CONCEPTUAL MODEL OF MOBILE LEARNING APPLICATION FOR KINDERGARTEN CHILDREN

by

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ABSTRACT

Mobile Learning Application (MLA) refers to the use of mobile devices in delivering learning content using the advantages of mobile devices. Unfortunately, some drawbacks pertaining to such application have circumvented its use and purpose in classrooms. Two main problems are identified and highlighted in this study; i) problems found within the existing MLA and ii) lack of incorporation of mobile learning related concepts and theories in MLA development for children. Therefore, this study has fulfilled four main objectives; i) to analyse and identify the potential MLA model related concepts and theories, ii) to develop and validate a conceptual model by incorporating all potential MLA association related concepts and theories, iii) to develop MLA by implementing all elements incorporated in the conceptual model, and iv) to evaluate the MLA in terms of usability and effectiveness. In this particular research, a total of eight important variables which are mobile application technology, usability, layout, content, navigation, touch gesture, pedagogy and scaffolding derived from a number of significant theories and concepts related to mobile learning have been incorporated into the MobChild conceptual model. The validation of MobChild conceptual model indicated that all the variables included in the model had been indeed significant for implementation in developing the MFolktales mobile application. Hence, all the variables that made up the conceptual model had been employed in the development of MFolktale. Finally, the application was tested to determine both its usability and its effectiveness. For that purpose, the usability evaluation comprised of a questionnaire instrument that involved 153 respondents and the Quasi Experimental Design was employed to determine the effectiveness of the application among 90 kindergarten students divided into 3 groups. The results obtained from the usability evaluations showed that the MFolktales mobile application had successfully satisfied the usability criteria, whereas the result retrieved from the effectiveness evaluation demonstrated that the students scored better mean marks when the MFolktales mobile application was utilized.

ABSTRAK

Aplikasi pembelajaran mudah alih (MLA) merujuk kepada penggunaan peranti mudah alih dalam menyampaikan kandungan pembelajaran menggunakan kelebihan peranti mudah alih. Dua masalah utama dikenal pasti dalam kajian ini; i) masalah ditemui dalam MLA yang sedia ada dan ii) kurangnya penggabungan pembelajaran mudah alih berkaitan konsep dan teori dalam pembangunan MLA untuk kanak-kanak. Oleh itu, kajian ini telah memenuhi empat objektif utama; i) menganalisis dan mengenal pasti model MLA yang berpotensi berkaitan konsep dan teori, ii) membangun dan mengesahkan satu model konseptual dengan menggabungkan semua pembolehubah MLA yang berpotensi berkaitan dengan konsep dan teori, iii) membangun MLA dengan melaksanakan semua elemen yang digabungkan dalam model konseptual, dan iv) menilai MLA dari segi kebolehgunaan dan keberkesanan. Dalam kajian ini, sejumlah lapan pembolehubah iaitu teknologi aplikasi mudah alih, kebolehgunaan, susun atur, kandungan, navigasi, isyarat sentuh, pedagogi dan *scaffolding* yang diperoleh daripada beberapa teori dan konsep yang berkaitan dengan m-pembelajaran dimasukkan ke dalam model konseptual yang dipanggil MobChild. Pengesahan model MobChild menunjukkan bahawa semua pembolehubah dalam MobChild adalah penting dalam membangunkan aplikasi MFolktales. Oleh itu, semua pembolehubah yang membentuk model konseptual dimasukkan ke dalam pembangunan MFolktale. Kemudian, aplikasi ini telah diuji untuk menentukan kebolehgunaan dan keberkesanannya. Untuk tujuan itu, penilaian kebolehgunaan terdiri daripada instrumen soal selidik yang melibatkan 153 responden dan reka bentuk eksperimen Kuasi telah digunakan untuk menentukan keberkesanan aplikasi di kalangan 90 pelajar tadika yang dibahagikan kepada 3 kumpulan. Keputusan yang diperolehi daripada penilaian kebolehgunaan menunjukkan bahawa MFolktales telah berjaya memenuhi kriteria kebolehgunaan, manakala hasil yang dicapai daripada penilaian keberkesanan menunjukkan bahawa pelajar mendapat markah min yang lebih baik apabila MFolktales telah digunakan.

