Application of Augmented Reality-Based Solar System Recognition Using Metaverse Studio

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Abstract
Learning media is currently developing with various innovations, especially in utilizing information technology. One of the technologies used for the learning process is Augmented Reality (AR). The purpose of the research is to provide alternative learning media using information technology, especially focusing on the use of AR. The learning that will be developed in this case is learning aimed at children to introduce learning about the solar system using interactive AR. The content of the learning media developed includes several things, namely learning the solar system and quizzes to test children's knowledge about the solar system. The research method used in developing learning media uses the Research and Development (R&D) method. The application development process can be done by adding features. The results of this study produce an AR-based application that describes learning the solar system in 2D/3D form and is equipped with a quiz to train children's knowledge.

Keywords: Planets, Solar System, Augmented Reality.

1   Introduction

Learning media is currently developing with various innovations, especially in utilizing information technology. One of the learning media that can be used is Augmented Reality (AR). AR is a technology that combines computer-generated 2D/3D with a real environment [1-2]. AR is different from Virtual Reality (VR). VR is a technology that can describe real technology that is simulated by a computer, while AR only adds or completes applications with 2D/3D [3]. According to Setiawan AR is very supportive as a learning medium, because AR applications can improve understanding of learning materials. Learning media using AR is more effective than using books, videos and other media [4].

Research conducted by Fendi [5] developed an AR application to support learning basic chemistry courses. The use of AR is used to describe atoms, molecules, chemical

bonds, the periodic system and some other materials in 2D/3D form. The benefits of using AR can motivate students in learning basic chemistry. This is because students can interact with the developed application.

Research conducted by Rianto has developed an AR application to introduce traditional musical instruments, especially Lampung traditional musical instruments [6].

The AR research used in addition to the learning model was carried out by Dwi. In his research, he developed an AR application for building recognition. The usefulness of this application can be to introduce students to introducing building information on campus [7].

Research conducted by Alifah developed an AR application about the Tapis Fabric Textile Museum. This application is used to provide information about the collection of tapis cloth which is one of Lampung's cultures [8].

Research conducted by Ilhami Arsyah developed an AR application for a 3D house model. This application is used to help buyers find information on houses to be purchased and make it easier for home sellers as a promotional medium to consumers [9].

AR application research developed by Christian, the results of research conducted to create an AR-based learning media to introduce rare animals in Indonesia (Christian O et al., n.d.). Research conducted by Ramadhan develops AR applications to introduce computer hardware. This application is used to help students study TKJ BLK majors. [10] .

Research conducted by Avief Barkah & Agustina designed interactive learning media using AR technology for the introduction of temples in the Malang area [11]. Another research that uses Augmented Reality for learning media is researched by [12-17).

AR applications can be used as an alternative learning media to introduce the planets in the solar system to children. Applications built using AR technology that are simulated in 2D/3D forms can provide information to children about the planets in the solar system. Learning media packaged using AR technology can provide knowledge to children on the material being taught. The use of AR technology makes the material more

interesting because it is packaged in 2D/3D form. Planetary Augmented Reality app developed using Studio.Gometa.io.

The use of the Gometa application in the development of Augmented Reality as a learning medium has been carried out by Lestari [18] and Andika [19]. The research conducted by Lestari discussed the introduction of medicinal plant learning media and Andika's research explored the introduction of animals.

Based on the introduction and the literature that has been described in the introductory section above, in this study developing learning media applications that use information technology, especially focusing on the use of AR. The learning that will be developed in this case is learning aimed at children to introduce an interactive AR-based solar ssystem.

The content of the learning media developed includes several things, namely learning the solar system and quizzes to test children's knowledge about the solar system. The application was developed using the Gometa online application to display objects in 2D/3D form. AR applications developed with Studio.Gometa.io can be seen using the Metaverse Studio application on smartphones.

