International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-8 Issue-12, October 2019

EML: An Android Application for Electrical Education

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Abstract*: This paper is to explain the development of android that will be used later in the mobile-based education system. Nowadays, it is important for schools, colleges, and universities to search for an innovative way of delivering information to students. Since the advancement of mobile-based technology, android has now become an important tool in teaching and learning processes. Several institutions have also proved that with this application, students are now able to gain more experience and be more engaging in classroom learning rather than the traditional learning method. In relation to that, the author has created a new application in mobile learning called Electrical Mobile Learning (EML), especially for Electrical Education. The purpose of this application is to positively contribute to users by providing them with a simple, convenient, reliable and a faster way of accessing information in Electrical Education either online or offline. EML application is developed by using the MIT Apps Inventor 2 platform and is mainly made with five function buttons containing electrical information as the user's options. The EML has been successfully developed with more options and information with just one application.

Index Terms*: Application Development, Android Application, Mobile Learning, Education System, and Smartphones.

I. INTRODUCTION

In this age, everyone is trying to fit their lives around these technologies by balancing their personal and professional lives accordingly. Mobility has also increased along with the needs to access to information in performing ordinary tasks using certain mobile applications whenever possible. One way to access to this information is by using the Mobile Internet services. An individual will be able to work better by using the mobile application either in a wireless or non-wireless environment. The tablets and other associated technologies are progressively admired everywhere across the world. This also contributes to the growing area of research regarding the use of technologies such as smartphones and tablets in schools or any institutional learning systems [1].

Revised Manuscript Received on October 30, 2019.
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According to [2], currently, there are several existing teaching methods being used that are effectively dependent on the teachers: Lecture Delivery, Classroom Discussion, Task-Oriented Groups, Groups Discussions and Quiz. The writers also stated that the biggest challenge the teachers found was in keeping their students' minds focused on related topics. They, then, contributed to the idea of developing games to keep the students more engaged in classroom learning using technologies.

An android system for the English educational purposes was developed by [3]. The android application system was made for the users to learn English, in communications and other related activities. The writer also wrote its functions for the learners to use in conducting online communication courses, online consulting, in viewing school announcements etc.

A research conducted by [4] among a few engineering students in Saudi Arabia found that most of them relied heavily on their lecturers or supervisors to feed them with information without having the need to search for it themselves. This led to a brilliant move in creating an Android application for the students to discourage them from depending heavily on their lecturers. The mobile learning system proved to be essential in the engineering education.

II. METHODOLOGY

In order to develop an application, it is important to start by knowing the needs and requirements of the application, the use of the most suitable technology and other related applications.

It is also essential to know the requirements before designing the application and to have a design before its implementation by following a structured lifecycle for a software development. However, the circumstances do vary due to the different lifecycles that have been developed and described over the years to accommodate different needs of different projects.

Android was chosen as the methodology because of its agile method in providing behavioral support during the project development. The method of android development promotes adaptive planning, evolutionary development, and delivery, time-boxed iterative approach, and encourages rapid and flexible response to change. It is also a conceptual framework that promotes foreseen interactions throughout the development cycle. This method is also beneficial in various ways because it can save a lot of re-work and it is also accommodative to changes as each cycle is shorter.

The developer will also find it easier in fixing a problem as it has an enough scope. But, if
they do encounter shortfalls, the matter can be solved in the next cycle because of its unknown requirements and until a working version of the system or other related solutions are created.

Fig. 1 shows the phases in Android development. This project was developed using Android Developer Toolkit and Android API Level 7 (for users of Android 2.1 and other latest version) so that it will be available for 76% of Android users. The interface design was made using the Ionic Creator which allowed the developer to build mobile apps without having to code. The MIT Apps Inventor 2 (AI2) is the Google approved development environment for Android Development and as such has the greatest level of online support. Android Applications are also being developed by using the blocks coding from AI2. A completed testing has also been conducted on the Android Emulator. In the case of crashed apk files or unreadable commands, a backup Java written application is used by the Android Studio software.

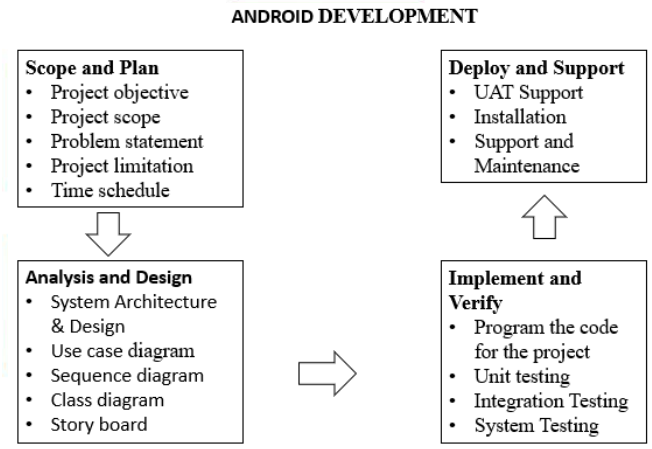


Fig. 1 Android Development Phases

III. RESULT AND DISCUSSIONS

The application is named Electrical Mobile Learning (EML) to ease the users in locating it in the Google Play Store. Fig. 2 shows the development process on how the application was made within the time duration, together with the appropriate corresponding steps to be taken.

