LEARNING THE STRUCTURE OF EARTH USING AUGMENTED REALITY AS TEACHING TOOLS

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This report is submitted in partial fulfilment of the requirements for the

Bachelor of Computer Science (Interactive Media) With Honors

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2017

BORANG PENGESAHAN STATUS TESIS

JUDUL: **LEARNING THE STRUCTURE OF EARTH USING AUGMENTED REALITY AS TEACHING TOOLS**

SESI PENGAJIAN: **SEMESTER II 2016/2017**

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DECLARATION

I hereby declare that this project report entitled

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is written by me and is my own effort and that no part has been plagiarized without citations.

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I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of

Bachelor of Computer Science (Interactive Media) with Honors

SUPERVISOR: _____ Date: 22/8/2017

(DR. MOHD HAFIZ BIN ZAKARIA)

DEDICATION

This final project is dedicated to my beloved parents for their endless support and helps when I need it, always pray the best for me and give me a lots of useful advices in process of developing this project.

To my supervisor, Dr. Mohd Hafiz bin Zakaria who has guided, give me a lot of supports and always patient with me while making the progress for this project.

To my evaluator gives a good advices and feedback on this project, Prof. Dr. Faaizah binti Shahbodin.

Last but not least, to all my beloved friends who always help me from the beginning of this project until the end of it.

ACKNOWLEDGEMENT

Bismillahirahmanirrahim,

Firstly, I would like to give all the praise to Allah S.W.T for giving me strength and patience for the whole process of completing this project. Without Him, I am sure this project cannot complete according to what have been planned.

I would like to thanks to people around me who keep on supporting, guiding and helping me during the development of this project. I am highly indebted to my supervisor, Dr. Mohd Hafiz bin Zakaria for his guidance, constant supervision and kindness in completing this project.

I also would like to give special appreciation to my parents and siblings whom always support and pray the best for me.

Besides, I would like to give credit to my fellow friends who helped me from scratch until this project has been completed. Thanks to my colleague who willingly helped me out with all their abilities and times.

Thank you to faculty too as this project really teach me a lot and test my skills and knowledge about what I have learned since my first year until last year.

Thank you.

ABSTRACT

This project discussed about the details development of the *Learning the Structure of Earth Using Augmented Reality (AR) as Learning Tools.* Augmented Reality is an innovation of technology nowadays which is a combination of virtual object into reality and user able to interact with the virtual object and it produces virtual 3D picture. This application is a combination of learning tools and augmented reality. This innovation can help youngster for their learning process. In this metropolitan world, science and technology is a life changing for us as it made our lives become easy. However, students still using textbooks as their based of learning process. Some students are easy to understand the detailed information that comes from texts and images but there are also some students who cannot understand and memorize the information because it is not quite interesting. So, this project is created to assist secondary school student to learn about the Structure of Earth in an attractive way. Through this technology approach, student's interest in this subject will be increasing because it has become commonplace nature, and they love to explore something new. This project involves the use of a booklet and a mobile. Apart from Structured of Earth topic, we will cover another topic which are Solar System, Earth System and Atmosphere Layers. This project was developed using Autodesk Maya, Unity, and Vuforia. Hopefully, by developing this application of augmented technology innovation it can help the teaching and learning process in classroom to become more effective.

ABSTRAK

Projek ini membincangkan perincian mengenai pembangunan peralatan dalam pengajaran dan pembelajaran teknologi ‘augmented reality’ (AR). Augmented reality ialah teknologi yang menggabungkan objek maya ke dalam dunia realiti dan pengguna boleh berinteraksi dengan objek maya tersebut. Aplikasi ini adalah gabungan alat pengajaran dan pembelajaran dengan teknologi ‘augmented reality’. Inovasi ini berupaya membantu pelajar dalam proses pembelajaran. Pada masa kini, pembelajaran pelajar di dalam bilik darjah masih berdasarkan buku teks semata-mata. Sesetengah pelajar mudah untuk memahami maklumat daripada teks dan imej, tetapi ada juga sebilangan pelajar yang sukar untuk menghafal dan memahaminya. Oleh itu, projek ini dibangunkan bagi membantu pelajar sekolah menengah untuk belajar mengenai Struktur Bumi dengan cara yang menarik. Melalui pendekatan teknologi, minat pelajar terhadap mata pelajaran tersebut akan meningkat kerana sifat ingin tahu sangat mendalam. Projek ini melibatkan penggunaan buku dan telefon mudah alih. Selain daripada topik Struktur Bumi, terdapat juga topik Sistem Solar, Sistem Bumi dan Lapisan Atmosfera. Projek ini dibangunkan menggunakan Autodesk Maya, Unity dan Vuforia. Dengan mengaplikasi aplikasi ini, kita berharap sesi pengajaran dan pembelajaran di dalam kelas akan berkesan.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Augmented Reality is an innovation of technology that permits a perspective of this present reality in a form of a 3D graphical images that brings the touch of a physical existence in a virtual environment. This innovation can help youthful children in their learning procedure. *Structure of Earth: Augmented Reality (AR) for Teaching Tools* is an application that is developed to assist secondary school student to use in teaching and learning session for one of sub topic for Geography subject. Based on subject matter expert (SME), currently to study about the earth structure, students need to utilize reading material which containing a 2D picture and text content.

