PERSUASIVE MATHEMATICS COURSEWARE DESIGN MODEL FOR SPECIAL NEED CHILDREN

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This dissertation is dedicated to my family for their endless support and encouragement.

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ABSTRACT

There has been a big growth on number of research of courseware design model for children with special needs. A lot of people interested in this topic. However, there is still lack of courseware design model for children with special needs especially in learning mathematics. Reviews from literatures indicate that content application such as courseware specifically designed to cater for the needs of children with special needs in learning is highly scarce. It is found that most of the existing content applications including courseware have focused on the needs of normal learners, in which most of this courseware means too little to the children with special needs learners with their own problem of learning difficulty. Across many courseware reviewed in this research, only two of them are for learning mathematics. Children with special needs required special module or syllabus that can fit in well with their impairment. Thus, this study aims at studying the core element needed in education courseware for children with special needs. In this study, six courseware components have been proposed; which are Structural Component, Content Composition, Design Guideline, Learning Theory, Learning Approach and Technology. To test the design model, some pre-tests and post-tests, observations and evaluations are conducted. The result of the test shows the improvement in their mathematical skill. In addition, the children have shown positive behaviour change in learning mathematics throughout the testing period. Furthermore, the result has also been acknowledged by expert as a useful learning tool for the children with special needs. In this study, MyMath has been proven to be an effective courseware for learning mathematic among children with special needs.

ABSTRAK

Penyelidikan terhadap reka bentuk model koswer bagi kanak-kanak dengan keperluan khas telah menunjukkan pertumbuhan yang besar. Ramai yang menunjukkan minat terhadap isu ini. Namun, masih terdapat kekurangan dalam reka bentuk model koswer bagi kanak-kanak dengan keperluan khas khususnya dalam pembelajaran matematik. Kajian lituratur menunjukan bahawa kandungan applikasi seperti koswer yang direka khas bagi memenuhi keperluan pembelajaran kanak-kanak dengan keperluan khas adalah sangat terhad. Didapati bahawa, kebanyakan applikasi yang wujud termasuk koswer, lebih mementingkan kepada keperluan pelajar normal, dimana terlalu sedikit koswer untuk kanak-kanak dengan keperluan khas dan masalah pembelajaran yang dihadapi mereka. Setelah pelbagai koswer dikaji menerusi kajian ini, hanya dua koswer yang direka bagi pembelajaran matematik kanak-kanak dengan keperluan khas. Kanak-kanak dengan keperluan khas memerlukan modul pembelajaran yang memenuhi kelemahan dalam pembelajaran mereka. Oleh itu, kajian ini bertujuan untuk mengkaji elemen teras yang diperlukan dalam koswer pendidikan untuk kanak-kanak dengan keperluan khas. Dalam kajian ini, enam komponen koswer telah dicadangkan; ianya adalah Komponen Struktur, Komposisi Kandungan, Garis Panduan Rekaan, Teori Pembelajaran, Kaedah Pembelajaran dan Teknologi. Untuk menguji reka bentuk model, pra- ujian, pasca- ujian, pemerhatian dan penilaian dijalankan. Keputusan dalam ujian menunjukkan peningkatan dalam kemahiran pembelajaran matematik mereka. Di samping itu, kanak-kanak telah menunjukkan perubahan tingkah laku yang positif dalam pembelajaran matematik sepanjang tempoh ujian. Tambahan pula, keputusan ini juga telah diaperakui oleh pakar, dan sebagai alat pembelajaran yang berguna untuk kanak-kanak dengan keperluan khas. Dalam kajian ini, MyMath telah terbukti sebagai koswer yang berkesan untuk pembelajaran matematik di kalangan kanak-kanak dengan keperluan khas.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

There has been a growth of interest in the use of computer technology to support social skills and self-management skills in children with learning difficulties. There are various kinds of disabilities such as Down Syndrome, Autistic Spectrum Disorders etc. These special children have different ways of absorbing what they are learning. They may have their own unique learning difficulties.

The topic for this research is "Persuasive Mathematics Courseware Design Model for children with special needs". This study focuses on the courseware design model for special need children in order to facilitate difficulty of learning faced by them. Based on research, one same application or courseware cannot be used by two or more different groups of special needs learners (Khan, 2010). Lack of the current design model is identified to fulfil the requirement for special education. A list of behaviours and problems of the children with difficulty of learning are listed down to get the big pictures of courseware components needed in the courseware design model that can help this kind of children by the persuasive approach.

Instructional technology for learners has been identified in a number of formats. However, there is still lack courseware for learning purpose specifically for these special children. In special education, instructional technology needs to be

conceptualized as simply as the design of teaching through the complexity of assistive devices.

