Faculty of Information and Communication Technology

MULTIPLE-DEFICIT DYSLEXIA SCREENING MOBILE GAME FRAMEWORK

Saifuddin Bin Hj Mohtaram

Doctor of Philosophy

2022

MULTIPLE-DEFICIT DYSLEXIA SCREENING MOBILE GAME FRAMEWORK

SAIFUDDIN BIN HAJI MOHTARAM

A thesis submitted
in fulfillment of the requirements for the degree of Doctor of Philosophy

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I declare that this thesis entitle “Multiple-Deficit Dyslexia Screening Mobile Game Framework” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree.

Signature : .....

Name : Saifuddin Bin Haji Mohtaram

Date : 7 January 2022

APPROVAL

I hereby declare that I have read this dissertation and in my opinion, this dissertation is sufficient in terms of scope and quality as a partial fulfilment of Doctor of Philosophy.

Signature : .....

Name : Assoc. Prof. Dr. Ahmad Naim Bin Che Pee @ Che Hanapi

Date : 9 January 2022

DEDICATION

To my family for the full support, they gave me during my studies.

ABSTRACT

Dyslexia is affecting more than ten per cent of the world population which involve difficulties in reading, writing and spelling. It is categorized as learning difficulties and it is estimated that around 314,000 Malaysian school-going children are dyslexic. One of the key issue facing the education system is the need for early and accurate identification of students with dyslexia. However, the current practice in the Malaysian school system is based on the teacher's observation and initiation before the screening process can be implemented. The issue of ill awareness and untrained teacher is one of the constraints in the screening process. The insufficient number of dyslexic students in the Malaysia schooling system is the proof of its inefficiency and therefore it is a necessity to have a dyslexia screening tool which is simple, accurate and easy to use. The potential impact of early identification of dyslexia in Malaysia is critical with the possibility of a proper remedial program for the dyslexic children and reducing the enrolment into the special need classes. It is a great necessity to develop a simple screening test that could help teachers and parents to diagnose dyslexia symptom in a child based on multiple deficit theories. This study proposes a Multiple-Deficit Dyslexia Screening Mobile Game Framework to overcome this issue by providing a simple screening method using a series of mini-game in the mobile environment which incorporated Multiple-deficit theories of dyslexia and mobile game. The study has been divided into three phases which are (i) Analysis; (ii) Design and Development; and (iii) Implementation and Evaluation. In the analysis phase, all factors and elements related to the dyslexia screening process effectiveness were identified through document review and validated by experts. At the end of these phases, a Multiple deficit framework was proposed. In the design and development phase, the DleksiaGame was designed and developed based on the proposed framework. Besides that, two testing instruments were developed to assess the effectiveness and acceptance of the DleksiaGame which are (i) Game usability testing and the (ii) Serious game acceptance. These testings were conducted separately toward a different group of participants. A pilot study was conducted to ensure that all the instruments are valid and reliable. Finally, pre and post-test with non-equivalent control group design were used in the implementation and evaluation phase to test the screening effectiveness which involves 153 respondents from the Dyslexia Association of Malaysia. All collected data were analysed using SPSS 23.0 software. Findings from the pre and post test indicated that 80 per cent of the dyslexic children were correctly classified and highly motivated to play the DleksiaGame. In conclusion, the proposed MDysS Framework model has shown a positive acceptance among the teacher and the student.