The thought of executing a few visual and sound components into the learning material can increase the level of interest and enhance the learning experience amid

conveying the data about the structure of Earth. Enlarged Reality applications was chosen with a specific goal to convey the sight and sound components on this learning book.

1.2 Problem Statement

Nowadays, learning in classroom is based on a textbook. The textbook is a book that contains detail information about the subject and only used text and some image as their medium of information. Students take time to understand and memorize the information given in the form of words rather than seeing the graphics and diagrams. Textbooks that have only verbal information are unattractive to students. Most of the subjects that is being taught at school requires reading, understanding and memorize the detail information and Geography subject is not an exception to it.

From the analysis at the existing learning media, there are several issues that have been detected. The problems are, it provides a lot of text information about structure and characteristic of Earth and students only memorize the information without understanding the real information that they learn. Besides, image from the textbook is dull and not attractive to capture and deliver understanding to student. In this era, students like to see something that can be animated. Lastly, textbook only provides two dimensional (2D) images and words that did not provides any interactivity for students to enjoy learning the subject. In addition, teachers have limited teaching tools. They are not exposed to today's technology related teaching tools that help them during teaching session in classroom.

1.3 Objectives

This project embarks on the following objectives:

- To study how augmented reality application can be used in teaching and learning session in classroom.
- To design an augmented reality application for secondary students to learn the structure of Earth.
- To test the effectiveness of the developed augmented reality application.

1.4 Scopes

a) Target User

The target user for this application is the secondary school students to help them understand a chapter in Geography subject modules and the teachers who taught the subject.

b) Contents / Modules

The layer of Earth is the selected module under the Form 4 Geography teaching plan. This topic is enhanced by using 3D compositing software. Then a learning book will be created and the image at the book will be the target for the augmented reality component. A modeled 3D of Earth's layer will appear at the tablet screen when the application is directed towards targeted image. Some additional topics Solar Systems, Earth Systems and Atmospheric layers are also included to make some revisions to students. This application is a stand-alone application that runs on android.

1.5 Project Significance

This application will provide an alternative to the student to understand more about the structure of Earth in an interactive way. Additional interactions through this application will improve the usability of the existing textbook and improved the student's attention and focus on this topic. This application is not only focusing on students, but also teachers for them to practice in the classroom.

1.6 Conclusion

This chapter explains about the overview of the augmented reality project for teaching tools which is giving a more in depth and attractive information to students. In the project overview, , I will provide explanation on what the application is all about, what it can do and the benefit of it. The objectives for this application will also be stated. In the scope section, there are the description about target user and modules for this application. Expected results have been decided. The next chapter will discuss the Literature Review and Project Methodology for this application.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This section will provide a literature review for any previous system, printed source and web source that related to this project. Comparison of existing project will be made. A comparison is based on the domain for this project, current technology that used and different multimedia skill. This section also explains the way that have been used in this project. Apart from that, this section also provides list of project requirement such as software and hardware.

2.2 Domain

Augmented Reality (AR) technology is one of modern technologies that often used to enhance the experience in a more interactive way. For example, students usually face difficulties visualizing unobservable phenomena such as spinning of the Earth (Kerawalla et al., 2006). According to Haller et al. (2007), AR is a term of describing those technologies that allow the real-time mixture between computer-generated digital content and the real world.

