Analysis of implementation Augmented Reality (AR) introduction of temple and ancient objects based on android to increasing student learning outcomes

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Abstract. Malang is one of the tourist areas in Indonesia which has many tourist attractions, among them the form of the temple. The temple and the Archaeological Museum of history that cannot be eliminated from our country, this time temples and Archaeological Objects rarely known or even visited by the public. This is particularly worrying given the duty as good citizens, especially the younger generation successor to the nation is to maintain and preserve the cultural heritage of their ancestors. distance and time is a major obstacle that makes the temples and archaeological objects are less attractive to the younger generation especially school students, therefore designed an application that implements Augmented Reality to support the introduction of interactive learning Temples and Archaeological Objects based on Android. A questionnaire was developed using the USE Questionnaire with modifications as needed research. While the analysis of data using Likert scale calculations. Based on the results of the analysis of the implementation of the game as a learning medium can be concluded that the application can be applied and get approval from the user of 85.85%. Based on the result of student learning result test, it can be concluded that the application with Augmented Reality technology helps them to study the temples and ancient objects, with the increase of Student Learning Result of 36.67%

1. Introduction

The young generation is a national asset that must be considered in view of it is they who will continue the history of the struggle of the nation, as well as much needed in the effort to preserve the cultural heritage of their ancestors, not just to know and appreciate the extraordinary legacy that but also participate actively conserving and keeping later future generations can still enjoy the beauty of the cultural heritage. Application of Augmented Reality (AR) made a combine virtual objects (text, pictures, animations) into the real world, of several temples in the city of Malang in a more interactive and attractive. This is expected to increase students' knowledge and motivation to the lessons of history.

2. Literature review

2.1. Overview on temple

The temple is derived from the word meaning home housekeeping Candika Goddess, the goddess of death or death goddess Durga, hence the temple is always connected with spot pendharmaan monument to honor the king who had died. The temple is a building of places of worship of relics of the past are derived from Hindu-Buddhist religion. The term of the temple is not only used by people to describe a place of worship, but also as a palace, baths / petirtaan, gate, etc. [1]. Some temples including the Temple Clowns, Singosari temple, Sumberawan, Jago temple, Kidal temple, Borobudur, Prambanan and Upgrading,

2.2. Antiquities

In Indonesia is estimated to have been used early humans, as follow:

2.2.1. Handheld ax. The first is a hand-held axe used by human kind Pithecanthropus to hunt. The structure and shape are very simple, there is a sharp portion that is only found on one side only. This ax used by way of grip and is found in several places, namely in Trunyan (Bali), Awangbangkal (South Kalimantan), and Trump (Lampung).

2.2.2. Shale tool. This tool is used by early humans to stab, cut and pierce the skin of animals, and is formed from rocks. It is estimated that, this tool is fragments of stone created as a hand-held axe. These tools have been found in Sangiran and Gombong (Central Java), as well as Cabbenge (Flores).

2.2.3. Axe Square. Square hatchet, this axe is a tool made of stone and used by humans for hoeing, sculpt, and hunting. It is made of rectangular stone on both sides finely honed. On one side of the base, there is a hollow part of the stalk. While other base part is sharp. This tool is found in many places in Indonesia, you know, from Sumatra, Java, Nusa Tenggara, Sulawesi up.

2.2.4. Tapering ax. The width of the base axes and sharp, while the sharp edges and attached to the handle. It is made of stone that has been polished until smooth. Hatchet shaped prehistoric era ever found in the Nusa Tenggara, Maluku and Papua.

2.2.5. Menhir. Menhir is a tall stone monument. It is estimated that menhir used as a place of worship by prehistoric man.

2.2.6. Dolmen. Dolmen is a table made of stone, estimated to be used by human pre-history as a place to store offerings to deities.

2.2.7. Sarcophagus. Sarcophagus is a coffin made of stone.

2.2.8. Statue. Statue is a stone shaped to resemble a certain living being.

2.2.9. Bronze vessel. Bronze vessels, these vessels are objects made of bronze. The shape is similar to the Spanish guitar without handles. This tool is only found in two places, namely in Madura and Sumatra.

2.2.10. Funnel ax. Funnel ax made of bronze and shape similar to the top of the funnel. These tools have been found in Java, Bali, Sulawesi and Papua.

2.3. Augmented reality

Augmented Reality (AR) is a technology that combines the virtual object and the two-dimensional or three-dimensional into a real three-dimensional environment and then projecting the virtual objects in the real environment [2]. Augmented Reality (AR) is a view directly or indirectly from physical

objects by adding information can then be displayed as virtual objects are virtual function displays information that cannot be accepted by humans [3]. This makes the reality of growing and useful as a tool to help its perception and interaction with the real world. Information displayed by virtual objects help users carry out activities in the real world. Unlike virtual reality which completely replaces reality, but AR only add or supplement reality. The framework of the possibility of merging and melting the real world and the virtual world into a continuum virtual as follows [4].
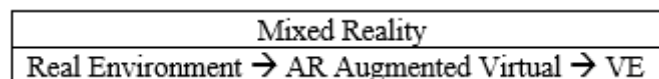
| Mixed Reality |
| Real Environment → AR Augmented Virtual → VE |

Figure 1. Continuum virtual.

Augmented reality that is designed from the perspective of pure technology will lead to the AR experience new and fun for consumption [5].

3. Results and discussion
3.1. Implementation system
Designing interfaces built into the system. Here are a few display interfaces has been implemented and the test results:

3.1.1. Marking interface

Figure 2. Marking.