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LIST OF ABBREVIATIONS

2D	Two Dimensional
3D	Three Dimensional
ADDIE	Analysis, Design, Development, Implementation and Evaluation
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
APK	Android Application Package
FRAME	Framework for Rational Analysis of Mobile Education
GUI	Graphical User Interface
HCI	Human Computer and Interaction
HE	Heuristic Evaluation
ICT	Information and Communication Technology
iOS	iPhone Operating System
ISO	International Organization for Standardization
IT	Information Technology
KEMAS	Jabatan Kemajuan Masyarakat
MCMC	Malaysian Communications and Multimedia Commission
MFOLKTALES	Folktales Mobile Application
MLA	Mobile Learning Application
MOBCHILD	Mobile Children Conceptual Model
MOE	Ministry of Education
MXML	Mining Extensible Markup Language
OS	Operating System
PERMATA	Program Asuhan dan Didikan Awal Kanak-Kanak
PC	Personal Computer
PDA	Personal Digital Assistants
PSD	Photoshop Document
RAM	Random Access Memory
SPSS	Statistical Package for the Social Sciences

TDT	Transactional Distance Theory
UEQ	User Experience Questionnaire
USB	Universal Serial Bus
UX	User Experience
XML	Extensible Markup Language

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this globalization age of the 21st century, the vast development in the field of Information and Communication Technology (ICT) has brought numerous changes and influenced how people live in this present world, particularly in the education sector. Education, undeniably, is the starting point in one's life that leads towards the acquisition of knowledge. Hence, in line with the development of ICT, the teaching and learning process via traditional method has begun to take a turning point with the way people acquire, use, and disseminate knowledge. Moreover, the implementation of ICT in the teaching and learning process can aid in achieving the goal of education towards making the process to be more effective and meaningful. Therefore, by distinguishing the role and the function offered by ICT, particularly in the education sector, the community has given profound attention in adopting new approaches to the teaching and learning process mainly to ensure continuous acquisition of knowledge.

Furthermore, the emergence of multimedia technology has been successful to some extent in introducing new impetus in the process of teaching and learning based on ICT. On a more interesting note, multimedia technology offers a variety of new features that have never been offered by previous technology. The present multimedia technology has sparked a new paradigm in education, whereby it has been picked as an alternative medium for the teaching and learning process especially because of its ability to integrate various elements, such as texts, graphics, animation, audio, and video, in a digital environment. In addition, the multimedia technology also incorporates unique features that allow interactivity between the user and the applications developed (Ramli, 2013). Thus, it is beyond doubt that multimedia

technology does make the learning process more interesting and fun because it involves almost all integration of human sensory elements, including hearing, sight, and tactile. This interactive multimedia technology also permits people to interact directly with the computer or the software program to obtain information or knowledge to the extent possible. This technology is certainly more attractive when compared with conventional methods that use printed materials to deliver information (Chiong & Shuler, 2010).

Due to the immense opportunities offered by the multimedia technology, numerous studies have been carried out to develop vast types of multimedia courseware for various reasons in Malaysia. For example, multimedia courseware for slow learners known as "Komputer Saya" (Abdollah et al, 2012), storytelling approach using multimedia courseware (Masri, 2009; Muda, 2006), classifying object multimedia courseware for preschool learners (Aziz et al., 2010), and multimedia courseware for learning Mathematics (Hanim & Zaman, 2008; Zaini & Ahmad, 2011), to name a few. The studies prove that the courseware exemplified some positive effects to the end users. Other than that, the results retrieved from the testing did display some improvement after using the courseware. However, such courseware had its limitation as it can only be accessed at a location equipped with personal computer (PC) or laptop. Moreover, some courseware can be played via compact disc (CD), while the others need to be installed to the computer or laptop before use.

In conjunction to that, a variety of multimedia applications have been developed specifically for teaching and learning by implementing a wide range of approached, including mobile learning application (MLA). Hence, users may utilize mobile devices for educational purposes. This can cater to more passive pursuits, such as reading news; as well as to more proactive pursuits, such as interactive learning. Passive pursuits refer to the fact that mobile devices can provide a less bulky and less wasteful alternative compared to the traditional paper media. Therefore, users can read electronic books through a reader or browse news from a web browser. For example, teachers can display slide presentations to their students rather than merely distributing paper handouts. In addition, visually impaired users or younger users can benefit from the ability of this mobile application to read stories audibly (Bidin &

Ziden, 2013; Sha et al., 2012). On the other hand, interactive pursuits mean that users can utilize their mobile devices to learn in a more proactive and interactive fashion. For example, teachers can use a special software program that can be obtained from Educational Testing Service to post questions to students via mobile devices. Furthermore, the answers attempted by the students can be immediately sent to the teachers, allowing the teacher to provide immediate feedback and personal individual attention.

On top of that, the Mobile Learning Application (MLA) is a mobile learning (mobile learning) category, whereby many studies have highlighted the strengths and the advantages of MLA. The advantages are sharing of teaching and learning materials; learners performing educational tasks based on their own effort; teaching and learning activities can be conducted at any time and any place; and lastly, becoming learning tools in the learning process (Baran, 2014; Cota et al., 2014; Mehdipour & Zerehkafi, 2013). By taking into account the abovementioned advantages of MLA, many angles of the education process can be improved, including attaining academic achievement by learners and institutions, determining the quality of teaching deliverables, improving communications, boosting self-confidence, and many others.