KERANGKA PERMAINAN MUDAH ALIH PELBAGAI DEFISIT UNTUK SARINGAN DISLEKSIA

ABSTRAK

Disleksia mempengaruhi lebih daripada sepuluh peratus populasi dunia yang melibatkan kesukaran membaca, menulis dan mengeja. Ia dikategorikan sebagai kesukaran pembelajaran dan dianggarkan sekitar 314,000 kanak-kanak di Malaysia yang mengidap disleksia. Salah satu masalah utama yang dihadapi oleh sistem pendidikan adalah pengesanan awal pelajar disleksia awal secara tepat. Akan tetapi, amalan semasa dalam sistem persekolahan Malaysia adalah berdasarkan pemerhatian dan inisiatif guru sebelum proses saringan dapat dilaksanakan. Isu kesedaran dan guru yang tidak terlatih adalah salah satu kekangan dalam proses saringan. Jumlah pelajar disleksia yang sedikit dalam sistem persekolahan di Malaysia adalah bukti ketidakcekapannya dan oleh itu adalah menjadi keperluan untuk membangunkan alat saringan disleksia yang mudah, tepat dan senang digunakan. Potensi daripada pengesanan awal disleksia di Malaysia sangat penting dengan kemungkinan program pemulihan yang betul untuk kanak-kanak disleksia dan mengurangkan pendaftaran ke kelas berkeperluan khas. Adalah sangat mustahak untuk mengembangkan ujian saringan yang dapat membantu guru dan ibu bapa untuk mendiagnosis gejala disleksia pada anak berdasarkan teori defisit yang berlainan.Kajian ini mencadangkan Kerangka Permainan Mudah alih Pelbagai Defisit Untuk Saringan Disleksia (MDysS) untuk mengatasi masalah ini dengan menyediakan kaedah penyaringan yang mudah menggunakan satu siri permainan mini di persekitaran mudah alih yang menggabungkan teori-teori Kepelbagaian-defisit mengenai disleksia dan permainan mudah alih. Kajian ini telah dibahagikan kepada tiga fasa iaitu (i) Analisis; (ii) Reka Bentuk dan Pembangunan; dan (iii) Pelaksanaan dan Penilaian. Dalam fasa analisis, semua faktor dan elemen yang berkaitan dengan keberkesanan proses pemeriksaan disleksia dikenal pasti melalui tinjauan dokumen dan disahkan oleh pakar. Pada akhir fasa ini, kerangka Pelbagai defisit diusulkan. Dalam fasa reka bentuk dan pengembangan, DleksiaGame direkabentuk dan dibangunkan berdasarkan kerangka yang dicadangkan. Selain itu, dua instrumen ujian dijalankan untuk menilai keberkesanan dan penerimaan DleksiaGame iaitu (i) Ujian kebolehgunaan permainan dan (ii) Ujian penerimaan pengguna. Ujian ini dilakukan secara berasingan ke atas kumpulan peserta yang berbeza. Kajian rintis dilakukan untuk memastikan bahawa semua instrumen itu sah dan boleh dipercayai. Akhirnya, ujian pra dan pasca dengan reka bentuk kumpulan kawalan bukan setara digunakan dalam fasa pelaksanaan dan penilaian untuk menguji keberkesanan saringan yang melibatkan 153 responden dari Persatuan Disleksia Malaysia. Semua data yang dikumpulkan dianalisis menggunakan perisian SPSS 23.0. Hasil daripada ujian tersebut menunjukkan bahawa 80 peratus kanak-kanak disleksia diklasifikasikan dengan tepat dan kebanyakan para pelajar sangat bermotivasi untuk bermain DleksiaGame. Sebagai kesimpulan, model Kerangka MDysS yang dicadangkan telah menunjukkan penerimaan yang positif di kalangan guru dan pelajar.

ACKNOWLEDGEMENTS

Allah, The Almighty, is the only one deserving of all praise and glory, for He is the only One who can set out paths straight. Mohammad (P.B.U.H.), The Last Prophet of Allah Almighty is the one who shows mankind the path of enlightenment.

I would like to express my deepest gratitude and appreciation to my supervisors, Professor Madya Dr. Ahmad Naim Bin Che Pee @ Che Hanapi, Dr. Abdul Samad Bin Shibgatullah for their invaluable personal and professional guidance. Their wealth of knowledge, advice, and encouragement has made my doctoral endeavour possible. My special thanks to Professor Dr. Abd Samad Hasan Basari (UTeM), Dr. Gede Pramudya Ananta (UTeM), and the late Profesor Dr. Burairah Hussin for their professional advice and encouragement to keep up the momentum to conclude my doctoral journey. My appreciation also goes to many of my friends and colleagues, in particular, Asrar Najib bin Yunos, Zainal bin Abd Kahar, Norazizan bin Mohamed and Mohd Yazid bin Abu Sari for their valuable input and help.

Special thanks to the Ministry of Higher Education and Community College for the scholarship throughout this study. Particularly, I would also like to express my deepest gratitude to Pn Sariah Amirin from the Dyslexia Association of Malaysia for allowing the study to be conducted in PDM. Many thanks to the top management, parents and dyslexic children from PDM Ampang, PDM TTDI, PDM Sungai Petani, PDM Batu Pahat and PDM Johor Bahru for their assistance and cooperation.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES