Development of Mobile EEF Learning System (MEEFLS) for Mobile Learning Implementation in Kolej Poly-Tech MARA (KPTM)

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Abstract—Mobile learning (m-learning) is a new method in teaching and learning process which combines technology of mobile device with learning materials. It can enhance student's engagement in learning activities and facilitate them to access the learning materials at anytime and anywhere. In Kolej Poly-Tech Mara (KPTM), this method is seen as an important effort in teaching practice and to improve student learning performance. The aim of this paper is to discuss the development of m-learning application called Mobile EEF Learning System (MEEFLS) to be implemented for Electric and Electronic Fundamentals course using Flash, XML (Extensible Markup Language) and J2ME (Java 2 micro edition). System Development Life Cycle (SDLC) was used as an application development approach. It has three modules in this application such as notes or course material, exercises and video. MEELFS development is seen as a tool or a pilot test for m-learning in KPTM.

Keywords—Flash, mobile device, mobile learning, teaching and learning, SDLC, XML.

I. INTRODUCTION

TRADITIONAL classroom instruction seems unable to meet the requirements of modern learning which emphasizes effective learning methods. In the modern era, an educator will act as a facilitator or mediator in the process of teaching and learning in the classroom. They will help the students in the learning process, help students to relate the learning objectives and outcomes, and monitor the learning activities. At the same time, they will ensure that students will not deviate from the learning objectives that have been outlined.

With the proliferation of internet development, information development has made the process of learning becomes more important and lead to changes in learning technology. The developed knowledge-based systems can provide a new perspective on the traditional education system and create new ideas in how to impart knowledge. For instance, network and computer technologies provide many methods to support the learning process that can be accessed at anytime and anywhere. The advancement of internet gives a positive effect

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on the learning process which allows online learning to be an alternative to classroom learning. With information technology, the learning material can be distributed and shared electronically among students regardless of distance and not bound to the class time.

In several higher education institutions and organizations, e-learning has become a major delivery method in learning process. Although e-learning can bring positive effects on learning which simplifies the process of distance learning, there are also technical and organizational barriers faced by students [1]. For an effective learning environment, online learning environments are be developed to engage students with the use of mobile technology to learning materials extensively. E-learning is sophisticated compared to traditional classroom, the mobile learning (m-learning) is a learning method that not limited to space or time [2].

M-learning is defined as the use of a portable computer or electronic device that is interactively and constantly communicate within a collaborative learning sessions either in fieldwork, guidance or counseling [3]. M-learning process is more specialized to experiences the specific domain and supports the innovation of application in recent learning content [4]. Generally, students can used this application at any location for more understanding about certain topics using mobile technology.

There are some definitions of m-learning such as refers to the use of portable or handheld devices in learning process through mobile phones, smart phones, PDAs, tablet PCs and laptops. Using m-learning, students enable to access education and training material at the place and time that he or she need it. It enhances student to promote real world skills, better lifestyle, access the learning materials regardless of location, access to just-in-time learning and reference tool, collaborate learning and interact with others. The m-learning system will be equipped with dynamic interaction, strong search capabilities, powerful support for effective learning and performance-based assessment.

The teaching and learning scenario at Kolej Poly-Tech MARA (KPTM) is more to the concept of talk and chalk which is centered on lectures and the teaching aids often being used are reference books, notes and supporting materials. Current technology has created a revolution on learning methods [4]. The development of wireless technology and mobile communication devices has also contributed to the use of mobile devices in education [5].

The application of m-learning will become a benchmark to

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a new learning method at KPTM. From the observation, this method has not been implemented in any branch of KPTM. There are several problems in the teaching and learning environment in KPTM.

Firstly, the timetable of lecturers and students are compact. This can reflect to student's concentration in class because they had to rush to attend classes. For the lecturers, they face the lack of time to prepare for class. Secondly, students and lecturers often face problems such the number of classes or lecture halls are limited or inadequate because of numbers of students are increased rather than the classroom or lecture hall facilities available. Thirdly, most students often complain for their textbook or reference a bit thick and cumbersome which result a negative impact on the students and the learning process. Finally, there is an advantage to conduct mobile learning among students because they always follow the current technology and the desire and inclination to own a mobile device are high.

II. RELATED STUDIES

There are several m-learning projects have been found and majority of these projects were focused on increasing students' access to learning materials at any time and any place [6], or to improve interactivity in learning process [7], [8]. A game-based learning application has been built to help international students to cope with culture shock and to get adapted to university life in United Kingdom [9].

A few projects have included teaching students some aspect of mobile technology usually in connection with ubiquitous delivery [10]. This project has combined ubiquitous delivery with a focus on interactivity with a single pedagogical focus. A small number of projects span more than one discipline area, for example interactivity study in computer science and education [11].

