

CHAPTER I

INTRODUCTION

1.1 Background

The 21st Century marked with a lot of technology used in every daily activity in our generation nowadays. Technology is one of the main things in “Goin’ Mobile” which is what now younger generation called, the existence of smartphones, MP3 player, gaming devices, and tablet technology are already common and become a daily necessity that a must. Technology generally becomes a prevalence especially in educational used which is by students. Kiger et al, (2012) consider about how 21% of upper elementary school students have a personal smartphone, a quarter of middle school students have a personal tablet device, and more than half of high school students access the Internet outside of school via 3G/4G mobile devices. They are fully aware what their technology devices for, almost every students have one or more devices that they are not only used but invest time, effort that they put, choose the information resources they wanted, buy with their own money, customize and exploit it. Kiger et al, (2012) note that these devices express part or much of their owners’ denomination, connection, personality, trademark, and individuality through their choice and use.

The uses of mobile technologies are slightly different between students, teacher, and even their parents. Students consider that the function of using mobile to their learning is more productive (Kiger et al., 2012). The aim of mobile devices nowadays are improved, its function is enlarged because the mobile devices can be used anywhere and anytime to connect the information, processes, and communications (Martin & Ertzberger, 2013). The rapid development of technologies is one reason that make ICT (Information and Communication Technologies) has essential role and function, as Lo et al, (2012) declares the application such as education software is used in education field and creates an interesting presentation that can attract students’ interest to come, explore, and decide to follow the rule of system in order to get information needed. Based on Kiger et al.

Darul Agustiana Ma’rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu |
perpustakaan.upi.edu

(2012) the example of mobile learning that already established in the educational field is one-to-one computing in Irving Independent School District, in which the students are receive one laptop or computer to do their works and activities in class. Kiger et al. (2012) also mention that Oconomowoc High School uses mobile learning in form of game software that can be downloaded by students' technology devices.

Living in today's world becomes more technology dependent, therefore, the improvement of technology is required to maintain those needs. Nowadays, learning science with Arduino becomes a breakthrough and peculiar topic to be discussed (Galadima, 2014). Arduino Uno is a microcontroller board, which has a low-cost and open source input and output board that work with a standard programming language (D'Ausilio, 2012). Galadima (2014) argued that Arduino can be used to develop interactive objects, controls outputs by taking in the inputs. The projects that can be run by Arduino have some way to be constructed, it can be stand-alone or by communicating with the Arduino board to a software that runs on a computer. Many interesting projects can be done by Arduino, for the examples are Traffic Light and LCD display. Teikari, et al., (2012) stated that light emitting diodes (LED) can be used as an effective and inexpensive light source by using the Arduino microcontroller as a platform. Arduino can also be programmed by the software and detects how the temperature around us. Arduino can work as a temperature sensor and the present work is to develop an automated system which monitors the temperature condition (Krishnamurthi et al., 2015).

Erinosho (2013) explained that physics is one of study that students often confused and mistakenly judged as a difficult subject to be learned. Hesti et al, (2017) stated that students feel indifferent toward Physics lessons because of the complexity of the concepts. Koponen & Huttunen (2012) argued that physics is learning conceptual knowledge that commonly develops and differentiates its concept in the learning process. The differentiation of concept which refers to a condition where two similar and closely related concepts related to the same phenomenological are in physics is often not properly understood as a different concept. In order to make students both comprehend and apply the knowledge, the suitable, flexible, and testable learning are needed. To visualize its complex

Darul Agustiana Ma'rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu |
perpustakaan.upi.edu

concepts, mobile learning is expected to be a solution. Bekker et al. (2015) argued that by using digital toolkits such as mobile application to teach children about science is help for their 21st Century skill improvement which includes ICT and information literacy.

One of the topics in physics that students find prevailing is electricity. In the previous research, Ergin & Atasoy (2013) explained that abstract concepts in electricity such as current, potential difference, resistance, power, electrical potential derive from the charge, short circuit and the properties of the electrical circuits are often mixed up and resulted in the misconception among these concepts. One of the misconception that students commonly stated is about current, students often think that current is an energy or force that move through a wire (Kapartzianis & Kriek, 2014). Electrical components and circuits are related with each other, students generally think that all current and voltage in series and parallel circuit are the same. This problem arises because of the misconception and lack of real visualization of the concepts. To handle these students' problems in investigating electrical concept and application, the mobile learning application based on Arduino project being first proposed.

According to the background, this research aimed to develop an Android mobile learning application based on an Arduino project. This prior research was conducted by designing and producing the mobile learning application, and the test instrument of mobile learning application itself to the experts, science teacher and students in Lower Secondary level (Junior High School).

