

Development of Animal Recognition E-Learning Using Augmented Reality Technology

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Abstract— The development of Information and Communication Technology (ICT) has changed the new face of education. The implementation of Information and Communication Technology (ICT) in educational institutions has become a must in educational institutions, not to close our eyes that schools are naturally responsive to technological developments. The use of interactive multimedia as a support for the teaching and learning process is considered to be able to increase flexibility in teaching and learning activities, especially for kindergarten students. Children at this age should be introduced to the benefits of technology. So that in the future it is not wrong to use technology. An interactive multimedia application that makes it easy for students to learn anywhere and anytime using a mobile device. Learning abilities are focused on making animal recognition applications for kindergarten (TK) students. Because knowledge related to animals must be introduced to students from an early age. Interactive multimedia applications are made by utilizing mobile android and Augmented Reality which are packaged in the form of games (games).

Keywords— *Multimedia, Augmented Reality, Learning Media, Interactive*

I. INTRODUCTION

Animal Recognition Learning is a learning material for Kindergarten (Kindergarten) children. This material is useful for increasing imagination in children, as well as providing knowledge about other living things in their environment.

The learning method is certainly very influential on the process and results of teaching and learning activities, especially during this COVID-19 pandemic [1]. When the teaching and learning process is difficult to digest and understand, the learning process will certainly not be effective. The teaching aids and

the method of delivering material must of course be adapted to the mindset of children who are still unstable. The teaching and learning process should also follow the direction of the development of Information and Communication Technology which is increasingly developing and facilitating human activities. And the material must be delivered in a way that is liked by children in that age range.

AR technology has great potential as an educational tool. One of the advantages that can be obtained from AR applications for educational purposes, namely increasing understanding object being studied. AR is more effective as other learning media compared to other media such as books, videos, and the use of computers normal (Radu, 2012). In addition, mobile learning with AR including context-based learning. In this case, when a visitor enters into a museum, then he can easily get additional information about the museum's artwork being observed. The AR application is installed and can be used through their smartphone (smartphone) easily [2, 3].

To project a virtual object into a real object in the application AR required a tracking method. Augmented reality can be classified into two based on the presence or absence of marker use, namely: marker and markerless [4]. The marker can be a photo of a real object or an artificial image with a unique pattern. AR markers are closely related to pattern recognition which calculates the position, orientation, and scale of AR objects. While the markerless method namely an AR tracking method that uses objects in the real world as markers or markers without using artificial markers.

Augmented Reality is augmented reality, or sometimes known by its English abbreviation AR which takes the term from Augmented Reality. Ronald T. Azuma, 1997 in his article explained that AR as a mixture of real and virtual objects in a real-real environment, where the display is presented interactively in real time where there is integration between objects in three-dimensional form presented with virtual objects that are integrated with the real world. Technology in incorporating real objects into virtual form or vice versa is supported by display technology and interactivity of images produced through input devices and good integration and requires more effective tracking [5].

The purpose of this research is to make teaching aids for the delivery of material in the form of interactive multimedia based on Augmented Reality which is packaged in the form of a game. The theme of the game was chosen because children at that age really like games, so the most effective way is to insert learning into the games they like. Augmented Reality technology is used so that children can play well, and their nervous system can be stimulated because they have to find the animal object they are looking for. With this Augmented Reality-based interactive multimedia, it is hoped that children will easily digest the learning delivered while playing.

II. LITERATURE REVIEW

According to Carmigniani et al. [6] augmented reality is a technology that add / combine virtual objects generated by the computer with the real world. augmented reality is interactive. Paul Milgram and Fumio Kishino explain about mixed reality by creating a taxonomy of mixed reality visual displays.

The development of AR technology today has contributed a lot to the various fields. These fields include advertising and marketing, architecture and construction, entertainment, medical, military, and tourist travel. In the field of education, AR has also been developed into several forms of applications such as AR Books, AR Gaming, Discovery-based Learning, Objects Modeling, and Skills Training [7]. One of the implementations of AR in the field of education and entertainment is the use of AR in video games museum.

