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Development of Augmented Reality in Biotechnology processes as a Supporting Media for Science Learning Modules in Elementary Schools

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Abstract. Learning media is an important aspect of the teaching and learning process. This can be seen if, in enjoyable learning, it will generate student learning enthusiasm, and vice versa. If students can grow their enthusiasm for learning, in order to be creative, innovative and active students will increase. Biotechnology material is one of the high grade material in elementary school. So that requires a special behavior in learning. Augmented reality is considered as an appropriate supporting media in the learning module in elementary school. This is considering that Augmented Reality is a program that is able to call a database in the form of 3D animation that facilitates and helps students in the learning process. The content contained in Augmented Reality is an abstract and real modification in a biotechnology process. The outcome of the development of supporting media is an application that is able to call for data code optimization into instructions in biotechnology material.

1. Introduction

The role of instructional media in a teaching and learning activity is one of the vital things. Learning media has a great contribution in achieving a learning goal. Not infrequently the learning objectives are not achieved due to the learning media used are not interesting. Not to mention added to the learning content that is difficult for students to imagine.

One of the difficult learning content in elementary schools is biotechnology. In this content a lot of students who have difficulty in understanding the content. Given the biotechnology content is an important content in the delivery of technological engineering developments in plants and plants that are often the goal of achieving the needs of humans. The process of biotechnology is felt to be very necessary in the development of the times at this time. A long process can be accelerated or shortened the time needed through the biotechnology process.

In learning in elementary schools, this biotechnology material provides information about a technological development that is able to shorten a process. Where this material is also able to provide insight that there is a method that can be done in such a way. However, this learning cannot be carried out properly if it is delivered without using appropriate supporting media. The role of supporting media in a learning like this is needed to help the achievement of learning objectives. Given the learning of biotechnology is difficult to imagine by students. Learning media are needed how to provide real biotechnology information so that it is easily understood by students.

Augmented reality is an application based on Android programming that provides information in 3 dimensions. Augmented reality is already used and applied in game media in an Android system-based programming application. This media system that is giving the object an image so that it looks into 3 dimensions through the user's gadget or smartphone. The development of this technology, is felt to be



helping in the development of a learning support media on biotechnology materials that are felt to be unable to be delivered optimally in class learning.

Based on the description above, it can be drawn a main idea that is needed a development of supporting media that can make learning biotechnology in learning in primary schools can be implemented optimally. Thus the emergence of the research idea "Development of Augmented Reality in the Biotechnology Process as a Supporting Media for Science Learning Modules in Elementary Schools".

2. Methods

This research is a preliminary study of all research sequences contained in our research roadmap. This research is based on literature study research. This study aims to compare previous studies so as to be able to strengthen and support the existence of further research programs from the research "Development of Augmented Reality in the Biotechnology Process as a Supporting Media for Science Learning Modules in Elementary Schools".

The stages of this research are supporting steps to continue further research in order to get good and valid consideration. When this is achieved, it will be continued with the development of learning modules based on augmented reality that are in accordance with the standards of achievement in education in primary schools.

3. Discussion

3.1. *Augmented reality as a learning medium*

In the 20th century, technology created several interactions between computers and their users. Some of these interactions create major interrelated roles. Computer creates convenience for its users. An important role of a computer is to make its users work effectively and efficiently. The development of this computer also gives rise to the visualization of objects. This visualization can be a visualization of dead and living objects.

Augmented reality is a 3 dimensional visualization program of objects. This augmented reality has grown over the last 5 years in Indonesia. But in its development, it is still rare in the world of education to use it as a learning medium. Augmented reality is one part of virtual reality [1]. This augmented reality develops a live user interaction. This augmented reality features an app that runs in real time. Users feel like the app is carrying itself. Some augmented reality applications create real-time, 3-dimensional objects that are real-time.

Augmented reality aims to make it easier for users to visualize objects in real time. In addition, augmented reality produces a combination of technology and real world [2]. Creating augmented reality applications can be done in a number of ways. The tools for creating Augmented Reality through AR-based marker methods include Tracking marker, Vuforia SDK, 3D unity, Sketch Up, and android.

The creation of augmented reality applications was originally based on the needs of a game. But some researchers are innovating in the use of augmented reality. Augmented reality can be used to support learning. Augmented reality applications can increase the attractiveness of the learning process [3]. Augmented reality is capable of giving its own impression of the material presented. This augmented reality also provides some help. Such aids are able to link information that existed in ancient times, such as dinosaurs [4]. These dinosaurs have been extinct for thousands and even millions of years. Using augmented reality is able to capture visualizations of objects that are not or are not even seen to be visualized according to the researchers' perception of the animal.

