Visual WiKu Apps as A Modern Interactive Media To Learn The Anatomy Of Wijaya Kusuma Flower (Epiphyllum Oxypetallum)

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Abstract: The process of learning a subject requires the power of creation and innovation so that the learning process will be more interesting. augmented reality enables the creation of learning methods that provide interactive touches and make objects appear lively and realistic. Wijaya kusuma flower (epiphyllum oxypetalum) is one of the subjects of biology that needs to be studied in anatomy. while the flower is unique that it blooms only in the middle of the night, so it is quite difficult to see directly during study hours. in this study created a learning media specifically designed to study the anatomy of the flower Wijaya Kusuma alone. researchers used augmented reality technology to make the flower model look so real and represent the original flower. the application was built using Blender, Vuforia and Unity software and named Visual WIKU. The result of the study is an interactive learning media that can show the user a three-dimensional model visualizes parts of flower in detail including its size. In this media, in addition to the three-dimensional model, narration in the form of text in each scene and sound is also displayed to integrate the sense of hearing so that it can stimulate students' understanding.

Keywords: AR, epiphyllum, media, interactive, learning

1. Introduction

Wijaya kusuma flower (*Epiphyllum Oxypetallum*) called the queen tonight came from Venezuela was originally brought by Chinese traders to Indonesia during the Majapahit kingdom, has very exotic white petals. One of the uniqueness of the wijaya kusuma flower is the uncommon blooming time of midnight. In biology, this plant becomes one of the objects studied by students mainly to observe its anatomy. This unusual blooming time makes it difficult for teachers to directly show the flower blooming to their students during school hours.

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The difficulty of the teachers to be able to directly show the blossoming of flowers to students becomes a motivation for researchers to overcome them, so a problem raised is how to develop an application to facilitate the learning process, especially studying the anatomy of the wijaya kusuma flower. The application should be able to run on a mobile device because today's students whose level of interaction with smartphones is very high, even since they wake up they have been holding smartphones for whatever they need, for example functioning as alarm clock and so on. Including at school, through smartphones they explore various knowledge from various learning sources to complete schoolwork, participate in online discussion forums, take exams and more.

In addition, the application must also be able to visualize part by part of the wijaya kusuma flower clearly and in detail. this is a reason to produce media that are able to present objects realistically so that they represent the actual flower conditions in terms of size, color and texture. the application should be able to stimulate students' learning motivation so that basic competencies are achieved. To arouse students' interest in learning, it is necessary to add other multimedia components, namely narration in the form of text and sound, as well as background music that is played throughout the running application to provide a comfortable atmosphere.

In this study a mobile-based learning media was made by utilizing augmented reality technology, specifically designed to study the anatomy of the wijaya kusuma flower by giving various touches of augmented reality to facilitate students in the independent learning process and arouse their interest in learning.

2. Theoretical Framework and Hypothesis Development

Interactive learning is a hands-on, real-world approach to education. According to Stanford University School of Medicine, 'Interactive learning actively engages the students in wrestling with the material. It reinvigorates the classroom for both students and faculty. Lectures are changed into discussions, and students and teachers become partners in the journey of knowledge acquisition.' Interactive learning can take many different forms. Students strengthen their critical thinking and problem-solving skills

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using a much more holistic approach to learning. Interactive learning can take place across the curriculum with or without technology.

Digital tools of today can play a big role in education, if they are properly designed they can extend the kindergarten approach and continue to develop us as creative thinkers (Resnick, 2007). Not only would we learn how to be more creative, but interactive learning environments can also help students do critical thinking (Wang et al., 2009). The most important thing in interactive learning is the learning media itself. Through digital data, a learning media can be generated to realize the object being studied. The media must be able to visualize in detail the objects specified in a subject so that it can help students understand the subject more easily and they get an impressive learning experience.

