technology (Faridz Fajar Nugroho, 2020).[2]

2. METHOD

2.1 Research Design

This research uses a research and development approach to design and implement Augmented Reality (AR) technology as a medium to introduce cultural diversity in Indonesia. This approach was chosen because it allows the integration of theoretical concepts with practical applications in technological development.

2.2 Research Method

The author uses the marker base method to bring up 3D objects, markers made by the author in the form of maps in Indonesia, for example the map of Java Island in figure 1 Marker Map of Java Island.



Figure 1: Marker Map of Java Island

In addition to the map of Java Island, there are still 5 other markers that use maps in Indonesia, namely Sumatra, Kalimantan, Sulawesi, Papua, and Bali. To be able to display traditional houses, students and teachers are required to download Markers on the user instructions menu, after successfully downloading students and teachers are required to print or print the Marker, then enter the material menu and select images that have 3D symbols, to be able to understand how the application works, the author creates an architectural model, which is explained in Figure 2: Architectural Model.

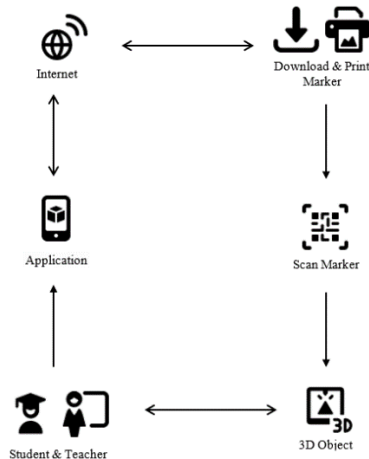


Figure 2: Architecture Model

2.3 Research Data

The instruments used to collect data involve a combination of quantitative and qualitative methods. Scale questionnaires were used to measure participants' subjective responses to experiences using AR apps, while in-depth observations and interviews were used to gain further understanding of their emotional reactions and perceptions to cultural content.

The source of data that the author gets comes from data obtained directly without intermediaries, either individuals or groups. For example, by conducting interviews or giving questionnaires to students and teachers. The author conducted primary data collection by giving a direct interview to one of the 7th grade students, and giving a questionnaire to 7th grade students at 2 Sewon Middle School, the author also obtains data through intermediary media or indirectly, examples of secondary data, namely, journals, scientific papers, theses, books, and others. The author uses data sources in the form of journals from several universities and takes quotes from several books. Data collection is carried out by direct surveys at SMP N 2 Sewon, using survey forms and conducting interviews, then data will be collected which is useful to help this research. Data in the form of how different learning before using the Augmented Reality application in the introduction of traditional houses and culture in Indonesia and after using this application.

3. RESULT

3.1 Description of Augmented Reality (AR) Technology

At the implementation stage of Augmented Reality (AR) technology, this research focuses on developing AR applications that can help in introducing cultural diversity in Indonesia. The app is designed to run on a mobile platform, utilizing the device's sensors and camera as a medium to present AR content to users.

3.2 Augmented Reality Content Development

The process of developing AR content involves selecting significant cultural elements to present to users. Through an in-depth study of various aspects of Indonesian culture, AR content is designed to include traditional dances, traditional clothing, fine arts, and other cultural elements. The author also visited a cultural museum located in Yogyakarta, to find out the form of traditional houses in Java province and to ensure the

truth about the material that the author entered in this research journal

3.3 Augmented Reality Application Trials

To evaluate the effectiveness of AR applications, a trial was conducted involving a group of participants from the general public and students at N 2 Sewon Middle School. Participants were given access to the AR app and asked to explore its content. The data obtained from this trial included participants' subjective responses and understanding of the cultural content presented.

3.4 Analysis of Trial Results

Analysis of trial results includes evaluating the technical performance of AR applications as well as user responses. It was found that most participants stated that the use of AR was effective in introducing them to Indonesia's cultural diversity. In addition, observations of participants' emotional reactions and levels of engagement provide additional insight into the potential use of this technology as a medium of education and cultural promotion. The results of this evaluation are presented in a diagram obtained from a questionnaire through Google Form, the diagram can be seen in Figure 3 Understanding Indonesian Culture and Figure 4 Understand the Real Form of Traditional House.