3.1.2. Interface AR. After the marker or detectable image appears content that consists of a 3D model of the temple according to the image marker is detected.
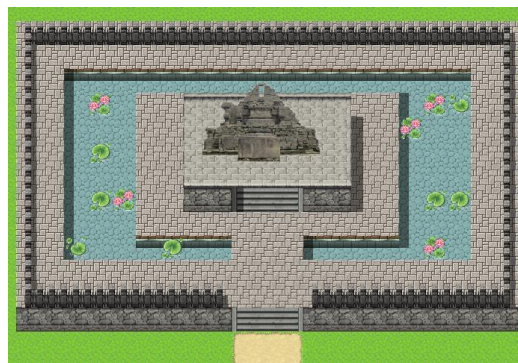

Figure 3. AR menu.

3.1.3. Interface Quiz

Figure 4. ARQuiz menu.

After pressing the OK button on the game manual and the camera is directed at the marker quiz provided and will appear 3d background, 3d character, a description the number of stars earned and the number of turn (turn) left.

3.2. Examination

Testing was conducted on 30 students who have been using the app. Questionnaire for users consists of 10 questions and using a Likert Scale answers 1 through 4 [6].

3.2.1. Product Testing Results. Instruments such as questionnaires to users consists of 10 questions and answers using a Likert scale of 1 to 4. The questionnaire consists of questions and answers, namely instruments questions.

The instrument is based on a combination of aspects of learning multimedia. The result of the calculation of the percentage of each value obtained answers from 30 respondents who have used the temple recognition Augmented Reality applications and android-based Archaeological objects are as follows:

Table 1. Product testing results.

Instrument	Percentage Answer
Application is easy to use	82.50%
Instructions on the application clear and easily understandable	83%
Applications run smoothly	83.00%
Fun applications used	88.00%
Menampilkam output corresponding application navigation	80.00%
UI design is attractive and communicative applications	90%
Media in applications (video, animation, 3D) draw	87.00%
The application helps learning about the temple and Archaeological Objects	87.50%
Material and quizzes clear and appropriate	87.50%
Applications motivate learning the history of Temple and Archaeological Objects	90.00%
Percentage Average - Average	85.85%

3.2.2. Tests on student results. Tests conducted to determine whether the results of the application of AR applications can improve and assist students in improving the achievement of learning outcomes. Tests carried out on 30 students. Questionnaire for users consists of 10 questions and using a Likert Scale [6] answers 1 to 4. The result is as follows:

Table 2. Student results prior to the media.

Question	Answered correctly	Answered wrong
1	20	10
2	10	20
3	15	15
4	15	15
5	10	20
6	20	10
7	20	10
8	20	10
9	18	12
10	12	18
Amount	160	140
Students' Average Scores	53.33	46.67

Table 3. Learning outcomes after the media.

Question	Answered correctly	Answered wrong
1	29	1
2	26	4
3	27	3
4	26	4
5	30	0
6	28	2
7	27	3
8	26	4
9	25	5
10	26	4
amount	270	30
Students' Average Scores	90.00	10,00

The increase learning outcomes for 36.67%.

4. Conclusion

Conclusion The introduction of Augmented Reality applications research temples in Malang based on Android are as follows:

- Based on the results of the analysis of the implementation of augmented reality as a learning medium can be concluded that the application can apply and get approval from users for 85.85%. This concurs with Didik Santoso and Nurgiyatna (2015) [7], using Augmented Reality on the learning process of making Batik declare that the material be easy to learn and understand to reach 85%. Another study states that 100% of students feel happy and excited using augmented reality based learning media [8]. The results of tests on high school students Arjuna Malang, it can be concluded that the application with Augmented Reality technology helps them to learn temples in Malang [9].
- Based on the results of testing on learning outcomes for students, it can be concluded that the application with Augmented Reality technology helps them to learn temples in Malang. Increase student achievement Learning Outcomes of 36.67%. Learning with media augmented reality can improve student learning outcomes with increasing rata2 13% of the three schools studied [8].

5. Suggestion

The suggestions for further research can be done on the implementation of Augmented Reality other areas of learning with the wider-scale materials.

References

[1] Maryanto A D 2007 *Know the temple* (Klaten: True Diamond Klaten)

[2] Azuma R T 2013 *A Survey of Augmented Reality Teleoperator and Virtual Environments* p 355-385 (Hughes Research Laboratories, Dept. Of Computer Science UNC, Los Angles, US)

[3] Furht B 2011 *Handbook of Augmented Reality* (New York: Springer)

[4] Milgram P 1994 A taxonomic Of Mixed Reality Visual Display *IEICE Transactions on Information Volume E77-D*

[5] Craig A B 2013 *Understanding Augmented Reality, Concepts and Applications* (USA: Elsevier Inc.)

[6] Sugiyono S 2012 *Qualitative and Quantitative Research Methodology R & D* (Bandung: Alfabetha)

[7] Didik Santoso and Nurgiyatna 2015 *Design Augmented Reality Applications for Displaying Process of Making Batik Write* http://eprints.ums.ac.id/41420/1/NASKAH%20PUBLIKASI.pdf

[8] Nur Jazilah 2016 *Application of Augmented Reality-Based Learning In Wudu Guide Book For Children* http://etheses.uin-malang.ac.id/2884/1/11650020.pdf

[9] Muhammad Avief Barkah and Rini Agustina 2016 *Use of Augmented Reality (Ar) As an introduction Interactive Learning Media Temple - Temple In Malang Based Mobile Android* https://media.neliti.com/media/publications/184824-ID-none. pdf