UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF AN ELECTRONIC EDUCATIONAL QUIZ BOARD WITH ANDROID APPLICATION THAT TEST STUDENT'S KNOWLEDGE ON SERIES AND PARALLEL RESISTOR IN ELECTRICAL CIRCUIT

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Award of Bachelor of Computer Engineering Technology (Computer System) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Pembelajaran elektrik agak mencabar bagi mereka yang baru belajar sekiranya pemahaman mereka mengenai konsep asas dalam litar elektrik tidak kukuh. *Res-Circuit Quiz Board* telah dibina untuk menguji pengetahuan pelajar mengenai sambungan litar sesiri dan sambungan litar selari bagi matapelajaran Litar Elektrik dengan menggunakan *Bluetooth* sebagai medium untuk menghantar data. Kehadiran kaedah pembelajaran ini adalah satu alternatif bagi pendidik untuk membantu pelajar mendalami pengetahuan pelajar mengenai asas mata pelajaran Litar Elektrik. Penghasilan kit pendidikan sebagai alat pengajaran akan membantu merapatkan jurang antara teori dan pengukuran praktikal. Aplikasi telah dibina yang memerlukan pelajar menyambung kepadanya melalui *Bluetooth* untuk akses kepada kit pembelajaran. Pelajar perlu membina litar elektrik mengikit soalan yang diberi ke kit tersebut dan periksa jawapan dengan menggunakan aplikasi. Kaedah pembelajaran yang melibatkan teknologi tanpa wayar memberi peluang kepada para pelajar untuk menjadikan pembelajaran subjek Litar Elektrik menjadi lebih menyeronokkan dan dapat menarik minat pelajar untuk mempelajarinya.

ABSTRACT

Learning electricity is challenging for a beginner if their understanding of the basic concept in electrical circuit is low. Res-Circuit Quiz Board is design to test student's knowledge on series and parallel resistor connection for subject Electrical Circuit by using Bluetooth. The presence of this learning method is an alternative for educator to help students to deepen student's knowledge on the basic of Electrical Circuit subject. Evaluation of educational kit as a tool of teaching will help bridge the gap between theory and practical measurements. An application is design that required student connect to it through Bluetooth for access to the kit. Student need to construct electrical circuit to the quiz board according to the question and check the answer by using the application. This learning method with includes wireless technology provide opportunities for students to make learning electrical circuit to be more fun and to attached students interesting.

DEDICATION

This report is dedicated to my beloved parents who educated and supported me throughout the process of doing this project. I am also wanted to say thank you to my supervisor and my friends who have encouraged, guided and inspired me to complete this project.

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LIST OF SYMBOLS

cm	-	Centimetre
C°	-	Celsius
D, d	-	Diameter
F	-	Force
g	-	Gram
m	-	Meter
R	-	Resistance
V	-	Voltage
3D	-	3 Dimension
Ω	-	Ohm
%	-	Percentage

LIST OF ABBREVIATIONS

BOM	-	Bill of Material
DC	-	Direct Current
IC	-	Integrated Circuit
IT	-	Information Technology
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
OS	-	Operating System
PCB	-	Printed Circuit Board
PDA	-	Personal Digital Assistant
PLC	-	Programmable Logic Controller
Rx	-	Receiver
TFT LCD	-	Thin-Film-Transistor Liquid Crystal Display
Tx	-	Transmitter
VDR	-	Voltage Divider Rule
WEIEC	-	Worked Example in Electrical Circuits

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter aim on creating the framework and introduces the brief idea of the project. It focused on the overview of the project, detailing the objectives, briefly the problem statement, scope and provide outcome of the project.

1.2 Background

Educational kit is a tools used for teaching, to assist learning process in a ready-to-teach formats while in the class where it will help bridge the gap between theory and practical measurements. According to the finding by N. Hikosaka (2012), educational kit are enjoying a remarkable market success today. There is a secondary effect market that stems from the need of education, demonstration, training and hobbies. Educational kit have sold extraordinarily well. In 2008, about 9000 educational system were shipped. In 2010, shipments exceed 100, 000 which is most of these is educational kit.

