

CHAPTER I

INTRODUCTION

1.1. Background of the Study

The outbreak of COVID-19 is negatively affected educational activities worldwide. The corona-virus pandemic affected educational systems worldwide, bringing about face-to-face learning is halting all over the world. It created a serious problem in educational activities. As part of the global efforts to handle COVID-19, many countries have stopped face-to-face learning in an attempt to suppress the COVID-19 pandemic. According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO) monitoring, over 100 countries implemented nationwide closures, impacting over half of the world's student population. Some of the countries that stopped face-to-face learning due to COVID-19 include Nigeria, Ghana, Senegal, South Africa, China, Kazakhstan, Ethiopia, Honduras, India, Japan, Iran, USA, France, Spain, Italy, North and South Korea, Lebanon, Vietnam, Thailand, Germany, and also Indonesia. The termination of the face-to-face learning process has devastating effects on disadvantaged people and their families(Onyema et al., 2020).

The termination of the face-to-face learning process is very controversial, and it can have spillover effects on a large number of students in schools. It can affect the quality of teaching and learning quality and academic achievement. Stopping the face-to-face learning process can certainly cause problems for students, educators, parents, and society in general. This can negatively affect student interest and performance. If students are not actively involved, it can lead to laziness which results in a lack of interest in learning and poor learning achievement. However, technology can be used to improve some of the effects of face-to-face learning.

Thus, as the world attempts to reduce the spread of COVID-19 or future outbreaks, the use of educational technology platforms will become a new reality for academic institutions, teachers, and students. Technology is involved in student-teacher relationships and communication especially in times of isolation, quarantine, and lockdown as a result of health crises and other emergencies.

Technology is an important tool for offering educational, psychological, spiritual, or support to parents, educators, and students during and after a pandemic.

Educational technology platforms can increase student satisfaction and increase student experimentation in the learning process. Augmented reality is a technology that can be used as an educational technology platform. Augmented Reality (AR) technology is a technology that combines virtual information with the real world. The technical means it uses include Multimedia, 3D-Modelling, Real-time Tracking and Registration, Intelligent Interaction, Sensing, and more. Its principle is to apply computer-generated virtual information, such as text, images, 3D models, music, video, etc., to the real world after simulation. In this way, the two kinds of information complement each other, thus achieving the enhancement of the real world(Chen et al., 2019).

Augmented reality applications for education are increasing since 2010. And now augmented reality is reaching popularity in educational institutions due to its efficiency in the teaching and learning process. Many studies also identify the trends, advantages, opportunities, challenges, and impact of this technology on education.

Mathematics is an area of education where augmented reality is particularly prominent. Students often have difficulty in learning mathematics because of the abstract concepts they contain. Mathematics lessons enriched with technologies that include visuals for the teaching phenomena that cannot be easily examined in the class are more effective than traditional mathematics lessons. As a result, students' interest in mathematics is increasing and concrete knowledge of the field of mathematics is provided. Furthermore, simultaneous use of virtual objects and real environments in augmented reality technology makes it easier for students to understand complex abstract concepts. Augmented reality technology, by enabling three-dimensional representation of invisible and difficult-to-visualize events, facilitates the realization of topics and provides an understanding of subjects that students normally find difficult.

In the context of mathematics (geometry), many researchers argue that most of the students are often not able to build a connection between the objects in two-dimensional (2D) space, with that of real-life 3D world, which in result become

difficult for students to distinguish geometric solids from two-dimensional shapes. Technology like AR is capable of providing solutions to the above-mentioned problems. With the help of AR, the user does not get completely disconnected from the real environment, but the user can remove or add any object from the real world (Klimova et al., 2018).

In 2016, Niantic with Nintendo developed and published an augmented reality (AR) mobile game, Pokemon Go, for Android and iOS devices. This game gained great popularity then become one of the most interesting factors of AR because users can manipulate virtual objects while interacting with real-world surroundings in real-time.



