



**Faculty of Information and Communication Technology**



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# **MULTIPLE-DEFICIT DYSLEXIA SCREENING MOBILE GAME FRAMEWORK**

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



**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.

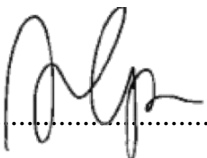
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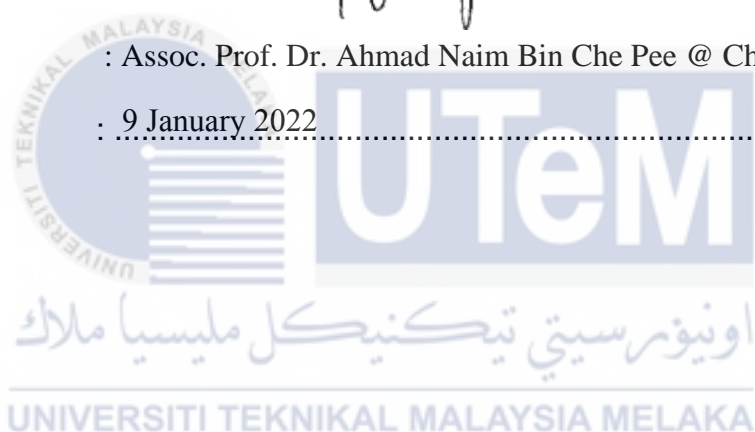
## APPROVAL

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.

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## 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 kebolegunaan 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.*

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## TABLE OF CONTENT

	PAGE
<b>DECLARATION</b>	
<b>APPROVAL</b>	
<b>DEDICATION</b>	
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	ii
<b>ACKNOWLEDGEMENTS</b>	iii
<b>TABLE OF CONTENT</b>	iv
<b>LIST OF TABLES</b>	ix
<b>LIST OF FIGURES</b>	xiv
<b>LIST OF APPENDICES</b>	xix
<b>LIST OF ABBREVIATIONS</b>	xx
<b>LIST OF PUBLICATION</b>	xxi
<b>CHAPTER</b>	
<b>1. INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Research Background	1
1.3 Preliminary Analysis	6
1.4 Research Problem Statement	6
1.5 Research Objective	10
1.6 Research Question	11
1.7 Research Contribution	12
1.8 Research Limitation	12
1.9 Research Scope	13
1.10 Research Approach	14
<b>2. LITERATURE REVIEW</b>	<b>16</b>
2.1 Introduction	16
2.2 Recent development of Dyslexia screening research	16
2.3 Dyslexia	21
2.3.1 Definition of Dyslexia	22
2.3.2 Dyslexia in Malaysia	24
2.3.3 Characteristic of Dyslexic children	28
2.4 Dyslexia Deficit Theories	29
2.4.1 Dyslexia Deficit Theories used in the screening tool	35
2.4.1.1 Phonological Deficit Theory	37
2.4.1.2 Auditory Deficit Theory	39
2.4.1.3 Visual Attention Deficit Theory	40
2.4.1.4 Working Memory Deficit Theory	41
2.4.1.5 Cerebellar Deficit Theory	41
2.4.2 Conclusion of Multiple Deficit Theories	42
2.5 Dyslexia Screening Tool	43
2.5.1 Screening Approach	45
2.5.1.1 Checklist-based Assessment	45
2.5.1.2 IQ and Reading-based Assessment	46