Based on Mark Billinghurst article, AR will display object that allow users to see the real world at the same time as virtual imagery attached to real location and objects. The user views the world through a handheld or head mounted display (HMD) that is either see-through or overlays graphics on video of the surrounding environment. People with no computer background also can have a rich interactive experience.

a) Technology can support learning skills

Researchers believe that AR has a great potential implication and lots of benefits for augmentation of teaching and learning environments (Billinghurst, 2002; Cooperstock, 2001; Klopfer & Squire, 2008; Shelton & Hedley, 2002). AR technologies help users engage in authentic exploration in the real world, and virtual objects such as audio, texts, videos, and pictures are supplementary elements for users to conduct investigations of the real-world surroundings (Dede, 2009). AR also has potential to help teach subject where students could not feasibly gain real-world first-hand experience (e.g. astronomy and geography) (Shelton & Hedley, 2002). Next, the use of AR technologies can extend to the integration of real-world and digital learning resources. As Klopfer and Squire (2008) showed, the usage of AR enables learners to experience scientific phenomena that are not possible in the real world (e.g., chemical reactions). They believe that students provided with opportunities to experience how scientist thinking and doing.

b) Augmented Reality can help communication skills

According to El Sayed, Zayed, & Sharawy, (2011), AR systems and environments could help learners develop skills and knowledge that can be learned in other technology-enhanced learning environments but in a more effective way. However, (Sotiriou & Bogner, 2008) said the environments could increase students' motivation and interest, which in turn may help them develop better investigation skills and gain more accurate knowledge on the topic. This technology can improve their communication skills and interest. Billinghurst (2002) said that AR has potential to enhance collaboration between students and instructors and among students. Next, (Hamilton & Olenewa, 2010) said AR has potential to help students take control of their learning at their own pace and on their own path. Based on Mark Billinghurst (2002), he stated that people with no computer background can still have a rich interactive experience. This property enables even young children to rich education experience.

c) Mobile technology as teaching tools in classroom

Liu et al. (2007) introduced several AR systems that fall into this purpose; through explorations in AR, students were able to view the virtual solar system on the classroom table or to visualize the process of photosynthesis. According to Mehmet Kesim (2012), AR can be applied for learning, entertainment, or edutainment by enhancing a user's perception of and interaction with the real world. User can move around the three-dimensional virtual image and view it from any vantage point, just like a real object. The information conveyed by the virtual objects helps users perform real world tasks. Billinghurst, M. (2002) stated that uses of AR in education show that in classroom settings students' work more effective together if they can share a common workspace, something that can be difficult with the traditional desktop computer-based education.

The analysis described indicates that mobile technology has high potential to improve classroom interaction as well as to enhance student creativity. It also capable as a teaching tools to enhance the way of learning. Additionally, mobile technology is probably the best devices can perform interaction between the education and the users.

d) Designed Augmented Reality for educational purposes

As proposed by Azuma (1997), AR can be defined as a system that fulfills three basic features; a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. Based on Hsin-Kai Wu et al., AR could enable (1) learning content in 3D perspectives, (2) ubiquitous, collaborative and situated learning, (3) learners' sense of presence, immediacy, and immersion, (4) visualizing the invisible, and (5) bridging formal and informal learning. With mobile devices, wireless connection, and location-registered technology, the pervaise or mobile-AR system could enable ubiquitous, collaborative and situated learning enhanced by computer simulations, games, models, and virtual objects in real environments (Broll et al., 2008; Dunleavy et al., 2009). Based on Sotiriou & Bogner (2008) AR environment could increase student' motivation and interest, which in turn may help them develop better investigation skills and gain more accurate knowledge on the topic.

2.3 Existing System

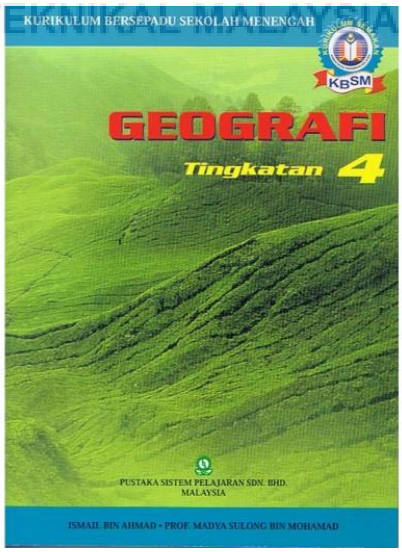

Figure 2.1: Geography Textbook Form 4