2   Research Methodology

During the research, researchers must consider and determine which method is appropriate for their research so that the chosen method synergizes with the problem being studied [20]. Researchers can use and choose from various research methods, including qualitative methods, quantitative methods, mixed methods, and research and development methods. In this study, using the Research and Development (R&D) method. R&D is a research method used to make certain products and test the effectiveness of these products [21]. The R&D method is a development method that is suitable for research that aims to find products/find something new/something new and develop products that have been found [22].

The research process is carried out with the R&D stage. The stages of the R&D method are better known as ADDIE. The research stages are shown in Fig. 1. Fig. 1 is a diagram of the development model used in the research process.
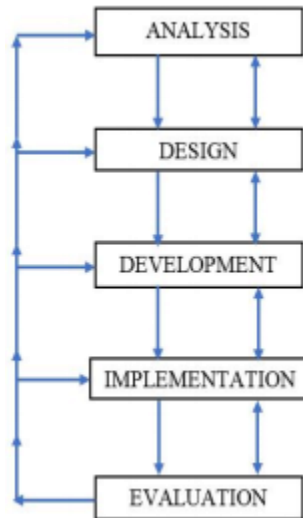
Figure 1. ADDIE Stages in the R&D method

This research will produce an AR application that describes the planets in the solar system in 2D/3D form developed using the Gometa application. Fig. 2 display
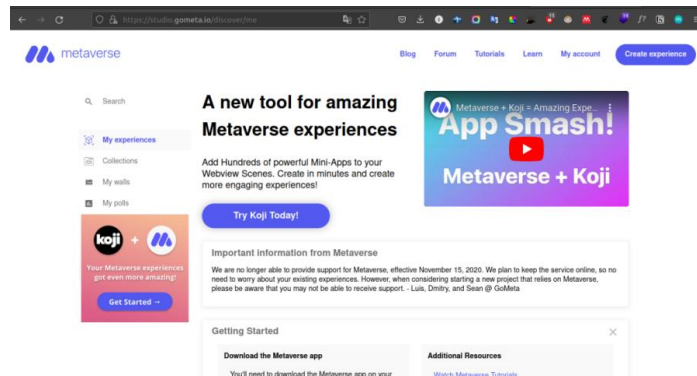
Figure 2. The front page of the Metaverse website with the link

https://studio.gometa.io/

The results of the development of the Augmented Reality application using studio.gometa.io can be seen using the Metaverse application. Metaverse application is an android-based application. Fig. 3 Metaverse application display on android.
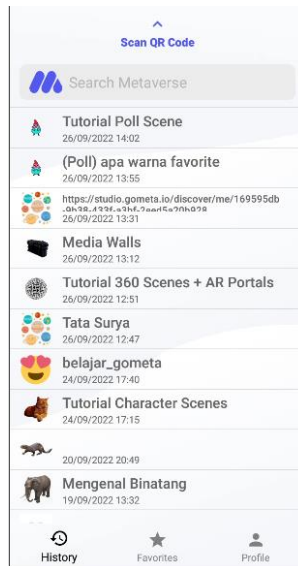

Figure 3. The front page of the Metaverse application on android

# 3   Results and Discussions

Linking Scene

The initial process of making the application begins with making information about the solar system in the form of a scene. Scenes that have been created will be assembled into one interconnected unit. The step to connect a scene with another scene is to select a button that contains a menu and is related or connected to another scene. Fig. 4, an example of a related scene.

Figure 4. Connecting Scenes with other scenes

Handling text input from the user

The developed application is also equipped with a scene containing a list of questions/quizzes. Before answering the question, the user must enter the name data. The process of designing input from the user uses the command / block save text feature. The process of using the save text block feature is shown in Fig. 5.
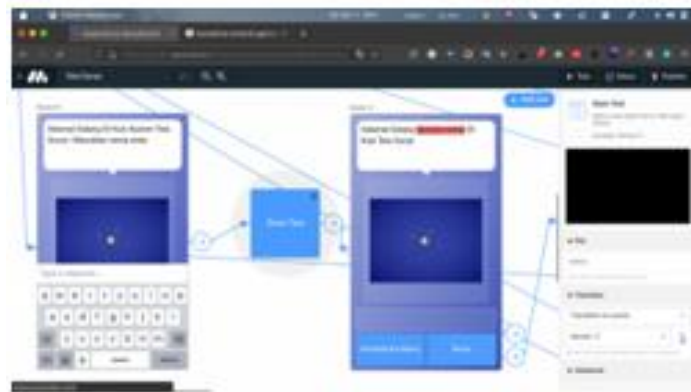