Observation of interactions between museum visitors and the device used is useful for identifying situations when AR applications useful and relevant. The challenge of AR applications is to enrich human activities, not just reality. AR is more useful when the technology can reduce reality which are too complex to display [8]. Another study of visits The museum states that usefulness and enjoyment are factors important when using mobile AR applications.

A good marker is a marker that is easily recognizable and reliable under any conditions [9, 10, 11]. For example, in low light conditions, less and the camera position moves, then a good marker will remain read by the AR system. Therefore, a good marker has a good texture complicated. The working principle of the marker is very easy, namely when an AR application find matches with marker identification results, either through tracking marker-based and markerless. Thus, the application can perform actions certain. For example, if the application recognizes a certain marker, then the application AR will display layered information (overlay) on top of the marker image identified. Furthermore, the AR application can display various kinds of data types of information, such as playing audio or video clips related to marker, displaying text information, historical facts related to the location, 3D models, and so on.

Learning using traditional books and props as a medium for learning subjects history, especially about objects historical which indicates it is still low learning outcomes and learning motivation of students.

So we need learning media that can help learning, from this study researchers tried to overcome this problem by developing learning media in the form of applications by utilizing Android-based augmented reality technology to simulate 3D object images. Augmented Reality work system using marker based tracking. By using 3d Max software and the Vuforia plug-in. Making learning media with Augmented Reality technology using the Modality Principle. This study uses experimental research, starting with a pretest, then given treatment and ending with a final test (posttest) which will be given to the experimental class and the control class. The results showed that there was no significant difference between the pre-test learning outcomes between the control group and the experimental group. Furthermore, from the post-test results showed that there was an increase in student learning outcomes and learning motivation in the learning process, there was a significant difference between the control group and the experimental group. The experimental group was significantly higher in learning motivation compared to learning outcomes in the control group. From observations and interviews, it was found that students were more active in learning activities and students were eager to take part in learning. This proves that students are interested in this media which can generate learning motivation

III. RESEARCH METHODS

The research is focused on several stages of research steps in the development of interactive multimedia application development of animal

recognition for kindergarten children based on Augmented Reality. The following stages of research used in this study are depicted in Figure 1.

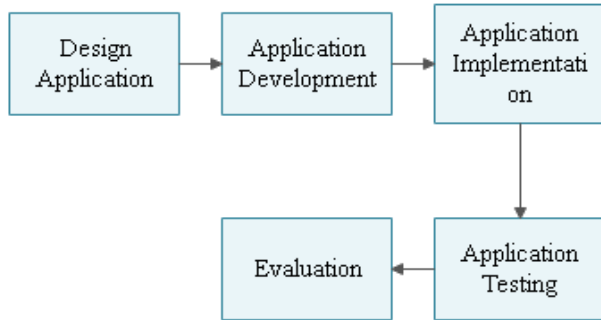


Fig 1. Application Research Stages

3.1 System Design

In his book, Jogiyanto, 1991 states that the analysis and design of systems, as well as system design can be described as follows:

- Stages after the analysis of the system development cycle.
- The stage of defining the functional requirements.
- The preparation stage for design and implementation.
- Stages of describing how a system is formed.
- The next stage is in the form of drawing plans and making sketches or arrangements of several separate elements into a unified whole and functioning.
- The configuration stage where this includes matters related to the configuration of the hardware components of a system.

System design concerns the process of running the program (flowchart).

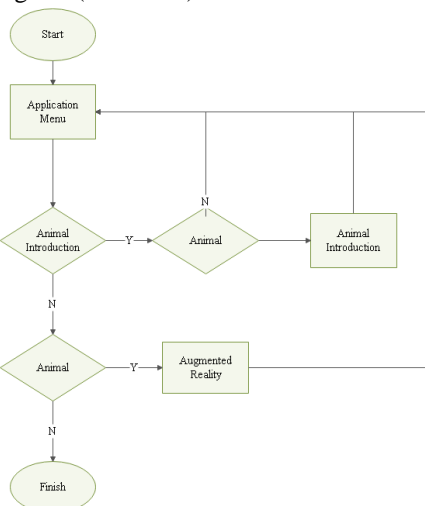


Fig 2. Game Flowchart

When running the application designed, the user will be guided to play animal using augmented

reality. After selecting the game to be played. The user will move from the menu page to the camera. After the camera is open, the user just needs to find an object that matches the problem. Objects (animals) will appear (spawn) with random coordinates so the user must direct the camera to find answers that match the questions.