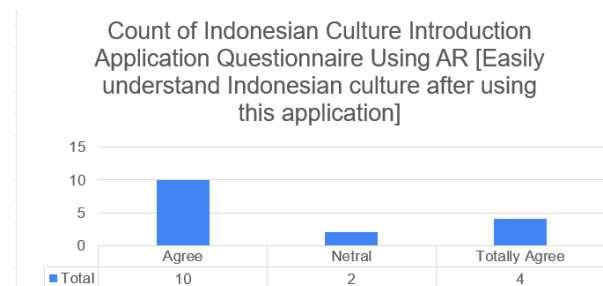


Figure 3: Understanding Indonesian Culture

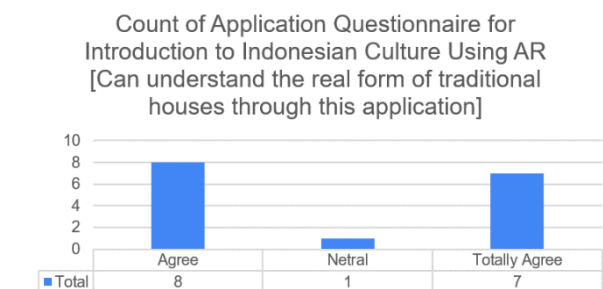


Figure 4: Understand the Real Form of Traditional House

The author provides solutions to problems about conventional learning on cultural diversity material by creating an application to be able to get to know the cultures in Indonesia, in that application there are also 3D objects that can make students interested in trying and learning about Indonesian culture. The survey results from the questionnaire distributed produced final data on how students thought after trying to use Augmented Reality applications for learning media in cultural introduction materials in Indonesia.

3.5 Challenges and Learnings

The AR implementation process cannot be separated from technical and conceptual challenges. Some technical constraints involve hardware and software limitations, while conceptual constraints include the adaptation of cultural content to fit AR experiences. The author conducted several tests

on each Android device, the purpose of this test is so that the application can run smoothly and find out bugs or problems list

of Android devices used can be seen in Table 1 Result of Android Device Testing.

Tabel 1: Result of Android Device Testing

Type Of Testing	Expected	Result			
		Samsung A22	OPPO A5 2020	OPPO A5s	Redmi Note 11
Material button testing	Can display Island Selection, as well as display clothing materials and custom houses	Valid	Valid	Valid	Valid
Button testing Instructions for use	Can display user guide pages	Valid	Valid	Valid	Valid
Developer Info button testing	Can display developer info pages	Valid	Valid	Valid	Valid
Testing the Exit or Exit Button	Can exit the application by pressing the exit button or exit button	Valid	Valid (Slow response when exiting the app)	Valid	Valid
Application Resolution testing	Adjust the screen size in an app to the Android screen size	Valid	Valid	Valid	Valid
Marker detector testing on cameras	Can detect Markers and bring up 3D objects	Valid	Valid (Android becomes slow due to RAM limitations)	Valid (Android becomes slow due to RAM limitations)	Valid
Testing interactions with 3D objects	Can adjust the size (Scale), move (Drag), rotate (Rotate) 3D objects	Valid	Valid (Android response becomes slow)	Valid (Android response becomes slow)	Valid (Android response becomes slow)

3.6 Implications for Education and Cultural Promotion

Devi Wiliadi Putri, Owen Rahadiyan (2022) stated “the purpose of creating this Augmented Reality-based application to visualize traditional houses in realtime with 3D object shapes”[3]. The results of this study contribute significantly to the understanding of AR implementation as a medium to introduce cultural diversity. The implications for cultural education and promotion in Indonesia can be explained by increasing the accessibility and attractiveness of cultural content through AR technology, so as to enrich the learning experience and foster a sense of pride in cultural heritage.

3.7 Display and Button

The display results of the application that the author created produced 6 display pages, here is an explanation of each display and button of the Augmented Reality application. the SplashScreen page appears the logo University of Technology Yogyakarta. Here's the SplashScreen image of the logo of Yogyakarta University of Technology displayed on figure 5 SplashScreen Display.