Figure 5. Handling text input

Handling text input from the user is by adding a block save text feature by connecting the display scene with the keyboard with the usual scene. In Fig. 5 above, between the 2 scenes, there is a save text block to retrieve the name data in scene 10 then it is stored with the name key in the save text block and the data is retrieved in scene 11 with the ${props.nama} command.

Creating a Quiz Scene

The purpose of the quiz scene is for users not only to study the solar system but also to work on questions to determine the extent of the child's ability to understand the material of the solar system. The process of making the scene is in Fig. 6.
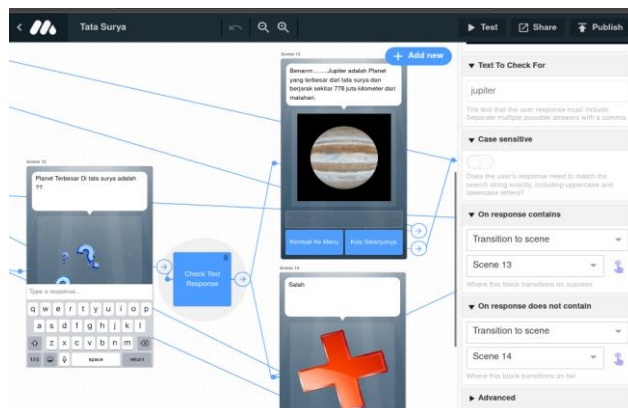

Figure 6. Handling the quiz scene

Augmented Reality Application Results at studio.gometa.id

The solar system application design is designed and packaged in scenes. Scene contains data about the planets and each scene will be connected to each other to form a unified solar system application. An example of the front page of an application developed in the form of a scene is presented in Fig. 7.

**Figure 7.** The design of one of the scenes of the solar system

There are 16 scenes developed. Each scene is assembled into a single unit so that users can use the application and learn various information about the solar system. The overall design of the planetary AR application in the form of a series of scenes is shown in Fig. 8.
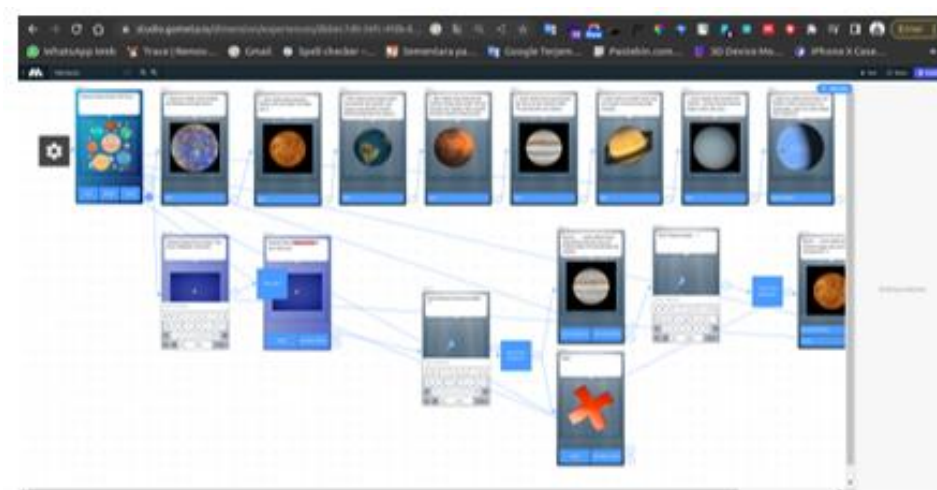
Figure 8. Overall Design of Planetary AR Application on Gometa