The Development of Android Application for Electrical Education process started off with the basic application interface design. The developer used Ionic Creator to quickly generate user interface (UI) snippets and rapidly bootstrap app project.

This process will later be contributed into the android design and simulation using the AI2. If it meets the required specifications of the developer, the software module development process will continue. If not, the developer will need to repeat the Java coding development process.

The Java coding in AI2 that was done in blocks coding; which was simpler than the normal Java programming language where it has variety of developing options to be chosen from such ad list picker, image, label, web links etc. It allowed the developer to understand, build, check for errors, and easily copy one after another of the block coding. The developer also created a Java interface that consisted of the required coding in developing the application before testing it in Emulator. The process will end once the application is able to run on a real Android smartphone.

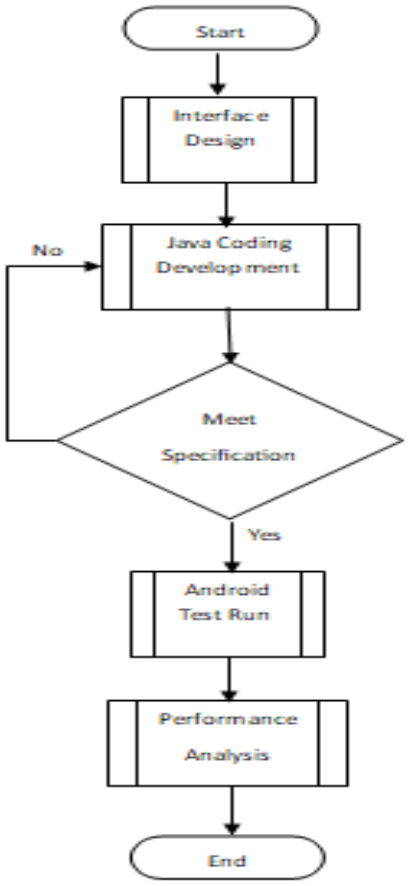


Fig. 2 Flow Chart of Electrical Mobile Learning (EML) development

In EML application, there are mainly five function buttons placed on the start page as shown in Fig. 3. These buttons will then be dropped down into multiple function buttons as an option for the user to freely choose from. Table 1 below simplifies the options in EML.

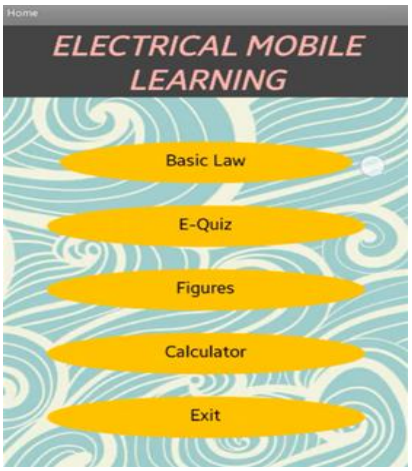


Fig. 3 Interface design of EML

Table. 1 Options provided by EML app

OPTION	CONTENTS
BASIC LAW	Electrical formulas, notes, links to simulation website
E-QUIZ	Multiple choice questions
FIGURES	Symbols of electrical components (link to Google image search)
CALCULATOR	Basic Mathematical calculator
EXIT	Exit the App

The screen interface for each option in Basic Law is shown in Fig. 4, 5, and 6. Basic electrical formulas are used to ease the users in referring and remembering. For a better understanding of the electric circuit, the users can use circuit simulation which allows them to play around with the component. The electrical notes were provided in the .pdf format.

As for the E-Quiz button, a set of 20 multi-choice questions on the basic electrical facts and simple calculations was created. The correct answer will be displayed at the end of the quiz with an option to try again as shown in Fig. 7. As for the calculator, a basic math, Watt (W) and Joule (J) calculator was designed to correctly calculate any given values as in Fig. 8.