Moreover, the effectiveness of mobile applications in education had made it an alternative medium in both education and learning processes. Furthermore, to ensure that students keep focus on learning, the instructional materials developed in multimedia application employ a variety of exciting and interesting elements, such as audio, video, and animation, which has been proven to enhance understanding and memory of the learning content delivered (Ahmad et al., 2012; Yahaya & Salam, 2014).

Besides, the wider range of capabilities offered by mobile devices has also led to the development of various types of teaching and learning tools. In fact, numerous studies have been conducted on the development of learning content, for instance, learning content to understand Iban language (Chachil et al., 2015), English literature (Masri, 2009), Mathematics (Noordin et al., 2011; Shafie et al., 2011; Zaini & Ahmad, 2011), religious studies (Isa et al., 2010; Yusof, 2012), and children with

disabilities (Kamaruzaman et al., 2016; Skiada et al., 2014). The advancement of mobile phone technologies nowadays has successfully provided a new medium for learning application to be used at any desired time and location. Moreover, the implementation of mobile technologies to the multimedia courseware encourages all target users to be actively involved in the learning process since restrictions involving time and locations are reduced (Corbeil & Valdes-Corbeil, 2007).

In addition, the use of mobile device technologies at present is widespread worldwide. Statistically, 91% of the world population own at least a mobile phone, 56% have smartphones, and 50% of mobile phone users use their devices as primary Internet sources (Hepburn, 2013). Meanwhile, a variety of Android devices can be found in the Malaysian market, allowing users to choose their devices based on their preferences in terms of specifications, brand, and performance. Besides, the cheapest price offered by Android devices compared to other operating systems also makes them a favorite among many Malaysians. Statistics also has displayed that one Android device can be found in almost every Malaysian house (Hepburn, 2013).

This is supported in Figure 1.1 that demonstrates an increasing trend in the usage of Android operating system from 2010 to 2015 (StatCounter, 2016). Android, currently, comprises approximately 81.02% of the mobile devices in Malaysia, while the second is iOS-based devices at 11.92%. Additionally, the graph exhibits that only the Android platform continued to show improvement from year to year, in comparison to the rest. Eventually, the statistics has opened up opportunities to expand access of multimedia courseware from PC to mobile devices, especially via smartphones and tablets.

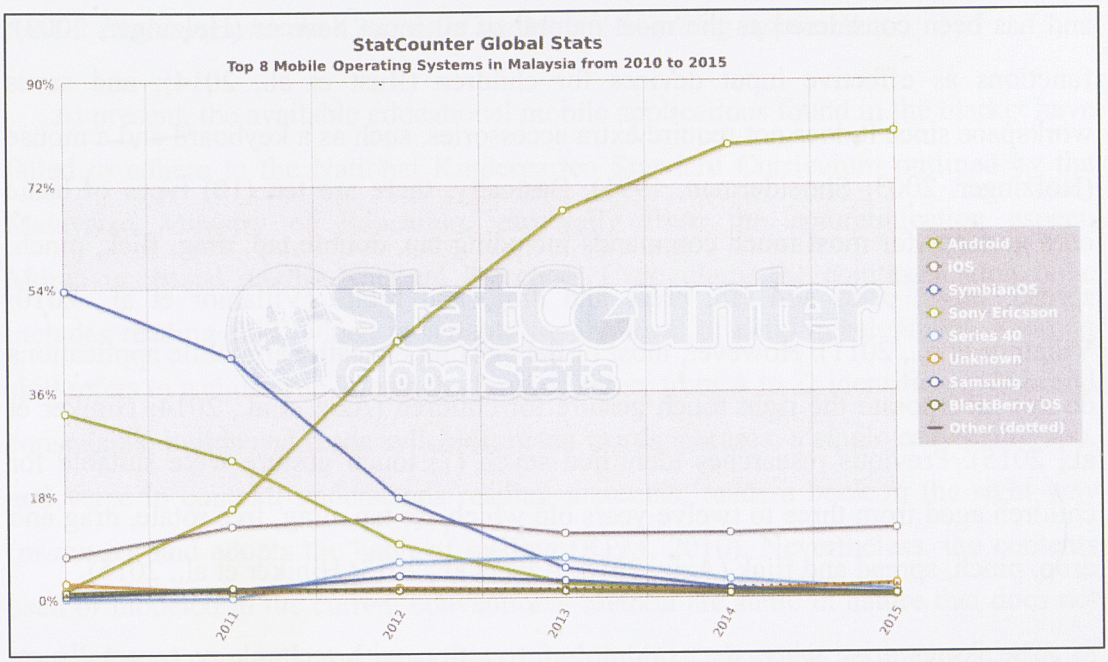

Figure 1.1: Statistics for Android Operating Systems in Malaysia from 2010 to 2015

1.2 Problem Description

This study had been conducted based on the identified technical and non-technical problems and issues. The details of the problems are elaborated in the following:

1.2.1 Problems with the Existing Mobile Learning Applications

As several shortcomings have been determined in the existing mobile applications, this study had been carried out to address those problems and limitations before overcoming those drawbacks with a proposal.