Another prove that show the successful of educational kit, in a report titled "Global Educational Toys Market 2017-2021," breaks down the toys market into three major categories: academic, cognitive thinking and motor skills. The most popular academic educational toys is math and science kit. This show that educational kit have becomes commercial success in market as one of the strategies for learning process. The

presence of this learning method not only gives an alternative for educator to help students to improve their knowledge, it also an effective method to help students to understand practically about what they learn since it need students to engage themself in the lesson.

Electricity is a subtopic inside Electrical subject that generally deals with the application and study of electricity and electronics. It is utilizes with nonlinear and active electrical components such as semiconductor devices, transistors, diodes, capacitor and integrated circuits, which is design to achieve a particular functionality. According to Calliot (1992), the teaching and learning of electricity, is a topic often included in primary and secondary curriculum to expose students on how the principle working of electric and electronic before go to another level where students will encounter with a conceptual and reasoning difficulties in understanding introductory electricity. After mastering the introductory of electricity, another deep-level is student need to innovate a new system.

According to Dermott & Shaffer (1992), argues that one of the difficulties the students encounter in understanding the behavior of electric circuits is the students' inability to give a qualitative reason about the electric circuit behavior. It can be proved from the survey that have been carried out, most of the learner state that Electrical Circuit is an interesting subject but hard to understand. However, the survey show that they are strongly agree that educational kit can be highly interactive during class session and they agree that educational kit can provide difficult things in simple way to understand. This show that education strategies is needed to make learning process to become more effective and clearly can give a real view on how the working principle of the subject.

Res-Circuit Quiz Box is an educational kit used to test student's understanding on how to construct series and parallel resistor circuit. It was created to attract student's interest in the basic of electrical circuit for primary, secondary school and also for a beginner. A question will be display on android smartphone and students need to connect to the application using Bluetooth. The question need students to construct a circuit on the quiz box according to the given diagram. After construct the circuit, the answer will be display on the application. This educational kit is a method for student to study the principle of electrical circuit.

1.3 Problem Statement

The principle of electrical subject has been exposed to students since primary and secondary school. The basic learning for this subject is on how the electrical flow in a circuit and how to construct a circuit. Topic inside this subject is quite tough and required student to deeply understand on how it is working. According to Mulhall, McKittrick, & Gunstone (2001), learning electricity is challenging because the physics concepts involved in electricity are highly abstract and complex. Cohen, Eylon & Ganiel, (1983) stated that, even if this topic is introduced to students several times in the course of their studies (from elementary to secondary), many students are still incapable of qualitatively analyzing simple circuits. In class, students are expose more to theoretically and practically lesson. A simple circuit with a few components and a fairly straightforward question is given for a beginner to understand. But, things can get hard when the circuit consist of many nodes and branches.

When it comes to a difficult question, students need to think more about the working principle of electrical subject. Theoretical is not enough for a student to grasp each topic. So the laboratory session provides hands-on experience with a guidance of an educator. Laboratory session has a particular challenges and opportunities that differ from those in a standard classroom environment, it becomes tough for students to catch-up the lesson due to the laboratory session that sometimes is not suitable to the level of education. According to Babadogan and Olkun (2006), one of the most important barrier to the reform program was a shortage of learning activities that support hands-on learning and visible modelling to represent abstract concepts. Therefore one of the solution might be using educational kit to provide students with opportunities to actively engage and conduct experiments involving abstract theoretical concepts by using concrete products.

1.4 Objective

The main objective of this project is to make an improvement from the previous E-Circuit Quiz Kit by Farhanah et. al (2016) by displaying the questions and feedback of Android's application. In order to achieve the main objective, here are four sub-objectives to be follow :

1. To design an educational kit using Proteus for the circuit layout, drawing 3D prototype using Paint 3D, and build educational kit using Arduino Mega 2560 as the controller, which the program is written using Arduino IDE. The project also use mobile application by using MIT App Inventor to display question and to check the answer.