Educational Media Introduction To Human Internal And External Organs For High School Students Based On Augmented Reality By Using The Assemblr Application

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Abstract

The development of information technology from year to year always experiences very rapid development, and one of the positive impacts of this development is the existence of innovation in the field of education. Education today already uses information technology, especially augmented reality (AR). The purpose of this study is to help high school students in getting to know human internal and external organs through 2D or 3D virtual objects projected against the real world. The features in the educational media for the introduction of human internal and external organs are learning materials, quizzes, and games to hone students' knowledge. The research method used is research and development (R&D). This research will produce AR applications that discuss human internal and external organs, in addition to the features that will be produced, namely learning materials, quizzes, and games. With these 3 features, it is hoped that high school students will understand the material about human internal and external organs. AR-based learning media is developed using the Assemblr application.

Keywords: anatomy, cranium, 3D slicer, smoothing module

1 Introduction

The world today has entered the era of the 4.0 generation industrial revolution which is characterized by increasing connectivity, interaction, and development of digital systems, artificial intelligence, and virtual [1]. This development also has an impact on various sectors of life, such as the economy, culture, politics, health, and education is no exception. In the field of education in the era of society 4.0 students in the learning process can directly face or interact with the visualization of 2D and 3D objects. AR is a technology that combines 2-dimensional and 3-dimensional computer-made objects into the real environment around the user in real-time [2] so that users feel virtual objects are around their environment. AR is a new way, where humans can interact with computers because it can bring virtual objects to the user's environment, then provide a real visualization experience [3]. AR accessibility in students is very open, this is evidenced by research that shows that 98% of smartphone owners are among the millennial generation, namely 18-24 years old [4].

With the accessibility of AR that is open among students, the development of AR-based learning media can be carried out. The research has been carried out by several researchers, including research on organ system learning media that uses AR has been developed with various software in the development process. Lestari's research develops android-based AR learning media in a simulation of human respiratory organ recognition which aims to help students in studying respiratory organs in detail [5]. Similar research was also conducted by [6], and Fuad using the marker base tracking method [7]. Saputra's research, in this study, developed AR learning media in introducing the human digestive system using the single marker system method whose purpose of this study is to increase and deepen students' knowledge of human digestive system material [8]. A similar study was also conducted by [9]. Aripin's research develops biology learning media, namely about the nervous system using AR

technology which aims to deepen students' understanding of the concept of biology learning which has abstract properties [10]. Syariffudin's research discusses the development of AR applications used as a learning medium for human organs in elementary school students, the purpose of this study is to support conventional learning that is applied [11]. The same research was also conducted by Fitriani who discussed the development of AR-based learning media regarding the introduction of organs in the human body [12]. Astiti's research, explores the application of dynamic video AR in android-based circulatory learning, with the hope that it can help teachers in delivering material, especially regarding blood circulation, and attract students to learn and understand the material [13].

From the research that has been carried out, AR is used in the development of learning media for the introduction of human internal and external organs. The process of developing AR-based learning media can be developed with various software, one of which is Assemblr. Assemblr is a software that can work using 2D and 3D visualizations, in addition to existing features including animation, video, music, and text, so it supports student-friendly learning. The use of Assemblr application has been used by Sugiarto in research on the development of learning media regarding the concept of blood circulation [14].

The introduction of human internal and external organs using AR is a means that can provide an overview to high school students about the function of the parts of human internal and external organs so that it can increase student focus and interest in learning, help students understand the material, while also making the learning atmosphere more interactive and fun. The results of the development of AR-based learning media display visualizations of images of human internal and external organs, in addition to that there are also quizzes and games to deepen students' understanding.