The collaboration of the European Union, the e-learning to m-learning project establishes in the creation of the global funding of training on the wireless Internet, promoting and reinforcing the contribution to be made by vocational training. It seeks to move from distance learning (d-learning) and electronic learning (e-learning) to mobile learning (m-learning) [12].

There are also m-learning tool that using ADDIE instructional design model in order to develop platform independent which implemented by Universiti Teknologi PETRONAS [13]. This project shows that the system was effective and usability evaluation was positive. The other m-learning project known as MOBIlearn project is a joint-venture of 24 partners including 14 universities from Europe, Israel, the USA and Australia who design context-sensitive approaches to problem-based, informal and workplace learning [14]. Guidelines for teaching, learning and tutoring in mobile learning environment have also been suggested by Scheele [11].

Currently, the mobile phones and tablets are widely used for learning purposes. A system that used an extended Technology Acceptance Model (TAM) has been developed in Saudi Arabia to analyze the adoption of mobile devices and smart phones, searching the web for information, for accessing course materials and conducting assignments [15].

At the same time, the iPad technology is used in the development of m-learning. For example, a School of vocational teacher education (SoVTE) in Finland was employed a focus discussion group (FDG) session on the usage of iPads. As a result, the application was used in their daily practices and effects a cultural change regarding the usage of social media and mobile technology in the work community [16].

In summary, research into m-learning in higher education is in an exploratory phase with many learning and teaching issues still to be investigated.

III. FRAMEWORK

The social constructive and conversational learning models suggest that material should be personalized, allowing the users to filter information and collaborative allowing users to reflect on the information for proper use and retention. In order to have a greatest effectiveness, a user need to provide information and allowed to seek support when needed. Motiwalla [17] suggests that these educational concepts should be applied to an m-learning framework together with the thoughtful instructional design in a mobile application.

A mobile education framework proposed by Parsons et al. [18] comprises four perspectives such as the mobile environment, learning context issues, learning experience, and learning objectives. A mobile environmental issue defines the user-based factors or non-context that concentrates on m-learning design and includes mobile interface design, communication support, media type, user information, and mobility. Context issues consider student, identity, spatial-temporal, activity, collaboration, and facility, which affect the users learning experience. The learning outcomes can be individualized or collaborative based on learning objectives, which can be categorized as improved skill, new skill, social skill, or team skills.
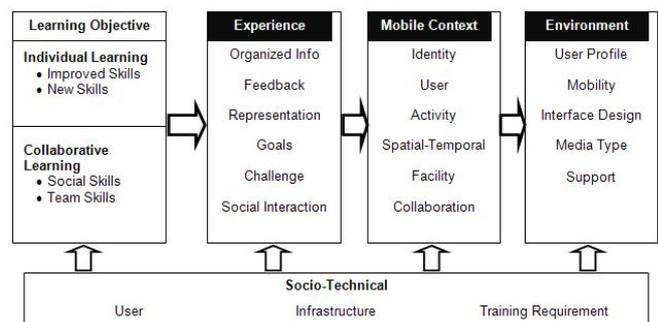

Fig. 1 Mobile Learning Frame [18]

The four perspectives of Parson's m-learning framework consider the m-learning environment, but can also include investigation of the culture, communication patterns, learning systems, and other potential barriers to implementation. Modification of the Parson framework includes adding a fifth perspective, social-technical issue. These issues include

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consideration of the user, the technology, and the purpose of the training. The framework is shown in Fig. 1.

Final design specifications should be based on technical requirements, yet the system as a whole should holistically take into consideration the user, the technical capabilities and complexities of the environment, and nature of the material being conveyed. All of this is important in the needs analysis or the evaluation of the opportunity for implementing an m-learning system in any environment [19].

IV. METHODOLOGY

In this study, m-learning application for Electric and Electronic Fundamental course called Mobile EEF Learning System (MEEFLS) has been developed using system development life cycle (SDLC). A SDLC is composed of a number of clearly defined and distinct work phases which are used to analyze requirements, design, code, test, and maintenance. SDLC aims to produce high quality application that meet or exceed customer expectations by delivering systems which move through each clearly defined phase, within scheduled time-frames and cost estimates [20]. The overall development process of the MEEFLS is depicted in Fig. 2.
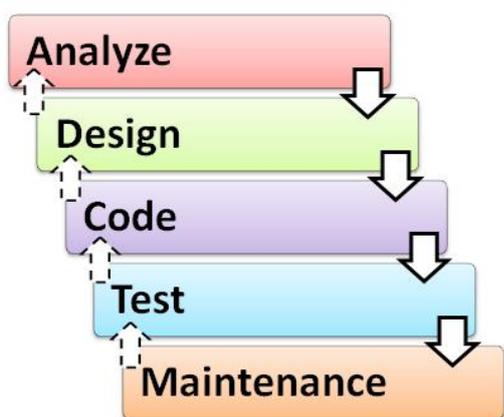

Fig. 2 System Development Life Cycle Phases

A. Analysis Phase

In the analysis phase, a preliminary survey has been conducted from 200 diploma KPTM students to find out the awareness and the readiness for applying the mobile technology in learning process [21]. As a result, the students are willing to use the mobile technology in learning process. At the same time, they have a positive perception and awareness of mobile technology and will use the elements in mobile technology in learning process.