1.2.1.1 Weakness in Selecting the Suitable Touch Gesture for Children

Touch gesture has been proven to give many benefits to its users, including being the fastest pointing device and giving easier hand-eye coordination than mouse or keyboards (Shneiderman, 1991); providing a sense of immersion (Srinivasan & Basdogan, 1997); effectively used for simple applications without prior experience

and has been considered as the most natural of all input devices (Holzinger, 2003); functions as effective input devices for children (Rust et al., 2014); and saves workspace since it does not require extra accessories, such as a keyboard and a mouse (Holzinger, 2003; Shneiderman, 1991). Basically, there are ten (10) types of basic core gestures for most touch commands including tap, double tap, drag, flick, pinch, spread, press, press and tab, press and drag, and rotate (Villamor et al., 2010; Villamor et al., 2011). However, most of the existing educational mobile applications do not incorporate the right touch gesture for children (Aziz et al., 2014; Hiniker et al., 2015). Previous researches identified seven (7) touch gesture were suitable for children aged from three to twelve years old which are tap, drag, free rotate, drag and drop, pinch, spread and flick (Aziz, 2013; Aziz et al., 2013; Hiniker et al., 2015).

The issues arise when the children's interaction with technology especially on touch and gesture input is different from adults. This is because children's arms and fingers are smaller and weaker than adults (Willigen, 2014). Besides, the children's way of controlling their hands and fine motor skills are weaker than adults (Hamza, 2014). The fine motor skills of children differ at different ages and there may be a huge difference in their gesture abilities (Donker & Reitsma, 2007b).

In fact, a study conducted by Segal (2011) found that children who used a touch screen interface (iPad) performed better than those who used a mouse interface. Since touch screen devices have become increasingly a commonplace, touch screen interactions are quickly overtaking other interactions. Segal further suggests that guidelines need to be set for designers and educators on how to develop effective gestural interfaces for the purposes of improving both cognition and learning. However, issues arise when the interaction displayed by children with technology, especially on touch and gesture inputs, differ from those experienced by adults. Such issues that arise are related to the way children control their hands and weaker fine motor skills compared to adults (Hamza, 2014); as well as smaller and weaker arms and fingers of children than adults (Willigen, 2014). Nonetheless, the existing researches carried out by Harris et al., (2009), Michael Cohen Group Llc, (2011), Segal (2011), and Yu et al., (2010), to name a few, do not depict gestures in detail, except for one; Sesame-Workshop (2012).

1.2.1.2 Problems with the Content of the Mobile Learning Application

At present, the available educational mobile applications found in the market have failed to adhere to the National Kindergarten Standard Curriculum outlined by the Malaysian Ministry of Education, especially from the communication aspect. Moreover, based on the National Preschool Curriculum, the communication bone includes reading skill, which is suitable for the level of child development. Reading skill refers to a child who knows the form of letters from A to Z; identifies vowels and consonants; builds and reads syllables; reads words, phrases, a single easy paragraph, and verse in context; understands reading materials; reads a book in the right way (*prabaca*); and adopts the habit of reading (KPM, 2010). Nevertheless, the contents used or modeled in the current conventional method are static in nature that does not change based on user's understanding or their level of expertise, for example, lack of the interactivity feature. Therefore, this study will take the advantage of the extinction of the Malay folktales among young. A mobile learning application will be developed containing 2D Malay folktales animation story and four interactive games modules. This mobile learning application will provide interactive learning processes which include the elements of multimedia.

Furthermore, most of the existing educational mobile applications have failed in achieving the goal in developing educational mobile application (Ahmad et al., 2012). This is because; the companies that usually publish such educational mobile applications only focus on the profit and the commercialization aspects. Moreover, the present mobile application claims educational goals, but it only dispenses information or targets a single objective with limited contents (Ahmad et al., 2012; Technologies, 2015).

According to Shuler et al., (2012) most of educational mobile application in Apple Apps Store are dedicated to early childhood education. Although the developers claimed their application are designed in the way make interesting learning experience, most of the application are lack of the appropriate criteria for children. Table 1.1 illustrated the finding on the disadvantages of existing mobile application for kindergarten early reading.