Parameter	Symbol	Measuring Unit	Discription
Voltage	Volt	V or E	Unit of Electrical Potential V = I x R
Current	Ampere	I or i	Unit of Electrical Current I = V÷R
Resistance	Ohm	R or Ω	Unit of DC Current R = V÷I
Conductance	Siemen or Mho	G or ℧	Unit of Conductance G = 1÷R
Power	Watts	W	Unit of Power P = V x I
Capacitance	Farad	C	Unit of Capacitance C = Q ÷ V
Inductance	Henery	L or H	Unit of Inductance V_L = -L(di÷dt)
Impedance	Ohm	Z	Unit of AC Resistance $Z^2 = R^2 + X^2$
Charge	Coulomb	Q	Unit of Electrical Charge Q = C x V
Frequency	Hertz	Hz	Unit of Frequency f = 1÷T
Period	sec	s	Unite of Period T = 1÷f

Fig. 4 Basic Electrical Formula

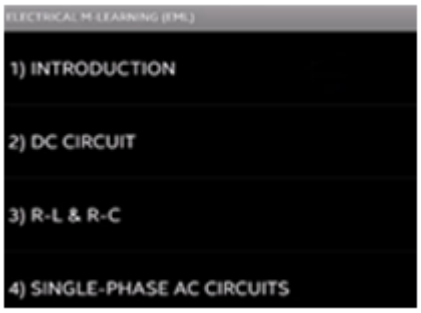


Fig. 5 Example of Selection of Notes

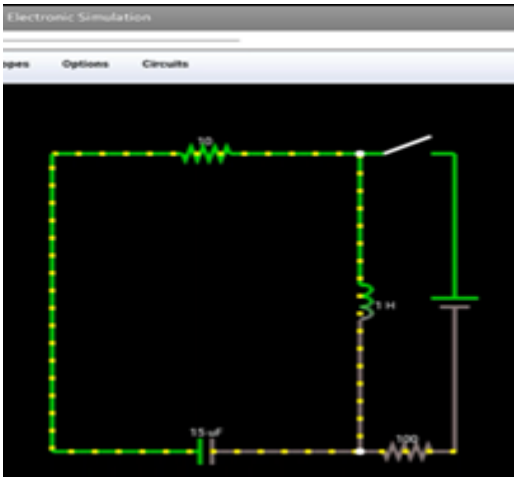
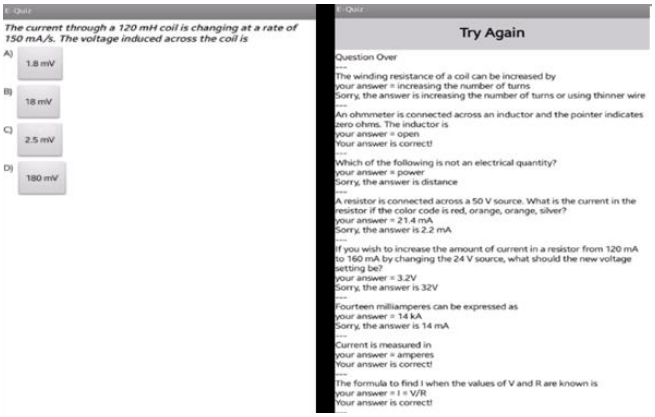
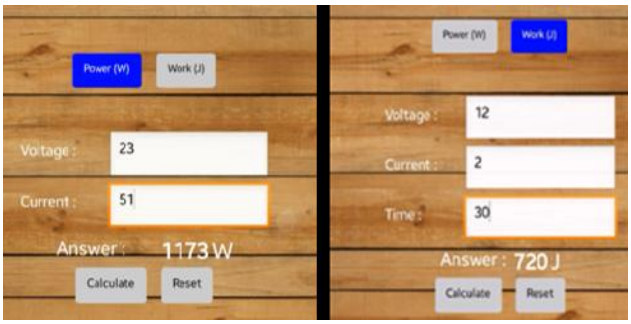


Fig. 6 Electronic simulation interface



(a) **(b)**

Fig. 7 (a) E-Quiz sample question and (b) The outcome of results



(a) **(b)**

Fig. 8 (a) Power and (b) Work calculators

A survey was conducted among 50 randomly selected electrical engineering students at Malaysian Institute marine Engineering Technology, Universiti Kuala Lumpur (UniKL MiMET) to use the EML application. The students were then required to provide a feedback by answering a Likert-scale survey questions. In this survey, they need to answer 10 questions about the application in term of features, design, easiness and usefulness. The survey shows a sample of 76% of the students often used mobile application daily to check and update the learning

information. 70% of the results show that this application will be helpful for students to study, to get information, and to share it with their friends anywhere and anytime.

IV. CONCLUSIONS

The aim of this study is to develop an Android Application for Electrical Education called Electrical Mobile Learning application that will assist users, mainly students of engineering courses by providing on-the-spot information.

In general, users who are students in the related field of study will mostly benefit from the Electrical Mobile Learning (EML) application. They will be able to expand their knowledge in the electrical study with a simple and reliable application. Other than that, this kind of mobile learning system will also be able to enhance its domination with the use of learning technology method and yet might also replace the e-learning system that is currently being used as a popular learning system in educational institutions.

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