1.2 Research Problem

According to the background which has already stated, the problem of this research is “How does the development of Android Mobile Learning Application based on Arduino project in Lower Secondary level (Junior High School)?”

1.3 Research Question

Elaborating on the research problem, the research attempts to explore the following questions:

Darul Agustiana Ma'rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu |
perpustakaan.upi.edu

- 1) How does the development of mobile learning application based on Arduino projects?
- 2) How does the review of experts on content, language, and media of mobile learning application based on Arduino projects?
- 3) How does the implementation and response of mobile learning application based Arduino projects by students and science teachers' as a user?

1.4 Limitation of Problem

In order to avoid widening of a problem on this research, the research was limited for following things:

- 1) Mobile learning is learning that arises in the course of person-to-person mobile communication that supports the role of mobile phone which is enhanced human daily life communication. The knowledge that got by a situational environment that mobile learning aim is to do practical tasks that contain multi-sensorial contents that connect each other not only by texts but also by advance pictures and media (Laouris & Eteokleous, 2005).
- 2) Android is an open-source mobile phone operating system which platform is a Linux-based as includes an operating system, middleware, user interface and application software (Holla & Katti, 2012). The mobile application in this research made by a platform engine called Android Studio.
- 3) Arduino is an open-source computer hardware in form of microcontroller-based development boards that implement certain processing language. Arduino Uno is the version that used in this research, and the Arduino IDE 1.6.7 is complemented to compute the processing (Galadima, 2014).
- 4) Arduino project that included inside the mobile application is the traffic light project, LCD Display project, and Temperature Sensor with LCD Display project. These projects represent the dynamic electricity concept that applied in Lower Secondary level of learning.
- 5) In this research, the electricity topic that elaborated is only about dynamic electricity concept that limited by Cambridge IGCSE

Darul Agustiana Ma'rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu |
perpustakaan.upi.edu

Syllabus on Physics O625 for examination in 2016, 2017, 2018 on competence 4.2 about Electrical Quantities and competence 4.3 about Electrical Circuits. The topic also limited by the Syllabus of Indonesian Curriculum 2013 on competence 3.5 about Current and Electrical Circuits.

1.5 Research Objective

This research objective is specified as follow:

- 1) To describe the development of mobile learning application based on Arduino projects.
- 2) To analyze the evaluation review of experts on content, language, and media of mobile learning application based on Arduino projects.
- 3) To analyze the implementation and response of mobile learning application based Arduino projects by students and science teachers' as a user.

1.6 Research Benefits

The result of this study is expected to provide the following benefits:

- 1) Students
The results of this study are expected to provide students to upgrade their knowledge toward the dynamic electricity topic, improve the flexibility of learning that is not limited by place and time, and encourage students to learn electricity topic by doing the project.
- 2) Teachers
The results of this study are expected to provide teachers to use this Android mobile learning application as a supporter in teaching learning process in order to enhance students' understanding, make effective teaching-learning process, and

Darul Agustiana Ma'rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

create opportunities for students to learning by using media that in line with learning science in 21st Century.

3) Researcher

The results of this study are expected to contribute the development of mobile learning application about Arduino project and reference to other researchers who have same focus study.

1.7 Organization Structure of Research Paper

Generally, the organization structure section explains the details of the research paper structure based on the Universitas Pendidikan Indonesia's regulation 2016. The organization structure of this research paper is divided into five chapters. The chapters are resembled and explained as following.

Chapter I explains about the background and problem identification which are elaborated into research problem and research questions. This research problem is also limited in limitation of problem. In this chapter, the research objectives and benefits are determined. This chapter is crucial to determine the following chapters, such as literature review and methodology.

In line with the Chapter I, Chapter II of this research paper explains about the theories and relevant research needed by the researcher to analyze the result and the finding. In this chapter, there are some literature reviews that support the argument and the result analysis in this research. Some literature reviews that included in this chapter are about mobile learning, Arduino UNO projects, Arduino projects applied to the mobile learning, and dynamic electricity materials.

Chapter III is about the methodology of this research. This chapter explains the details of research method used in the research. Furthermore, research sample and population, research procedure, and operational definition are explained in this chapter. A set of instruments applied in this research is also explained concisely.

Chapter IV explains the research result and discussion. This chapter explains about the finding and analysis concerning on this research. The research problem described in the first chapter is answered in this

Darul Agustiana Ma'rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

chapter. Through discussion, each findings are analyzed using the previous findings of the other researchers that already explained in the second chapter.

Chapter V is the closure chapter which includes the conclusion of this research and recommendation for the next research.

Darul Agustiana Ma'rifah, 2018

THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS

Universitas Pendidikan Indonesia | repository.upi.edu |
perpustakaan.upi.edu