Persuasive technology or persuasive design is defined as interactive information technology designed for changing users' attitudes or behavior (Fogg, 2003). Traditionally, persuasion is meant for human communication designed to influence the actions and autonomous judgments of others (Simons *et al.* 2001). Persuasive technologies can be adjusted to what they will do based on user needs, inputs, and situations (Fogg, 2003). It is sometimes called captology, which is a term derived from the acronym CAPT which means computers as persuasive technology, as suggested by Fogg in 1996. In short, captology is the study of the problems and possibilities related to the use of computers for persuasive purposes.

This research tries to adopt mobile technology as the development platform for the courseware to encourage mobile learning to benefit the education special need children by using mobile applications (Fernandez-Lopez *et al.,* 2013). Mobile technologies, particularly games, are considered promising in assisting spastic children, such as autism in learning social interactions and developing language skills. However, very few tools are available to target a crucial factor in communication, emotions (Abirached *et al*. 2011). The process of design and development have involved a series of meetings with the assigned teacher alternating it with design work. In the initial stage of design, interview sessions with the teachers are conducted to obtain information on concepts that were taught, what the teachers believed they needed to effectively teach these concepts, and student characteristics that would impact the design. Adopting persuasive approach in the system analysis and design is essential in this project because designing an interactive learning system for users with special needs is a challenge due to needs of inadequate understanding of the life experiences of people with special needs and difficulty of learning (AlSuwaidan *et al*, 2010). Figure 1.1 shows the flow of content for this chapter.