2   Research Methodology

From the various methods that exist in conducting research, it is selectively selected by researchers according to the theme of the title raised. One of the successes of researchers in conducting research is determined by the selection of the right research method [15]. The Research and Development (R&D) research method is a method used to produce a particular product, and test the effectiveness of that product. To be able to produce certain products, research that an analyst is used [16]. There are several models of R&D research methods, namely the define, design, develop and disseminate (4-D) model, analysis model, design, development, implementation, and evaluation (ADDIE), the Plomp model, the Borg and Gall models [17]. In this study, researchers used the R&D method with the ADDIE model. The stages of the ADDIE model can be seen in Fig. 1.
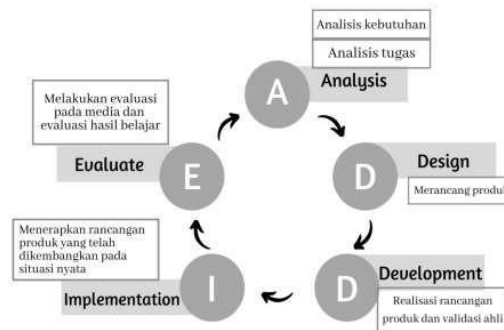
Figure 1. ADDIE Model Stages

This research will produce AR-based human internal and external organ learning media using Assemblr as a development medium. Assemblr is a website-based application with a www.assemblr.com page. Fig. 2,   Assemblr front page view.
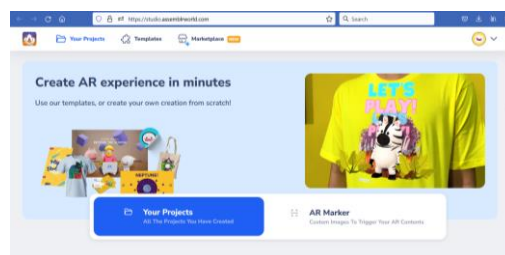

Figure 2. Assemblr website appearance

3 Results and Discussions

Linking a scene

Scenes are used to describe a learning activity packaged in the form of AR. Each learning material is packaged in a different scene and between scenes is connected using the switch scene feature through 3d objects as shown in Fig. 3.

Figure 3. Use of the scene switch feature

Annotate

Each 3D object used in the learning process will be added annotated or notes as information of the usefulness in the designated section. Annotation is intended to provide labels in which there is additional information about the 3d object displayed. Annotation can be seen in Fig. 4.

Figure 4. Annotation

Change the objects that appear in a single scene

Changing objects that appear in one scene can be done using the move, show, and hide features at the same time. Move function to move objects, the show is used to display objects, and hide is used to hide the previous object to show the next object so that it does not occur buildup. Changing the object that appears using the next button to display the next object and the previous one to display the previous object, can be seen in Fig. 5.
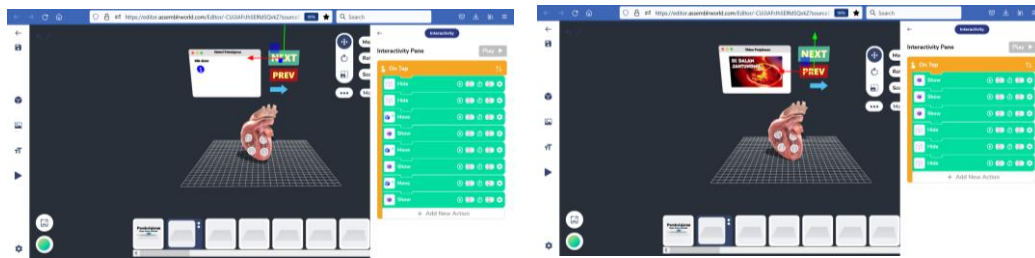
Figure 5. Object display with next button and previous button

Create a material scene

One of the steps in creating a material scene is to add videos and learning materials. The addition of this learning video is carried out aimed at complementing the material learned by the students. Some additional material uses links from existing material on YouTube, such as https://youtu.be/F2hqR2iqhF8, https://youtu.be/QiElDzKuDzo. Fig. 6, the use of material on YouTube as a supplement to the material.
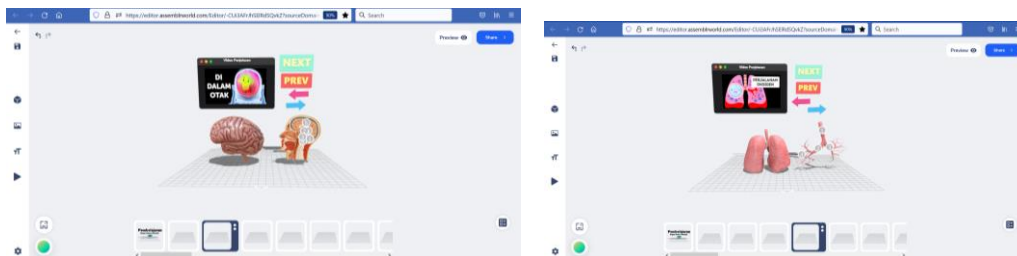
Figure 6. Addition of learning materials from Youtube