Media is a means to send or send messages and in the teaching-learning perspective deliver content to students, to achieve effective instruction. Learning technology / media for teaching and learning process provides tools to engage students strongly in the learning process. This greatly increases communication effectiveness. If it is well designed, skillfully produced, and used effectively it has a big effect on teaching & learning because it produces an impact: Save time, Increase interest, Keep attention, Explain ideas, Strengthen concepts, etc. Media can be used effectively in formal situation where students are working independently or teacher is working with other group of students. Media play a significant role in the education of students with exceptionalities children with disabilities in particular need special instructional treatment which is supplemented with adaptation and specially designed media for effective instruction of such students. (Naz and Akbar, 2008)

Augmented reality (AR) combines real world and digital data. At present, most AR research uses live video images, which the system processes digitally to add computer-generated graphics. In other words, the system augments the image with digital data. (Siltanen, 2012). A simple augmented reality system consists of a camera, a computational unit and a display. The camera captures an image, and then the system augments virtual objects on top of the image and displays the result. Figure 1

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shows a flowchart for a simple augmented reality system. The capturing module captures the image from the camera. The tracking module calculates the correct location and orientation for virtual overlay. The rendering module combines the original image and the virtual components using the calculated pose and then renders the augmented image on the display.
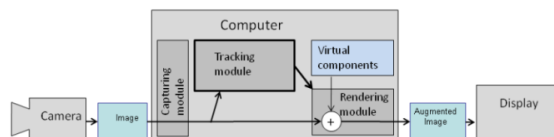

Figure 1. A Simple Flowchart for AR System

Augmented and Virtual Reality technology has advanced in all sectors over the past 12 months - with applications that revolutionize the interaction between humans and machines, and humans and virtual reality. In particular education, AR and VR applications are rapidly changing the way we learn, providing learning experiences by simulating real-world environments. AR and VR increase the level of student involvement, and provide insights on what they will experience in various environments when they enter the workforce. This technology is very attractive to visual learners and students with learning challenges - providing alternatives to more traditional teaching methods.

Marker-based Tracking. Augmented reality presents information in a correct real world context. In order to do this, the system needs to know where the user is and what the user is looking at. Normally, the user explores the environment through a display that portrays the image of the camera together with augmented information. Thus in practice, the system needs to determine the location and orientation of the camera. With a calibrated camera, the system is then able to render virtual objects in the correct place. The term tracking means calculating the relative pose (location and orientation) of a camera in real time. It is one of the fundamental components of augmented reality.

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3. Research Method

This research was conducted in several stages including problem identification, data collection, literature study, system requirement analysis, software design, implementation and testing. **The problem identification** stage is an important initial part of this study. After studying things that unravel in the background, we identified the problem of how to build an interactive media based on AR to learn the anatomy of the wijaya kusuma flower. **Data collection** is done by studying various relevant literature through textbooks, journals and the latest releases from leading media and summarizing them to gain sufficient understanding of the theory needed. At the next stage the **system requirements analysis** is carried out. This stage is to define user expectations for the learning media application that we have developed. In the **software design** phase, markers are created using photos of Wijaya Kusuma flowers which are processed with Adobe Creative Cloud depicted in figure 2.

Figure 2. Wijaya Kusuma flower picture used as a Marker

3D objects are created to visualize objects using AR technology. This modeling was created using 3D modeling software, Blender. The 3D image objects made in this study are the shapes of parts of the wijaya kusuma flower in the form of 3D objects as shown in the following pictures.
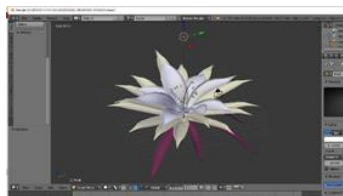

Figure 3. 3D Model of all parts of Wijaya Kusuma flowers with lighting

After the 3D modeling stage, the Rendering process is then performed. The rendering process is the final process for this whole modeling process. In this process,

