



Faculty of Computer Science and Information Technology

***ANDROID MATHEMATICS LEARNING GAME
FOR PRESCHOOL OF AGE 3 TO 5***

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Bachelor of Computer Science with Honours
(Multimedia Computing)
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FOR PRESCHOOL OF AGE 3 TO 5**

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This project is submitted in partial fulfillment of the
requirements for the degree of
Bachelor of Computer Science with Honours (Multimedia Computing)

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UNTUK PRASEKOLAH UMUR 3 KE 5**

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ABSTRACT

The existence of smart phones or tablets should serve as a learning tool rather than an entertainment tool for children. Children should experience effective practices in their early childhood to better mastery their learning skills. Nowadays, the widespread adoption of mobile devices has created large opportunities for mobile learning. However, less practical application has been implemented. By catching the trend, we can create more functionality game especially to children of age 3 to 5, whereby they can enjoy learning through mobile-based educational game. Our purpose in this study is to carry out reviews and studies on the mobile learning development criteria, preschool mathematics learning content, such as number sense and number relationships, and learning method that is most suitable in developing a mobile mathematics learning application that aims to enhance the mathematics knowledge of preschool children. In order to achieve the objectives of this project, the approaches and techniques reviewed will be implemented in the design. An application prototype will be developed by following the steps in the methodology chosen at the end of this project.

ABSTRAK

Kewujudan telefon pintar atau tablet seharusnya bertindak sebagai alat pembelajaran dan bukannya alat hiburan kepada kanak-kanak. Kanak-kanak seharusnya menjalankan aktiviti latihan yang berkesan dalam zaman kanak-kanak untuk penguasaan kemahiran pembelajaran mereka dengan lebih baik. Pada masa kini, penggunaan meluas peranti mudah alih telah mewujudkan peluang besar untuk pembelajaran mudah alih. Walau bagaimanapun, kurang aplikasi praktikal telah dilaksanakan. Dengan menangkap trend, kita boleh mewujudkan lebih banyak permainan terutama kepada kanak-kanak yang berumur 3 hingga 5, di mana mereka boleh menikmati pembelajaran melalui permainan pendidikan berasaskan peranti mudah alih. Tujuan kami dalam kajian ini adalah untuk menjalankan tinjauan dan kajian mengenai kriteria pembangunan pembelajaran peranti mudah alih, pembelajaran konteks prasekolah dalam subjek matematik, seperti bilangan dan hubungan nombor, dan kaedah pembelajaran yang paling sesuai dalam membangunkan matematik aplikasi mudah alih pembelajaran yang bertujuan untuk meningkatkan pengetahuan matematik kanak-kanak prasekolah. Dalam usaha untuk mencapai objektif projek ini, pendekatan dan teknik yang ditakrifkan dalam ulasan dan kajian akan digunakan dalam reka bentuk. Prototaip aplikasi akan dibangunkan dengan mengikuti langkah-langkah dalam metodologi yang dipilih pada akhir projek ini.

CHAPTER 1 INTRODUCTION

1.1 Introduction

Most preschooler enjoys doing mathematics practices in their everyday activity. For example, they count steps as they walk up the staircases, ask parents for buying them one or more toys, comment that this object is longer than the other. These are some of the daily activities that mathematical theories involved.

Nowadays, the widespread adoption of mobile devices has affected our daily life unconsciously. Children especially, followed their parents and people surrounding, mastered the use of smart phones and tablets with astonishing speed. However, the existence of mobile devices should serve as a learning tool rather than an entertainment tool for children. Children should experience effective practices in their early childhood to better mastery their learning skills. By catching the trend, we can create more functionality game especially for children of age 3 to 5, which they can enjoy gaming and learning simultaneously through mobile-based educational game.

The purpose of this project is to assist preschool kids to learn effectively and enhance their numbers and arithmetic knowledge through mobile-based educational game. This project is about to design an Android-based mobile application for the purpose of numbering concept and basic arithmetic theories learning for preschool children. To achieve the aim of this project, research will be

done to identify suitable approaches and techniques used, to design the interfaces and to develop an application prototype at the end of this project.

1.2 Problem Statements

The ubiquity of mobile device has created new opportunities for learning that extends beyond the traditional teacher-led classroom, which is mobile learning (Sharples, 2006). Although researchers have recognized the large potential of mobile learning, less practical applications have been implemented (Lima, Barros Filho, Ribeiro, Andrade, Viana, & Júnior, 2011).

In recent years, there has been growing interest for children with mathematics difficulties. Preschool children nowadays are facing problem with memorizing numbering patterns. Besides, they are facing issue with numeral writing and recognition. For example, some of them tend to reverse the word when writing; especially the digit '3'. They also facing problem on writing whereby they could not write the number word nicely especially there is curving for a certain number word. Meanwhile, they often have difficulties in learning basic of arithmetic. Preschool children should be trained to get familiar with the mathematical operations such as addition and subtraction before attending primary school. On the other hand, parents always play an important part in preschool learning. In this case, parents often need extra material such as paper, graphic or video for effective learning outcome. Thus, a mobile learning application will help parents to better assist their kids throughout the learning process.