Video learning that lain among others sourced from links including https://youtu.be/vGRIcRuGgcM, https://youtu.be/Znw6CfnsaMI, https://youtu.be/9ZOnqAIQSsw, https://youtu.be/g9LvjUavRMg, https://youtu.be/1VaD8rLh5vk, https://youtu.be/zyptq2nYjDo, https://youtu.be/2MsbUulBpzY, https://youtu.be/HlGjKCHV9SY . Fig. 7 the use of material from Youtube sources.
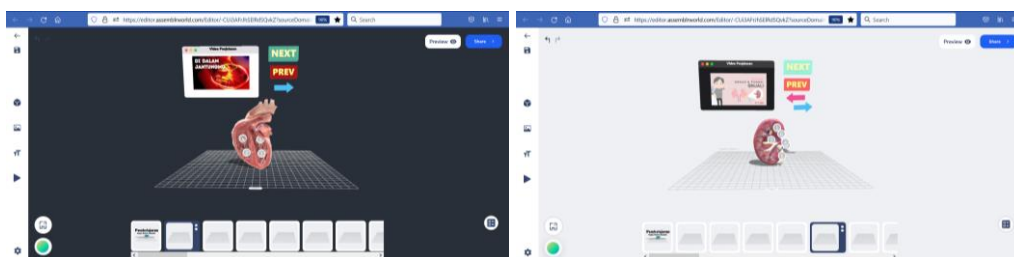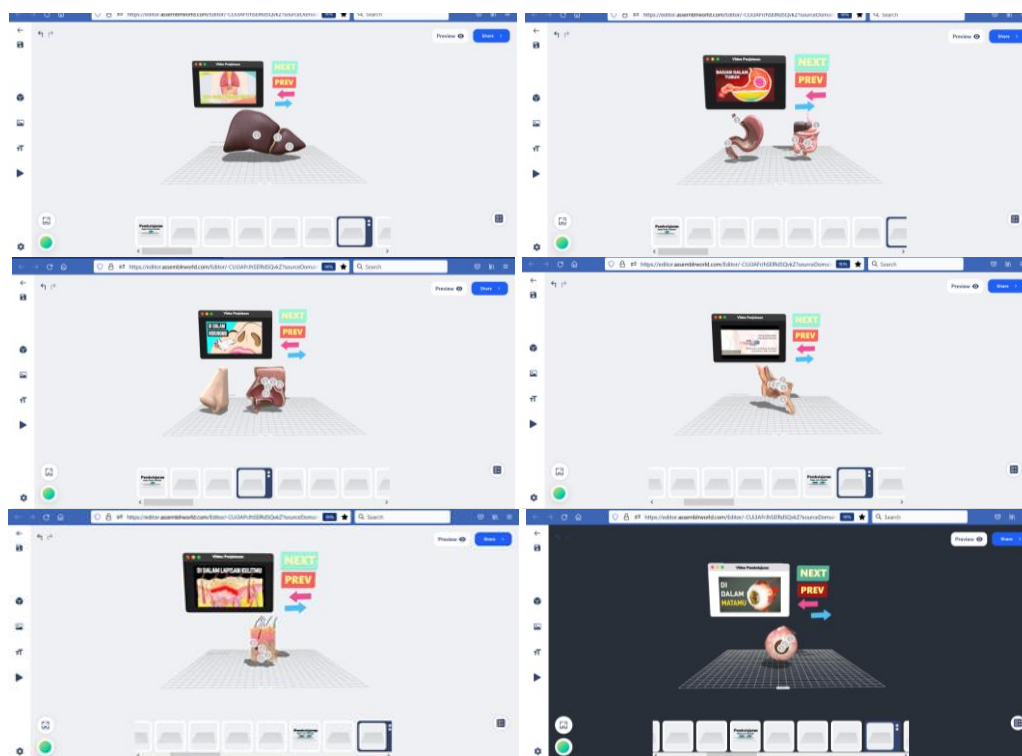
Figure 7. Addition of material from Youtube sources