B. Design Phase

The second phase involves the designing of the MEEFLS content. From Fig. 3, it shows that the flow of the content had been outlined by the Electric and Electronic Fundamental course content. In the same time, the interface prototype also been designed.
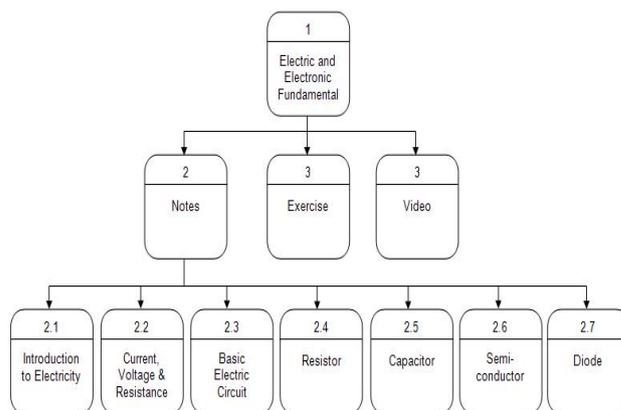

Fig. 3 Content design

C. Code Phase

In coding phase, the J2ME and XML were used together with Flash file to develop the MEEFLS application. In this phase, some of the software used to translate the design to writing code. Among the software used are Adobe Flash, Java SDK and Java Runtime Environment (JRE).

D. Test Phase

The MEEFLS application was examined and validated to ensure its functionality. Finally, the evaluation has been conducted and edit based on the feedbacks from several expert lecturers that conduct this course. The final output of this phase is the final prototype of the MEEFLS application.

V. RESULTS

Generally, the MEEFLS application's user interfaces can be perceived usable as the mobile students or users are considered the most important entity in our design. Much effort has been devoted in analyzing and evaluating the mobile students' need and caters for beginner, fast acting for a more expert student, provides efficacious support to the students' working needs and is easy to use.

Figs. 4 (a)–(e) illustrate the flow of a module designed for MEEFLS application which comprise of four main menus such as "Notes", "Exercise"', "Video" and "Exit". The structural design overall menu is depicted in Fig. 4 (a) and encompassed as follow:

(i) Notes: display the course materials according to topics outlined in course content.
(ii) Exercise: assessment for each topic.
(iii) Video: displays the video related to topic.
(iv) Exit: exit from the system.

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(a)   (b)   (c)

(d)   (e)

Fig. 4 MEELFS interfaces (a) Main Menu (b) Selection of Notes Menu (c) Example of course material (d) Exercise (e) Video

The similar design selection and paradigm are adopted in MEEFLS application with intention of reducing users' training time and to facilitate the metaphoric understanding. Additionally, the visibility of the selected menu at the above of screen is constantly displayed which lessen the anxiety of the mobile students.

The simplicity of the design and do not overuse the color and the amount the text advance mobile students to interact comfortably. The simple navigation assists the mobile students to minimize the number keystrokes made when navigating from one page to another. The attribute of consistency is obviously noticeable with the design of the color used, standard typeface, font style, and size, layout, proportion, and navigation of the fragmented page for every entry of the interfaces designed.

In the Notes menu, instructional materials will be posted by topic as depicted in Fig. 4 (b). When a topic is selected notes will be displayed along with diagrams, if any, as a reference. Navigation buttons are provided at the bottom of the display along with the current notes pages as a guideline to student to keep track the progress, as shown as in Fig. 4 (c)

Exercise as a part of module's assessment, as depicted in Fig. 4 (d), has been designed and embedded into the m-learning system which acts to supplement the self-enrichment for the topics covered. There are four option button designed for every question. The use of "green" and "red" colors indicates the "correct" and "wrong" answers attempted by the mobile students.

In short, the functionalities of the option designed have been taken care by simplifying the task flow and reducing the

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complexities as possible in order to maximize the beauty of usability.

VI. CONCLUSION

MEEFLS provides the benefit of personalized education in anytime and at anywhere. For MEEFLS to be truly flexible and user-centered, it should fit the needs and objectives of the users and their abilities. This is one of the most important factors in the design of MEEFLS. It is also very important that the user is satisfied and has a positive experience with the MEEFLS system.

The future research phase is to evaluate the effectiveness of these applications. In addition, a framework for developing sustainability and usability will be developed to become a key element in the development of m-learning applications. It also involves the evaluation of graphics, video and audio to MEEFLS.

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