Figure 5: SplashScreen Display

After the SplashScreen display, the page menu will appear, on the menu display there is Material button, User Guide, Developer Info, Sign Out, and there is a logo of the application. The appearance of the menu page is described in Figure 6 Page Menu,



Figure 6: Page Menu

When students and teachers select the Instructions for Use button, the page will scroll to the Instructions Page, the display on the Instructions page there is a back button and procedures for using the application to bring up 3D objects. The appearance of the Instruction of Use page is described in Figure 7 Instruction Page.

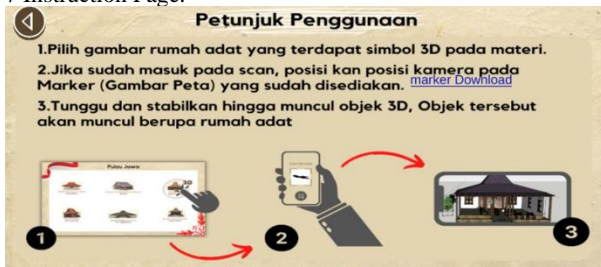


Figure 7: Instruction Page

If teachers and students or users select the developer info menu, the biodata display will appear consisting of developer photos, social media accounts such as Instagram, Facebook, and Email, the appearance of the Developer Info page is described in Figure 8 Developer Info Page.



Figure 8: Developer Info Page

When students and teachers enter the material page, a choice will appear from 6 islands in Indonesia, namely Java, Kalimantan, Sulawesi, Sumatra, Bali, Papua. Each of the islands has its own material in the form of traditional clothes and traditional houses. The appearance of the Material page is described in figure 9 Material Page.



Figure 9: Material Page

If the teacher and student or user select one of the custom house images that already have 3D symbols, then the teacher and student or user will enter on the AR page, On the AR page, students and teachers will see the view of the Smartphone camera, when there is no Marker, the view is only an ordinary camera and no 3D objects will appear, but if it has been given a Marker, a custom house 3D object will appear, the object can be rotated, zoomed out, and moved around. The appearance of

the Augmented Reality page is described in Figure 10 Augmented Reality Page.

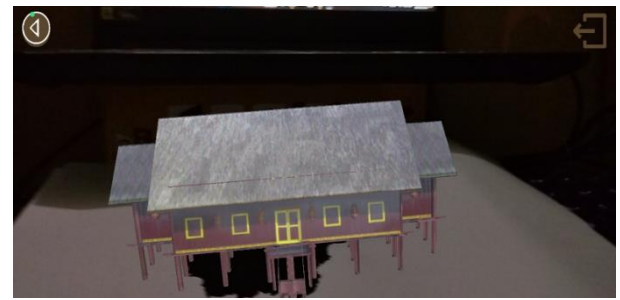


Figure 10: Augmented Reality Page

4. ACKNOWLEDGMENTS

The completion of this journal on the "Implementation of Augmented Reality Technology for Cultural Awareness in Indonesia" has been a journey enriched with support, collaboration, and inspiration. The author also takes writing references and materials from a journal entitled Augmented Reality-Based Application Media for Cultural Introduction (Nunuy Nurjanah, and Rifal Lukmanul Hakim, Ruhaliah 2021)[4] and a journal entitled Building an Augmented Reality-Based Hudoq Mask Recognition Application with a Marker Based Tracking Method (A. Franz, Imron, and Satria, 2023)[5].

From a technical point of view, the implementation of AR as a medium to introduce cultural diversity shows success in the development of interesting and interactive applications. The selection of culturally significant elements, such as custom clothing and custom homes, is able to be effectively integrated into the AR environment, creating an immersive and engaging user experience.

In addition, user response to this AR application is generally positive. The results of the trial showed that users responded enthusiastically to the experience of understanding cultural diversity through AR and knowing the original form of traditional houses in Indonesia.

This research opens up great potential for the use of AR in educational contexts and cultural promotion. AR applications can be an innovative tool to enrich learning in schools and as a means of cultural promotion for governments and cultural institutions. Nonetheless, the study also identified some technical challenges, such as hardware limitations, that need to be addressed in later developments. In addition, updates to the application will continue to be done by adding new materials such as traditional songs, musical instruments, and some materials related to Indonesian culture.

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