Learning materials for human organs, in addition to using material taken on Youtube, are also equipped with learning book materials including biology students from high school grade 11 by Nunung Nurhayati and Resty Wijayanti. Fig. 8, learning material information taken from biology book material.
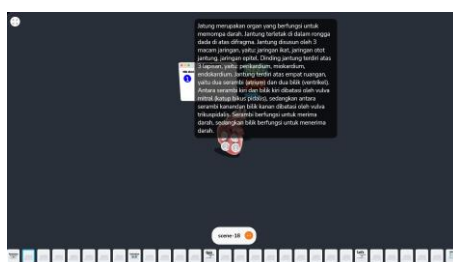

Figure 8. Learning materials in the form of text

Create a quiz scene

The developed learning media is complemented by quizzes. This quiz can be used by students to test their comprehension of the material being studied. Creating a scene quiz using the switch scene feature, so when the user answers right or wrong, it

will be directed to a certain scene. An example of the display of this scene can be seen in Fig. 9.
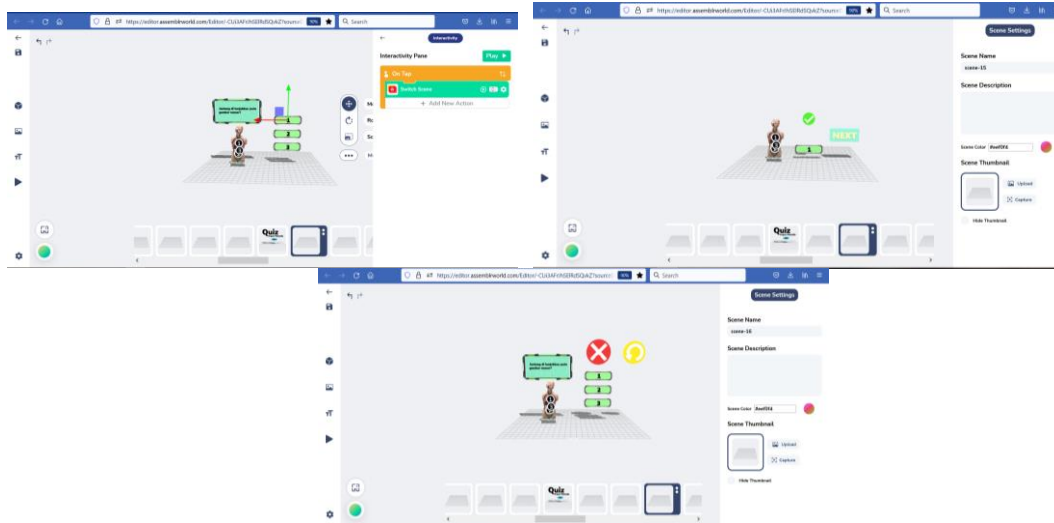

Figure 9. Scene quiz display

Create scene games

This scene uses the move, show, and switch scene features, which were previously explained. This game scene works by retrieving many objects according to the command by clicking on one of the objects then the object will move, but if the object is taken it is not accordingly, it will move to the scene that has been determined. The game scene is shown in Fig. 10.

Figure 10. Scene games

Publish applications of human internal and external organs

The way to publish is by clicking the publish button and then filling in the title, image and video preview, description, sharing settings, and categories such as Fig. 11
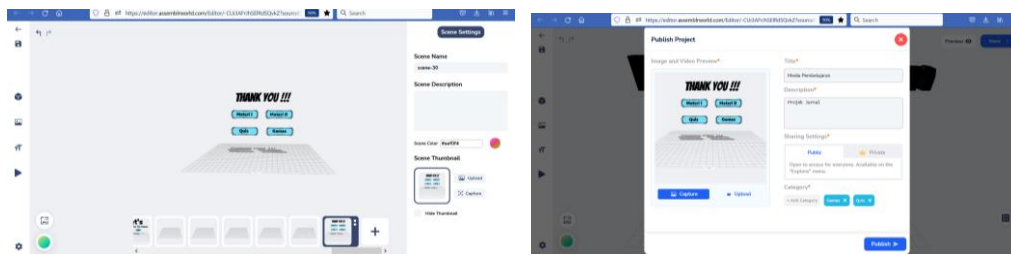
Figure 11. The process of publishing an AR-based application in Assemblr