The use of augmented reality can be seen from some previous research. Tonny Hidayat is innovating the application of augmented reality to children's dental health education toys. In the study, tonny stated that augmented reality can provide learners convenience. These facilities are easy to accept, easy to convey and easy to attract learners to learn [5]. Other researchers also point out that a learning activity when supported by multimedia creates an optimal learning goal. This is also conveyed by Wellia, she points out that the Augmented Reality app can be combined with a learning model. These combinations are applied to the senses resulting in an easier level of understanding of learners [6].

3.2. *Learning Biotechnology in elementary schools*

Biotechnology is a branch of science that studies the modification of a network of organisms to meet human needs [7]. Biotechnology in broad definition is a science with a high degree of disciplinary

discipline. This can be proven by the combination of biology, microbiology, genetics, chemistry, biochemistry and technology that combines tissue, cells, protoplasm and so on [8]. Based on the description above, a definition can be drawn that biotechnology is a science that combines technology with the composition / tissue of plants to meet the needs of humans.

In learning in elementary schools, biotechnology can be included in the material in grade 4. The content of material in biotechnology in elementary schools is one of the efforts to preserve natural resources together with the people in their environment. Basically, biotechnology applies technology modification to support human welfare. Biotechnology material contained in elementary schools if delivered with the delivery of theory will confuse students. Therefore many teachers / instructors who deliver this material use learning media. The level of understanding for children in grade 4 primary school still has limitations about information outside the material.

3.3. Development of Augmented reality as a supporting medium for learning biotechnology in elementary schools

Biotechnology learning materials in elementary schools often use images, audio and video learning media. This is seen to result in an increase in the level of student interest in teaching and learning activities in the classroom. However, researchers still consider learning media innovations that can be used in this learning process. This innovation hopes to be able to provide broad knowledge about the use of technology to support human welfare itself.

We can present this biotechnology material in a virtual form that makes a combination of technology and material. We can develop this combination using Augmented reality. This is supported by previous researchers using a combination of material in the school domain. Lia Kamelia uses augmented reality as a learning medium in basic chemistry courses. The results of this study provide a good impact in the form of recall understanding, provide realistic interactions to understand a theoretical concept, and be able to motivate users to be more active [9].

The learning process always gets the support of learning media that is trending with developing technology. the use of media in line with technological developments is able to provide optimal information to its users. This was also done by Rujianto in the development of learning media to recognize human digestive organs using the technology of Augmented Reality [10]. Rujianto got satisfying results in the learning process that was carried out. Learning is not monotonous and the learning media provides motivation for students to understand the material.

Researchers in the world of Education pack a lot of everything that is difficult to be associated with a technological development. This is very helpful in delivering difficult material. Many large Education professionals develop large learning media whose ultimate goal is to help motivate and enrich students' knowledge [11]. Education Professional packs a number of learning media products attached to paper so as to create an interactive and fun learning environment.

Biotechnology learning is one of the learning content that is difficult for students to absorb. not only at elementary school, but at the university level like that. Learning bio-technology requires an innovation in terms of packaging the content and learning media. In this study, it was emphasized that the biotechnology learning media for elementary schools is packed with augmented reality.

This learning media has a tendency that makes it easier for students to understand the content of the material presented. The material used in the development of augmented reality learning media there are 5 topics namely cassava, cacao, coffee, corn and rice. The content of the material is based on the Jember University's strategic plan. In addition to being a strategic plan for the development of this learning media, it can be made on the basis of these materials which can be found directly in Jember University area.

In the stages of making this learning media requires some material, namely Unity 3D, Vuforia, and other supporting elements. The steps taken in creating this content are through the following stages:

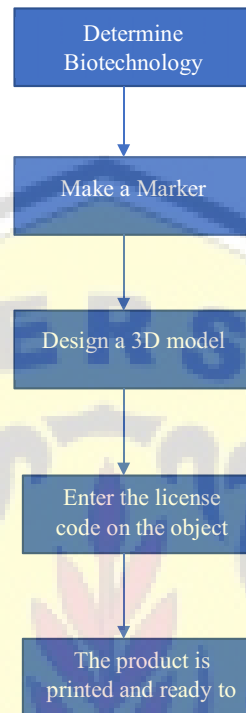


Figure 1. Learning media creation chart

The implementation of making supporting media is also synchronized with the curriculum in force in the elementary school, the k-13 curriculum. This curriculum consists of several themes that are able to combine several subjects into one specific theme. The hope of this augmented reality media-assisted learning is that it can support the learning process in elementary schools for the better. In addition, this augmented reality learning media is also able to provide increased student interest in learning and other supporting factors of the learning process.

4. Conclusions

Biotechnology is a science that combines technology and networks to meet human needs. The development of learning media based on augmented reality is able to increase interest in participating in learning. When interest is achieved the criteria for learning objectives are easy to achieve. This learning media is packaged based on technology so that it is able to synchronize the domains it wants to achieve in learning. The next goal in this research process is to develop content that is packaged in biotechnology learning modules so that it becomes a learning medium that is compatible with learning for elementary schools.

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