The user only has 3 chances to answer the question incorrectly. If all three opportunities have been exhausted then the game is over. In the game, another object (time) has also been provided which serves to provide additional time for the user to answer questions.

3.2 Application Development

In making applications that can introduce animals to kindergarten children. It is carried out using a combination of technologies, including the Android Operating System, Unity 3D Engine software, and Vuforia. The combination of these three technologies is used in making learning applications which are divided into two introductions, namely animal recognition. In matching the shape of the character, students will be introduced to the latest technology, namely Augmented Reality. By utilizing this technology. Students will be able to play well and can stimulate their nervous system. Because students have to find their own letters/numbers and the type of animal they are looking for.

4 System Implementation

As the implementation of the system that was carried out after making this application, the application of software was carried out in kindergarten.

5 System Test

At this stage, making applications that can introduce water and land animals to kindergarten children is testing the results of the application, namely by conducting questionnaires before using the application (pre-test) and after using the application (post-test).

6 System Evaluation

At this stage, an assessment of the system test results obtained from the pre-test and post-test questionnaires is conducted to determine the level of usefulness and success of the implemented system.

IV. SYSTEM DESIGN

The results achieved in this study are the creation of applications for learning media that can introduce water and land animals to kindergarten children.



Fig 3. Splash Screen

Figure 3 shows the appearance of the Splash Screen which is themed according to the application made. Namely merging images of small children with several animals playing together.



Fig 4. Main Menu in Applications

Figure 4 shows the appearance of the game on the application that was created. Deliberately given a cute icon to foster students' interest in playing and learning. There is a main menu and a sub menu of the application created. Where on the main menu looks a menu to explain how to play. After understanding the user is directed to the next menu.. The first menu is level 1, which is an introduction menu that is packaged in a different view with a 3D model that can be moved. While the second and third menus are at levels 2 and 3, when the user selects the menu, the application will direct the user to play using Augmented Reality technology as shown in Figure 5.



Fig 5. Animal Introduction Menu



Fig 6. 3D View of Water Animal Recognition

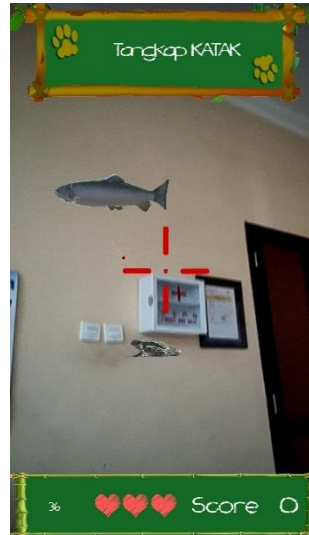


Fig 7. Game Display

Figure 7. shows the appearance of the application/game by directing the target (crosshair) towards the animal that appears. The player must direct according to the questions given. After the answer is found, shoot the animal by pressing the cellphone screen.

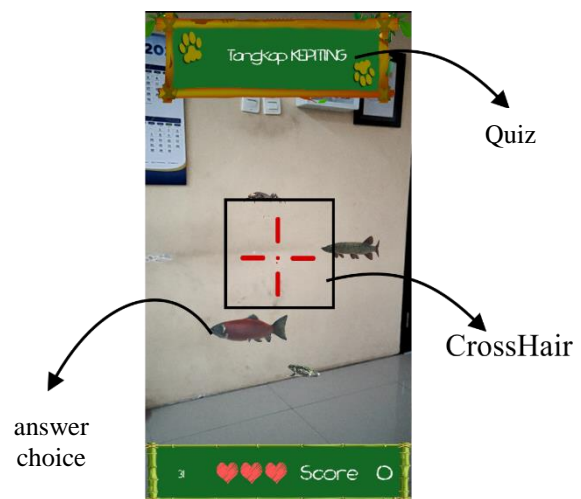


Fig 8. Question icon, target (crosshair) and answer choice display

The game ends when the player's life runs out. Lives will be reduced if the player answers the question incorrectly. So that the player only has 3

chances of failing to answer the question. As seen in Figure 8.

