ANDROID-BASED EDUCATIONAL MATHEMATICS LEARNING APP FOR PRIMARY 4

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FACULTY OF COMPUTING AND INFORMATICS

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DECLARATION

I hereby declare that the material in this thesis is my own except for quotations, summaries and references, which have been duly acknowledged.

14 June 2015 .....

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"Reflect upon your present blessings, of which every man has plenty; not on your past misfortunes, of which all men have some." --- Charles Dickens

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ABSTRACT

Using smartphones and tablets to learn is becoming a growing trend. However, there are not many educational apps on the market. In addition, the target demographic is not clear or focused to a specific group. In GooglePlay Store, it is found that only nine Mathematics learning apps are based on Malaysian school syllabus. Therefore, the objectives of this work are (1) to design an educational Mathematics learning app for primary 4 students based on Malaysia primary school syllabus KSSR model, (2) to develop the educational Mathematics learning app on android platform and (3) to evaluate whether the developed app is effective to help students on Mathematical skills. The methodology uses to develop the app is agile extreme programming development. For software testing, functionality testing is performed in unit testing level whereas user acceptance testing and compatibility testing is performed in acceptance testing level. The advantages of the developed app are more interactive and attractive graphical views. However, limitations are it consists limited questions and large app size.

ABSTRAK

Android-Based Educational Mathematics Learning App for Primary 4

Menggunakan telefon pintar dan tablet untuk belajar menjadi satu trend yang semakin meningkat. Walau bagaimanapun, tidak banyak aplikasi pendidikan terdapat di pasaran. Di samping itu, demografi sasaran tidak jelas atau memberi tumpuan kepada kumpulan tertentu. Dalam GooglePlay Store, didapati bahawa hanya sembilan Matematik aplikasi pembelajaran berdasarkan sukatan pelajaran sekolah Malaysia. Oleh itu, objektif kajian ini ialah (1) untuk mereka bentuk sebuah Matematik pendidikan aplikasi pembelajaran untuk sekolah rendah 4 pelajar berdasarkan sukatan pelajaran sekolah rendah Malaysia model KSSR, (2) untuk membangunkan pendidikan aplikasi Matematik pada platform android dan (3) untuk menilai sama ada aplikasi ini berkesan untuk membantu pelajar dalam kemahiran Matematik. Metodologi yang digunakan untuk membangunkan aplikasi ialah agile extreme programming development*. Untuk ujian perisian, ujian fungsi dilakukan dalam tahap pengujian unit manakala ujian penerimaan pengguna dan ujian keserasian dilakukan dalam tahap ujian penerimaan. Kelebihan aplikasi ini ialah paparan grafik lebih interaktif dan menarik. Walau bagaimanapun, batasan ialah mengandungi soalan yang terhad dan saiz app besar.*

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter introduces on Android-based Educational Mathematics Learning App for Primary 4. This mobile app will be referred to as Mat-tack throughout the thesis. The name of this mobile app origins from the combination and simplification of the words “Math Attack”. Beginning of this chapter presents a brief overview of the problem background on the current mobile educational learning apps, the statistical analysis of the mobile market in Malaysia (UNICEF Malaysia, 2014) and the number of similar educational Mathematics learning apps in GooglePlay Store. Then, the problems are summarized in the problem statement. Objectives of this project and scopes are explained in this chapter. The last section is the organization of the project.

1.2 Problem Background

The development of mobile-based educational learning apps is not a new agenda in this decade. With the availability of development tools and the game engines over the internet, everyone can learn and build a simple learning app. However, to build a successful or effective educational learning app is not easy. Based on the reviews by Balefire Labs which handled by people who are trained on an evaluation system that covers 14 criteria around two metrics, instruction design characteristics and usability, only seven percent scored a grade of A or B among 1,200 educational apps reviewed

(Dian Schaffhauser, 2013). The Balefire Labs Founder and President, Karen Mahon, who is also an educational psychologist, founded her company after becoming frustrated with the thousands of educational apps lacking standards for evaluation and failing to provide meaningful learning outcomes to the children. Research done by Jennifer M. Zosh, Kathy Hirsh-Pasek and Roberta Golinkof on the caution of many apps risk losing what truly educational (2015) also stated that although there are over 80,000 apps marketed as "educational" in the Apple App Store by January 2015, most of these apps are actually not educational. There are currently no scientific standards to guide the determination of a good educational apps. This has left parents and teachers wondering how to differentiate the actual educational apps among all the apps labelled as "educational". Moreover, researchers caution that not using evidence-based design concepts could lead to the development of apps which is good on the surface but has little to no actual educational value.