Fig 1.1. Pokemon Go

An interactive augmented reality is an up-to-date technology that affects important elements of the education system, including the advantages of interest, immersion, and situational awareness (Kim & Kim, 2018). Also, interactive AR can offer an interactive learning experience so that it builds students' concepts in understanding real mathematical objects, builds critical thinking skills, and increases student curiosity to be more creative in exploring a concept.

One of the mathematical topics that require critical thinking skills and conceptual understanding is two-dimensional shapes. However, due to the COVID-19 pandemic, students have difficulty learning to two-dimensional shapes as a result

of online learning, moreover in online learning, where students lose the ability to discuss, collaborate, and practice directly with the teacher, and sometimes the teacher only provides explanations through videos through online classes without interacting with students which results in low concepts of reasoning power of students and low interest in learning and student enthusiasm for learning.

Based on the previous description, the researcher is interested in researching “The Development of Android-Based Interactive Augmented Reality Learning Media to Improve the Student’s Conceptual Understanding of Two-Dimensional Shapes”.

1.2. Problem Identification

Based on the explanation of the background above, the problems in this research can be identified as follows:

1. Students need valid, practical, and effective interactive learning media during pandemic COVID-19
2. The limitations of Augmented Reality media in the learning process
3. Students' understanding of the concept of two-dimensional shape is low
4. The interaction between teacher and students during online learning is low

1.3. Scope of Study

Based on the problem identification above, below are the scope of study that will be discussed in this research is developing an interactive Augmented Reality learning media that is valid, practical, and effective to improve the students’ conceptual understanding of two-dimensional shapes.

1.4. Research Question

Based on the problem scope above, the question of this research is how the product of the development of interactive augmented reality is valid, practical, and

effective to improve the students' conceptual understanding of two-dimensional shapes?

1.5. Research Objectives

The objective of this research is to develop valid, practical, and effective Interactive Augmented Reality learning media to improve the students' conceptual understanding of two-dimensional shapes.

1.6. Scope of Problems

To ensure clear and purposeful research to achieve the expected goals, the problem scope that will be discussed in this research is the development of interactive learning media based on Augmented reality that is valid, practical, and effective to improve the students' conceptual understanding of two-dimensional shapes.

1.7. Research Benefits

This research has a positive impact on all participants involved, namely researchers, students, and teachers. The following are expectations obtained from all parties involved:

1. For the researcher, this study is expected to increase creativity in developing learning media that is needed during a crisis.
2. For students, the products of this study are expected to be used to improve students' conceptual understanding of the two-dimensional shape material.
3. For mathematics teachers, this research is expected to be a reference to become a technology-based learning media, and hope that the products of this research are used in the learning process.

4. For other researchers, this study is expected to be a reference for similar research.

1.8. Operational Definition

Operational definition in this research refers to a detailed explanation of the terminology used in this research. Defining the terms is intended to reduce the risk of inconsistency and might provide a different understanding for the reader. Below is the definition of the terms used in this research, namely:

1. Learning media is anything to communicate from teacher to students to stimulate students' thoughts, feelings, attention, and interests and so that the learning process occurs.
2. Augmented Reality is a technology that combines two-dimensional and/or three-dimensional virtual objects into a real environment and then projects these virtual objects in reality in real-time.
3. Android is an open-source and Linux-based Operating System for mobile devices such as smartphones and tablet computers
4. Development of Learning Media is used to generate and validate the learning media that will be required during the life of the instructional modules.
5. Validation is a process that involves an ongoing gathering of evidence for the interpretation, evaluation, and uses of a measurement instrument.
6. Practical is easy to use or something that can be used as efficiently as possible.
7. Effectiveness is the level of success that can be achieved from a certain method or effort following the objectives to be achieved.
8. Van Hiele's theory is a theory about the stages of students in understanding geometry. There are five stages of students in understanding geometry, namely visualization, analysis, abstraction, formal deduction, and rigor.