V. PERFORMANCE EVALUATION

In the As a result of testing and evaluating the system, it is carried out through the provision of questionnaires using applications that have been made, namely applications that can introduce animals to children. As a result of testing and evaluating the system, it is carried out through the provision of questionnaires using applications that have been made, namely applications that can introduce the animals to children. At the testing stage of the application that has been made, questionnaires are distributed to thirty students by giving questionnaires before using the application (pre-test) and after using the application (post-test). From several questions that were asked during the pre-test and post-test, the following results were obtained:

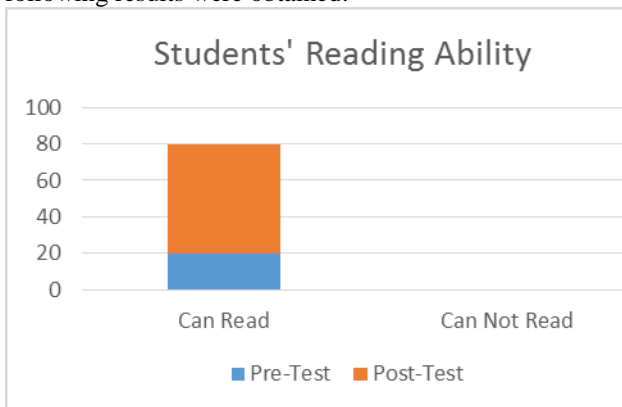


Fig 9. Students' Reading Ability During Pre-test and Post-Test

Based on Figure 9, it can be seen that before and after using the application as a student learning medium for kindergarten age children, there was an increase in the percentage of students who could read by 7% from the pre-test results of 83%. and 90% post-test results. After using the animal recognition application, there was an increase in students' reading interest using this application by 87%. This is based on the results of a questionnaire submitted to students, where the learning process and learning to read using the application can increase their reading interest as shown in Figure 10.