Cynthia Chiong and Carly Shuler (2010) in their paper stated that the learning study conducted on Rockman et al, an evaluation firm, confirmed that interest in the apps can be fleeting. In the learning study, the firm observed several factors in the two PBS KIDS learning apps that affect playtime and engagement. The firm found that if a younger child found the content of a particular mini-game to be too difficult, he would move on to play a different game. Meanwhile, the older children easily mastered the literacy content and often got bored and stopped playing. Parents also commented on how the game mechanics employed by this app were appropriate for younger children, but the content was not. In short, developmental of appropriate content which fit and focus with the children learning age group is important as it can increase the potential to demonstrate sizable learning gains and making the learning more effective.

According to a report by market research company GfK, during the first three quarters of 2013, the value of smartphone sales in Malaysia was RM7.4 million (US$2.3 million)—which amounts to about 6.4 million smartphone devices purchased.

The most popular smartphone operating system in the country is Android, accounting for 83% of smartphones sold. Apple's iPhones are less popular in the region given their higher prices. Malaysia has a huge potential to promote learning through mobile apps, especially for Android platform due to the popularity of Android Smartphone among Malaysians.

There are variety of similar learning apps developed in other country. However it is lesser in Malaysia. Among all the educational Mathematics learning app found in GooglePlay store, up to May 2015, it is found that only nine apps are designed for primary school students in Malaysia. They are Wonder Bunny Math Race, Wonder Bunny Math 1st Grade, Wonder Bunny Math 2nd Grade, Wonder Bunny Math 3rd Grade, Kids Math Fun, Numbers Out Loud Malaysia, LatihTubi, UPSR and UPSR Matematik 2013.

Hence, there come to the idea of creating an educational Mathematics learning app for primary 4 students in Malaysia. In this project, the author also wish to see how effective the created learning app in enhancing students learning a particular subject. Basically, Mat-tack's questions genre and hardness are based on Malaysian primary school syllabus and KSSR model.

1.3 Problem Statement

1. Most of the apps categorized as educational found in markets are not educational.
2. The app design target demographic is not clear or focusing enough. Those similar apps found in GooglePlay store did not state clearly whether their apps are designed for which age group.
3. Only nine Mathematics learning apps found in GooglePlay Store with Malaysian school syllabus developed in Malaysia.

1.4 Objectives

1. To design an educational Mathematics learning app for primary 4 students.
2. To develop the educational Mathematics learning app on android platform.
3. To evaluate whether the educational Mathematics learning app is effective to help students on their Mathematical skills.

Methods to achieve the objectives:

For objective 1,

- Questions of the quiz are based on Malaysia primary school syllabus KSSR model. Questions get from Praktis+PLUS Matematik Tahun 4 (Lee, 2015), 四年级数学 KSSR 金榜新焦点(Tan, 2015) and Kertas Peperiksaan Sebenar UPSR 2007-2014 (Laman Klasik Resources, 2014).

For objective 2,

- The app is developed using Adobe Dreamweaver CC 2014 and Construct 2.
- Prototypes are tested using emulator with Android SDK and Samsung Smartphone with Android version 4.1.2.
- The app is exported into apk format and can be installed and playable in Android smartphones and tablets.

For objective 3,

- A pre-test and post-test will be set up. Player is required to take the pre-test before starting the app and the post-test after the app. The scores of each test are taken and compared to see the student's improvement.
- 31 students selected students from SK Darau Kota Kinabalu are used as target players in the experiment.

1.5 Project Scope

- Supported operating system or platform of the app: Windows 7 with Android emulator, Smartphone and tablet with Android operating system version 4.1 and above.
- Genre: educational
- Play:
    - The app is designed for Malaysia primary 4 students. Quiz questions, including the genres and difficulties are based on Malaysia's education system KSSR model. Please refer to Chapter 4 for detail explanation.
    - The app has the audio functionality. Player can choose to turn on or off the background music and sound audio before or during the gameplay.
    - The displays are available in three languages. Player can select to view the questions in either English, Chinese or Malay.

To evaluate students' performance:

- A pre-test and a post-test is set up before and after playing the app. Thus the scores are compared to evaluate the performance.

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