Access to published apps

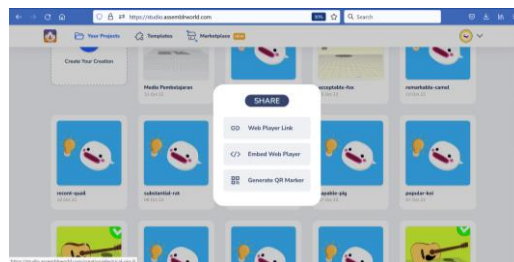In accessing AR-based applications that have been published, there are 3 ways such as Fig. 12 .

Figure 12. How to access published AR-based applications

Access using a web player link

The application is carried out using a browser by using the http://asblr.com/TGb9f link, Fig. 13 , the front page view of the application, and Fig. 14 , the display of the developed application.

Figure 13. Web Player Link: http://asblr.com/TGb9f
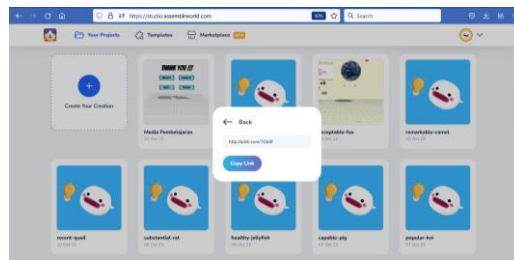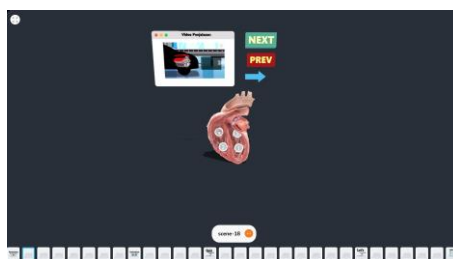

Figure 14. AR-Based Application Display

Access by generating QR markers

Another way to access AR-based applications is to generate QR markers. This process is carried out by scanning the QR marker made through the Asemblr application. Fig. 15 , a QR marker that can be used to run applications, and Fig. 16, a scan process on a smartphone.
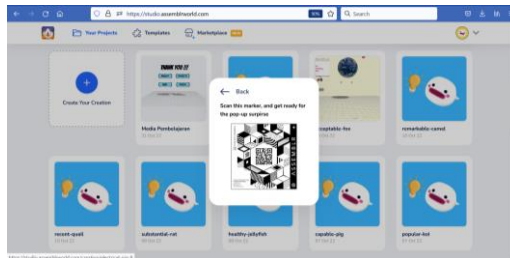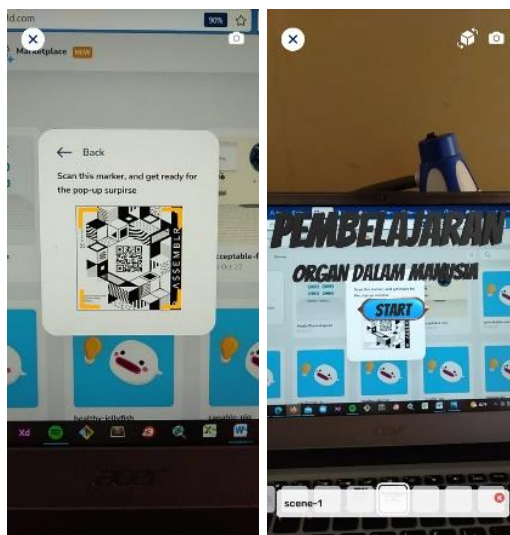

Figure 15. Generate QR marker

Figure 16. QR marker scan process and results after QR scan

4   Conclusions

The development of AR-based learning media is expected to help high school students to deepen their understanding of material regarding human internal and external organs, besides, that it is also expected to change the classroom atmosphere to be more interactive. AR-based learning media is developed using the *Assemblr* application.

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