Planet App Publication

The process so that the Augmented Reality application developed can be accessed by users by first doing the publishing process. The results of the publishing process are in Fig. 9.
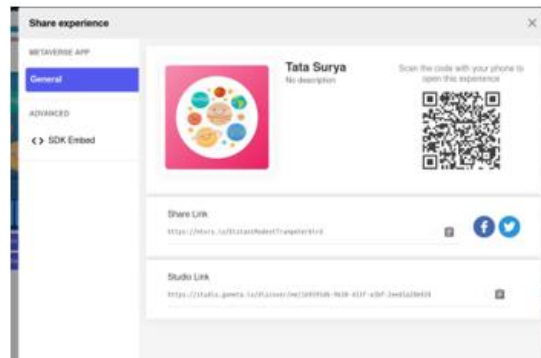

Figure 9. Planet Application Publish Page on Gometa

Once published, users can run the solar system application by first running the Metaverse application and directing the scanner to the published barcode. Fig. 10, the barcode that users can use to run the application and Fig. 11 the barcode scanning process in the Metaverse application to the Gometa website
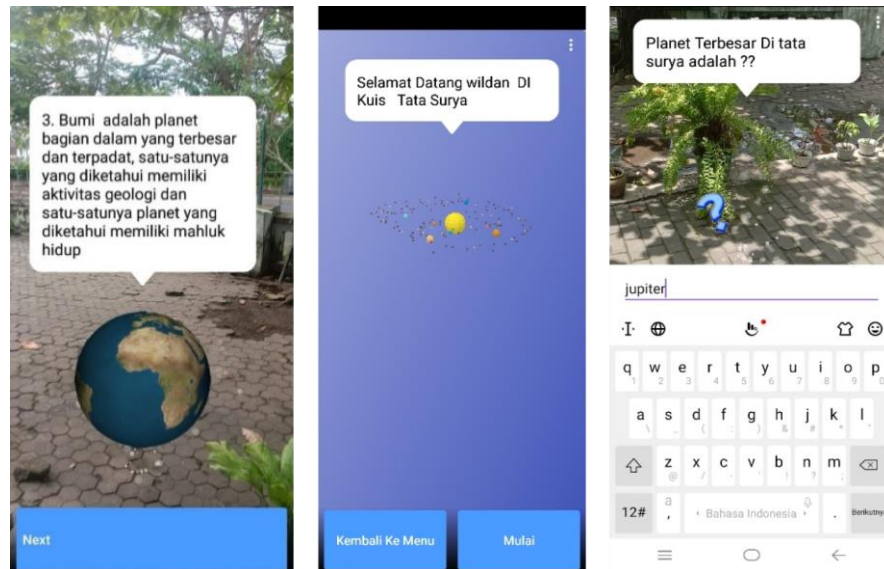

Figure 10. Solar system application barcode
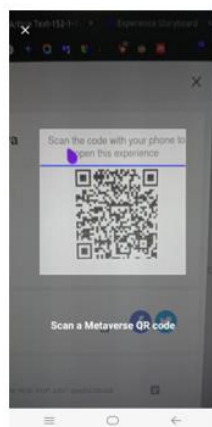
Figure 11. The barcode scanning process in the Metaverse application

The results of the scanning process, users can see the appearance of the solar system application in 2D/3D in Fig. 12.

Figure 12. Solar system AR results and sample quiz when scanned

4   Conclusions

Augmented Reality-based introduction to the solar system can be an alternative learning media. The use of AR is expected to make it easier for children in the learning process, especially the material to recognize and understand the planets in the solar system. The solar system augmented reality application was developed using the Gometa application. The development process is distinguished in the form of interconnected scenes and to see the results of the developed application, it can be seen using the Metaverse application on the smartphone.

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