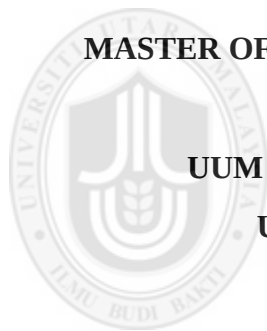


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**NUMBER SENSE EDUCATIONAL GAME DESIGN FOR DYSCALCULIA
AND LOW NUMERACY CHILDREN**

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**MASTER OF SCIENCE (INFORMATIONTECHNOLOGY)
SCHOOL OF COMPUTING
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UNIVERSITI UTARA MALAYSIA**

Universiti Utara Malaysia

**NUMBER SENSE EDUCATIONAL GAME DESIGN FOR DYSCALCULIA
AND LOW NUMERACY CHILDREN**

Thesis submitted to Dean of Awang Had Salleh Graduate School in

Partial Fulfillment of the requirement for the degree

Master of Science in Information Technology

University Utara Malaysia

Hazim Majeed Jasim



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Abstract

Dyscalculia is a specific educational difficulty which affects an individual's acquisition of basic concepts of numbers and prevents them to understand and apply number facts. Dyscalculia can effect on different aspects of learning and performance mathematical skills, but number sense is the most affected issue by Dyscalculia. Studies indicate that approximately 5–8% of school-aged children experience difficulties to understand number sense. Mobile devices with installed educational games help these individuals feel more comfortable and relaxed doing and understanding mathematical skills. The main objective of this study to propose an effective educational game design guideline for learning number sense for Dyscalculia and low numeracy children. The methodology of this study has five stages which are: awareness of problem, suggestion, development, evaluation and conclusion. Every stage involves activities and output. This study also describes the design, implementation, and evaluation of the 123GO app a mobile educational app that is designed and developed based on the guideline. The principle design of 123GO app based on used the interaction design (IxD) that allowed to identify and apply for an educational game app that can be used by children that have difficulties with low numeracy and thus number sense problem. The evaluation of the app suggests that it is useful and easy-to-use. In conclusion, based on the evaluation results, it is found that the 123GO app is effective in helping Dyscalculia children with number sense difficulties.

Abstrak

Diskalkulia merupakan masalah spesifik pembelajaran yang melibatkan perolehan konsep asas nombor dan mengekang mereka daripada memahami dan mengaplikasikan fakta berkenaan nombor. Diskalkulia boleh memberi kesan ke atas pelbagai aspek pembelajaran dan prestasi matematik, namun deriaan nombor (*number sense*) adalah yang paling terkesan oleh Diskalkulia. Beberapa kajian menunjukkan bahawa lebih kurang 5-8% kanak-kanak sekolah mengalami kesukaran untuk memahami deriaan nombor. Peralatan mudah alih yang dimuatkan dengan permainan pembelajaran boleh membantu individu ini merasa lebih selesa dan senang melakukan dan memahami kemahiran matematik. Objektif utama kajian ini ialah untuk mengetengahkan panduan reka bentuk permainan pembelajaran yang efektif bagi mempelajari deriaan nombor kepada kanak-kanak Diskalkulia dan mereka yang mempunyai keupayaan numerasi yang rendah. Metodologi kajian melibatkan lima peringkat iaitu: kesedaran permasalahan, cadangan, pembangunan, penilaian dan kesimpulan. Setiap peringkat melibatkan aktiviti dan output. Kajian ini turut menerangkan tentang reka bentuk, implementasi, dan penilaian terhadap aplikasi 123GO yang direka dan dibangunkan berdasarkan panduan tersebut. Prinsip reka bentuk aplikasi 123GO ialah berasaskan reka bentuk interaksi (IXD) yang boleh diaplikasikan kepada aplikasi permainan pembelajaran yang boleh digunakan oleh kanak-kanak dengan masalah keupayaan numerasi yang rendah dan juga masalah deriaan nombor. Penilaian aplikasi tersebut mencadangkan yang aplikasi ini berguna dan mudah untuk digunakan. Kesimpulannya, berdasarkan keputusan penilaian, aplikasi 123GO ini adalah efektif dalam membantu kanak-kanak dengan kesukaran deriaan nombor.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Dyscalculia means some specific educational difficulties which affects an individual's acquisition of basic concepts of numbers and prevents them to understand and apply the number facts (Mangal, 2007). This difficulty appears in the form of inability to deal with numbers and figures ordering it from top to bottom or from bottom to top and putting them in larger or smaller quantities and understanding them without counting. This leads to problems in learning the facts about numbers and steps to solve arithmetic problems, while some believe that particular mathematical disorder of logical thinking. The first definition of Dyscalculia presented by Kosci (1974) that "the difficulty in the level of mathematic abilities caused by deficiencies exist in parts of the brain responsible for calculating perception without being accompanied by disorders in the general mental functioning

The most prominent symptoms of this difficulty are (Butterworth, 2010):

1. Child has difficulty in accurately counting things.
2. The child finds it difficult to count descending more than finding counting upward.
3. Find it difficult to read successive numbers such as: 376985469396.

The contents of
the thesis is for
internal user
only

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