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all data that has been previously set up in the 3D modeling process, namely animation data, texture rendering, lighting with certain parameters are translated in an output form in the form of the final display on the model.
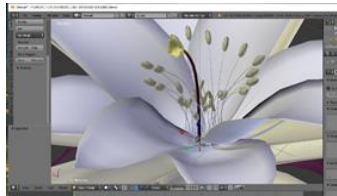

Figure 4. The Final Results of the Wijaya Kusuma Flower Model

4. Results and Discussion

This section explains the results of developing process of a mobile-based learning media application called Visual WIKU. This application is made to visualize the parts per part of the flower Wijaya Kusuma. A detailed description including the size, color and function of each flower section is presented with an interesting display in a separate scene. Using Unity 3D software as a development tool and Vuforia engine software to produce 3D objects with AR. The result is the wijaya kusuma object which has been modeled in 3 dimensions will look like a real one

In every scene there are two buttons to allow users to go to the previous scene and the next scene which is equipped with a 3D model accompanied by voice narration and text on the screen to facilitate the process of understanding the anatomy of flowers. When the application is run, it displays a home screen with pictures of wijaya kusuma flowers and accompanied by Javanese style background music installed to provide a more immersive atmosphere. On the home screen there is a play button to start playing the application while stop button at the right top depicted in figure 5.

From the home screen, the initial scene is to display the flower buds starting to bloom. In this scene, the size, color and function of this part of the flower are explained in detail as shown by figure 6 while the figure 7 as the next scene that displays the petals that function is to protect the flower crown

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Figure 5 Application Home Screen
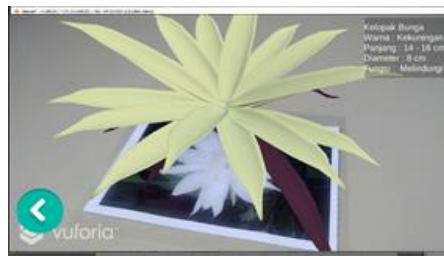

Figure 6 Scene of flower bud

Figure 7 Scene of flower petals

The next scene as shown in figure 8 displays a very beautiful white flower crown with a diameter of 10cm and a length of 11-13 cm to attract insects. The next scene shows a very beautiful white flower crown with a diameter of 10cm and a length of 11-13 cm to attract insects, while the stamens are shown in the next scene as shown in figure 11. The next scene shows a very beautiful white flower crown with a diameter of 10cm and has a length of 11 - 13 cm to attract insects, while the stamens are shown in the next scen.. Explained with a voice narration that is quite clear in this scene from stamens as male reproductive organs with a length of 5-6 cm. The pistil as a female reproductive organ in yellow has a length of 7-8cm displayed in the next scene.

Figure 8 This scene shows the appearance of pistil

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Next scene displays the pollination process of Wijaya Kusuma flower, it begins when the curved pistil meets the stamens. Wijaya Kusuma flower pollination process begins when the curved pistil meets the stamens. This process produces seeds that will become fruit and can grow as new plants. The process is shown in figure 13.

Figure 9 Scene that shows the process of pollination

After the pollination process is finished, the flowers will re-bud and this is the last scene of the application.

Figure 10 The last scene that shows the flower bud

5. Conclusion, Implication and Limitation

5.1. Conclusion

From this study it can be concluded that the making of learning media can be made based on mobile to ensure easy installation and use by users. AR technology can be used to present wijaya kusuma flower objects that are blooming in 3-dimensional form to be studied part by part of the flower, when it is actually difficult to present during school hours. Designed in interactive mode, the application makes it easy for students to repeat the stages of learning that are not yet understood.

5.2. Implication and Limitation

This application is expected to support the process of learning biology, especially on the topic of wijaya kusuma flowers. The ease of use of the interface is designed simple enough so that users in this case students and teachers can adapt quickly.

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In the next study the application can be improved by adding various variants of the wijaya kusuma flower to enrich the database library which shows the diversity of the flower species in Indonesia and other countries.

Applications can also be developed by presenting a virtual environment so that it can bring users into a great experience by utilizing virtual reality technology.

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