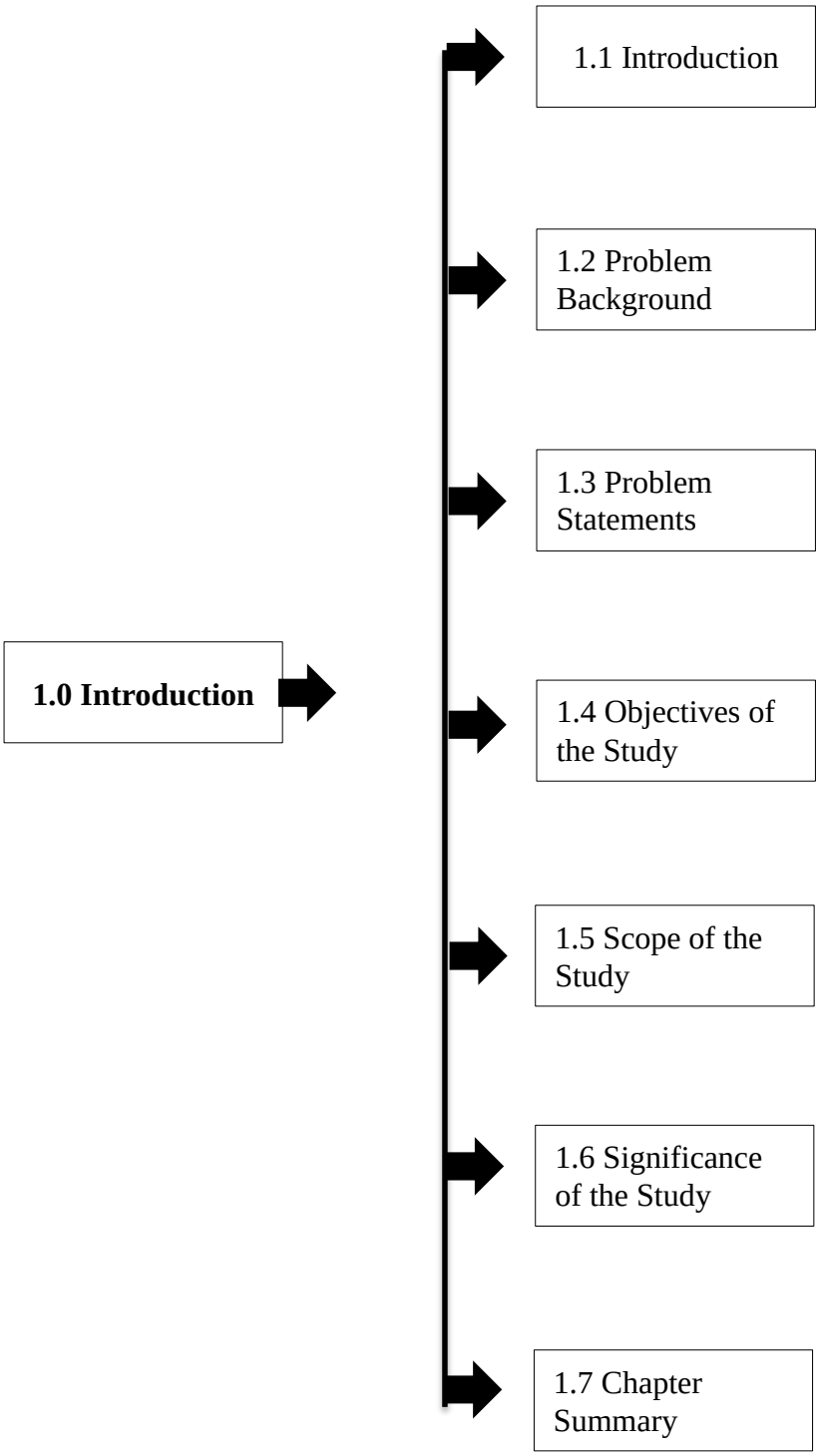

Figure 1.1: Flow chart of Chapter 1.

1.2 Problem Background

In the recent studies towards courseware development for children with special needs, some techniques have been applied for the courseware design, such as Dual Coding Learning (Shafie *et al*., 2013; Abdullah et al., 2009) and Scaffolding Method (Abdullah et al., 2009; Yussof and Zaman, 2011).

An analysis on model design of courseware is important as it should identify their common components to be adapted in the conceptual design (Aziz *et al.*, 2014). However, the same application or courseware cannot be used by two or more different groups of special learners (Khan, 2010). Most of the existing courseware contents are designed to support certain specific needs of the group (Aziz et al., 2015).

Five basic elements in multimedia courseware are course content, learning/pedagogical methods, architecture, course objective and multimedia element have been highlighted (Hossain and Rahman, 2006). This content with the required media elements to be linked with some types of learning/pedagogical methods for the strategy to achieve the expected learning outcomes or course objective (Hossain & Rahman, 2006). Meanwhile, Aziz *et al.*, (2014b) has proposed 8 common components of courseware design model, which are Learning Approach, Structural Component, Technology, Design Guideline, Content Composition, Learning Theory Development Process and Instructional Design (ID) Model. However, the problem identified in this studies is that there are a lot of courseware in the market but mostly designed for a normal learning ability (Abdollah *et al.*, 2012). Even if the courseware content is helpful and suitable, it is still considered less effective as it does not comply with their learning needs.

According to a report by United Nations Children's Fund (UNICEF) (2014), a total of 22,089 children has been registered with special need from 2004 until 2012. They need specific courseware, on highlighted in the literature review; such as SynMax courseware that is designed for Down syndrome Mathematic learning problems. Persuasive design studies the human behaviour and persuades users to

achieve target behaviour (Fogg, 2009). It can help and support their problems; such as learning mathematics, understanding concept of object and poor short term memory.

The proposed courseware design model in this research would serve as a solution for difficulties in learning faced by special need children. With the use of suitable elements in the design model, it is believed that the children learning process can be improved from time to time. Thus, this research aims not only to provide a suitable design model for courseware development, but to observe their behaviours in using the courseware through persuasive design.

1.3 Problem Statements

Based on the brief introduction and research background, some problem statement and question have been identified in this study. Three main problem statements that have been identified are:

I. Special needs children need a special courseware design model to assist their learning difficulty.
II. Courseware design models for normal children have different requirements for its component and learning problem.
III. There are so many models of learning application however; there is a lack of Mathematics design model for special need children.

The problem questions that been points out base on problem statement in this study are:

I. What are the courseware design models that available for special need children?

II. What are the components for Mathematics needed in courseware design model for special need education?

III. What is the suitable Mathematics courseware design model that can be proposed for special need children?

1.4 Objectives of the Study

Research objectives are answer for those problem statements. The objectives that have been identified are as follows:

I. To study the courseware design model for special need children
II. To identify the components for Mathematics courseware design model learning.
III. To propose and test the Mathematics courseware design model appropriate for special need children.

1.5 Scope of the Study

The scope of this study is will be narrowed down to ensure timelines for this research. The scopes for this study are as follows:

i. The area of study is at Sekolah Kebangsaan Taman Desa Skudai in Johor Bharu, Malaysia.
ii. The respondents involved in this study are special children at the age of 7 to 9 years old with difficulty of learning mathematics.
iii. To use mobile applications or courseware as a means of learning Mathematic at an early age and to study their behaviour change in learning.

1.6 Significance of the Study

The significands of this study is summarised as follows:

i. To help targeted group in learn Mathematic using mobile apps.
ii. Develop a suitable learning application for targeted group.
iii. Encourage people to use an application suitable for their learning needs.

1.7 Chapter Summary

This chapter summarizes focus of the research including its objectives, scopes, aims, research purposes and significance. It is important to identify all these information before the research is conducted to ensure that the research is able to benefit the target group.

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