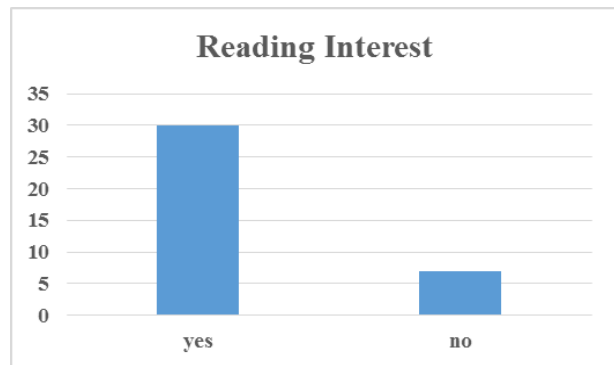


Fig 10. Animal Recognition Application to Increase Reading Interest

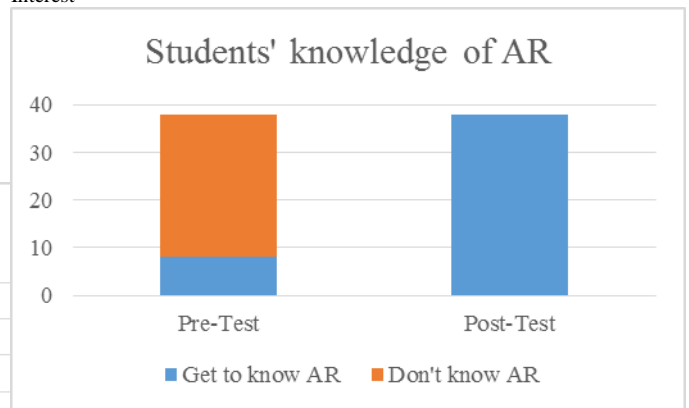


Fig 11. Student Knowledge About AR

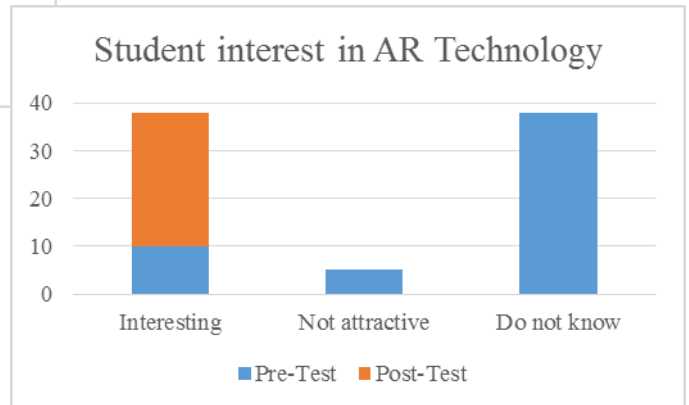


Fig 12. Student Interest in AR Technology

Based on Figure 11 and Figure 12, it can be observed that before and after using the application as a student learning medium for kindergarten age children, most of the pre-school students did not know about AR (Augmented Reality) technology. The results obtained show an increase in the percentage of AR technology introduction in kindergarten students and this increase also increases student interest in AR (Augmented Reality) technology.

The result of increasing the percentage of AR technology introduction can be calculated by 73% of the pre-test results of only 23% who are familiar with

AR technology and 100% post-test results which indicate that students are familiar with AR technology. After using the animal recognition application, there was an increase in students' interest in AR technology, almost 90% of which the majority of kindergarten age students were interested in animal recognition applications using AR technology.

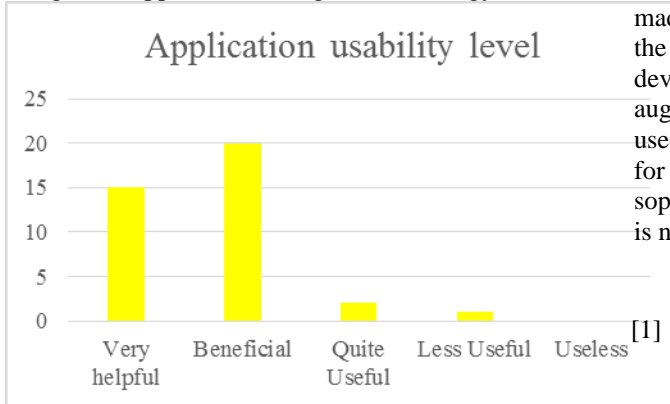


Figure 13. Application usability level

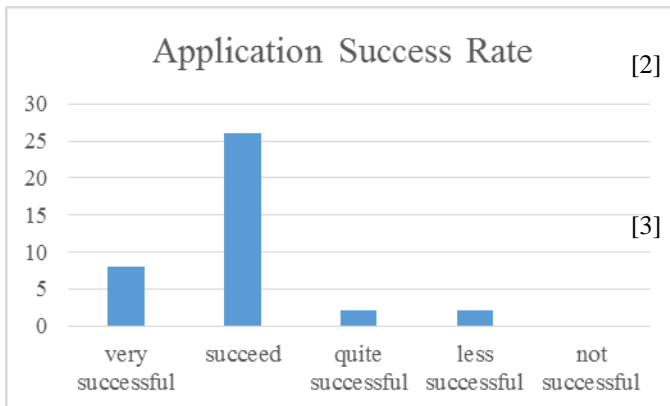


Figure 14. Application Success Rate

From the results of the questionnaire given, from Figure 12, the percentage of usefulness of animal recognition applications states that 37% is very useful, 50% is useful, 3% is quite useful, and 7% is less useful.

As for the results of the application testing given through the questionnaire, the percentage of success rate of animal recognition applications was 27% very successful, 60% successful, 7% quite successful, and 7% less successful. From the results above, it can be explained that the animal recognition application is very useful in increasing students' reading interest and the application is successful in introducing AR technology to preschool age students..

VI. CONCLUSION

Based on the results and discussions that have been described, it can be concluded that the application for learning media using AR technology is useful in increasing interest in reading and learning

for preschool age students and is successful in introducing AR technology through learning media where in the process of introducing AR using an Android phone as an option. teaching media for students. This is seen from the results obtained in increasing the percentage of AR technology introduction by 73%. Applications that have been made, in the future will still be further developed with the addition of more interesting features. Another development using ARCORE technology is an augmented reality platform from Google that can be used for further learning media. Because it is natural for learning media to take advantage of technological sophistication. Moreover, the use of Android phones is no stranger to all circles of society.

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