1.3 Objectives

The main objective of this project is to effectively arouse the passion of learning and to enhance the numbers and arithmetic knowledge of preschool children through mobile-based educational game. Minor objective of this project includes:

- i. **To assist preschoolers memorize the numbers from 0 to 9**
In this project, preschool children will be able to learn how to write the numbers properly by observing the numbering pattern and the pronunciation for each number word by listening to the audio provided.
- ii. **To train preschool children master the numeral writing skill**
Through this application, they are able to train their writing skill by following the watermarks on the mobile screen.
- iii. **To enhance the arithmetic knowledge in preschool children**
They are going to learn basic addition and subtraction through some counting game in the application.
- iv. **To assist the parents in teaching their preschool children**
This application will help parents to better teach and assist their preschool kids regarding the learning of numbering concepts and simple mathematical theories.

1.4 Scope

The target user of this mobile application is a group of preschool kids. Functionality of this application includes:

i. **Learning numbers from 1 to 10**

Preschool children will be exposed to the numbers through multimedia elements such as graphics and sound. In this case, preschool children will be guided by this application step by step throughout the learning process.

ii. **Numbers writing from 0 to 9**

Kids will be given a guideline on the numbers in this section. They can practice their numeral writing skill by following the guideline.

iii. **Addition**

Preschool children will be given simple addition game to enhance their mathematical calculation skill.

iv. **Subtraction**

On the other hand, simple subtraction game will be included too to train their subtraction skill.

1.5 Significance

This mobile application will help preschool children better understanding the numbering concept and enhance their skill on the mathematical theories. With the help of this application, preschool children could experience learning and gaming simultaneously.

This mobile application also helps preschool children to memorize better. They will get familiar with the numbers if they practice repeatedly through the game with the help of their parents.

Besides, this game also train children to be more focus. By implementing multimedia elements such as graphics, audio and text in the user interface design, children could enjoy playing and learning mathematics theories more effectively at the same time.

1.6 Expected Outcome

The expected outcome will be an application prototype providing mathematics learning game for preschoolers. The application prototype will be available in Android-based device.

1.7 Schedule

There are 8 major stages in the Multimedia Development Life Cycle (MDLC) (Aziz, 2011), which includes:

- i. Planning**
- ii. Requirement and Architecture**
- iii. Storyboarding**
- iv. Content Production**
- v. Authoring**
- vi. Evaluation**
- vii. Deployment**
- viii. Maintenance**

Risks are assessed and resolved throughout the process. It is also important that before progress can be made from one milestone to another, all paths leading to it must be complete. (Please refer Appendix A and B for the Gantt chart of project).

1.8 Conclusion

This android-based mathematics learning game is designed for preschool kids to help them better understanding the basic numbering concept and arithmetic theories. This application will include number words learning, numeral writing and recognition, simple addition and subtraction game. The interface design element includes multimedia elements such as text, graphic and audio to attract the attention of preschool children as well as to help them better memorize and understand the mathematics theories.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter will review on the issues, facts and findings in terms of book, journal, article, website, and other resources. All the issues, facts and findings will be stated clearly and discussed accordingly. First, this chapter will review on the cognitive development of preschoolers which includes how they process information and their learning styles. Then, we will review on the mobile learning application development. The challenges and opportunities of mobile learning in mathematics, the design criteria as well as evaluation criteria for mobile learning application will be further explained. After that, few existing mobile learning applications will be reviewed and compared in terms of the functions provided as well as the design elements applied in the application. The types of learning disabilities in mathematics, instructional approaches and strategies, and the importance of number sense in the development of mathematical concept will be studied and applied in the proposed project.

2.2 Early Childhood Cognitive Development

Cognitive development is the child's ability to learn and solve problems. For example, this includes a five year old learning how to solve simple math questions. In Malaysia, preschool curriculum in general is concept understanding (MOEM,

2001). Under cognitive development section, numbering concept instructions are given to students of age 3 to 5. These include:

- i. Counting objects 1 to 10
- ii. Matching symbols with objects 1 to 10
- iii. Matching the number of objects with symbols of numbers 1 to 10
- iv. Counting 10 to 1 in descending order
- v. Build a series of 20 and so on

Preschoolers usually demonstrate strong interest in learning and curiosity about the world, which prompts them a need to learn many things as fast as possible. However, some of them may become frustrated in learning when they cannot learn as efficiently as older children. Houghton (2013) stated, by structuring the learning situation and goals where children may achieve, at the same time giving guidance and support, children can be exceptionally mature in their ability to process information.

2.2.1 Information Processing

Learning consists of sorting and organizing knowledge or information, as well as coordinating organized information to decide how and when a person should respond (Seifert, 2002). By age of 2 to 5, most children have developed the ability to focus attention for extended periods, recognize previously encountered information, recall old information, and reconstruct it in the present (Oswalt, n.d.). For example,