2.5.1.3	Computer-based assessment (CBA)	46
2.5.1.4	Game-based assessment	47
2.5.1.5	Other computerized screening	49
2.5.2	Adaptation of Dyslexia deficit theories in the Dyslexia Screening Tool	50
2.5.3	Accessible dyslexia screening tool in Malaysia	58
2.5.3.1	<i>Instrumen Senarai Semak Disleksia (ISD)</i>	60
2.5.3.2	Dyslexia Association of Malaysia Screening Instrument	61
2.5.4	Conclusion of the Dyslexia Screening Tool	64
2.6	Serious Game	65
2.6.1	What is a serious game?	66
2.6.2	The evolution of serious game as a screening tool for special need	66
2.6.3	Related work of serious game in dyslexia screening	68
2.6.4	The serious game design challenge	75
2.7	Mobile serious game (MSG) framework	78
2.8	Serious Game Engagement	84
2.9	Screening Effectiveness	87
2.10	User's motivation Motivational Strategies in the Serious Game (SG)	91
2.10.1	ARCS Model	94
2.10.2	Type of Motivation	97
2.11	User's acceptance (Serious game Acceptance)	99
2.11.1	Validation of Serious Games Attributes Using the TAM model	101
2.11.2	An Extended TAM for Mobile Social Gaming Service	102
2.11.3	TAM model to study the effect of mobile games	103
2.11.4	Mobile game user adoption model	104
2.11.5	Conclusion of Serious Game Acceptance	105
2.12	Game Usability Testing Method	105
2.13	Summary	109
<b>3.</b>	<b>METHODOLOGY</b>	<b>111</b>
3.1	Introduction	111
3.2	Research Design	112
3.2.1	Concept	115
3.2.2	Prototype Design and Development	115
3.2.3	Implementation and Evaluation	116
3.2.4	Result and Discussion	116
3.3	Theoretical Framework	116
3.3.1	Independent Variable	118
3.3.2	Dependent Variable	119
3.4	Multiple-Deficit Dyslexia Screening Mobile Game Framework (MDysS)	121
3.5	Participants	122
3.5.1	Special need teacher	123
3.5.2	Dyslexic children from DAM	123
3.5.3	Primary School children (suspected to have dyslexia symptoms)	124
3.5.4	Subject Matter Expert and Game Expert	124
3.5.4.1	Dyslexia Screening Expert	124
3.5.4.2	Clinical Psychologist	124
3.5.4.3	Game Expert	125
3.6	Method of data collection	125

3.6.1	Preliminary Questionnaire	126
3.6.2	DleksiaGame Content and Design Validation	127
3.6.3	Gameplay Data Evaluation	127
3.6.4	Student motivation questionnaire	128
3.6.5	Gameplay User Observation rubric	130
3.6.6	Serious Games Acceptances Questionnaire	132
3.7	Development of DleksiaGame	136
3.7.1	Phase 1: Analysis	138
3.7.2	Phase 2: Design	143
3.7.2.1	Selection of the Screening Parameter from the Dyslexia Screening Test	144
3.7.2.2	DleksiaGame Storyboard Design	147
3.7.2.3	Selection of the Motivational variable and Strategies for the DleksiaGame	154
3.7.2.4	Expert Validation	157
3.7.3	Phase 3: Development	160
3.7.3.1	DleksiaGame Prototype development	160
3.7.3.2	Pilot Test	166
3.7.4	Phase 4: Implementation	168
3.7.4.1	Online Configuration	169
3.7.4.2	Expert Review	170
3.7.4.3	Refined MDysS Framework	171
3.7.5	Phase 5: Evaluation	173
3.7.5.1	Testing Procedure	174
3.8	Research Analysis Method	178
3.9	Summary	179
<b>4.</b>	<b>GAME DESIGN</b>	<b>180</b>
4.1	Introduction	180
4.2	Game Architecture	180
4.3	Genre and Theme	181
4.3.1	Genre	182
4.3.2	Theme	183
4.4	UI Aesthetics	184
4.4.1	Colours	185
4.4.2	Font	187
4.4.3	Characters	189
4.5	Technology	190
4.6	Mechanics	191
4.6.1	Actions	193
4.6.2	Objects	200
4.6.3	Space	202
4.6.4	Goals	203
4.6.5	Rules	205
4.7	Game Content	206
4.7.1	Mini-game 1	207
4.7.2	Mini-game 2	207
4.7.3	Mini-game 3	209
4.7.4	Mini-game 4	211

4.7.5	Mini-game 5	213
4.7.6	Mini-game 6	217
4.7.7	Mini-game 7	217
4.7.8	Mini-game 8	219
4.7.9	Mini-game 9	223
4.7.10	Mini-game 10	224
4.8	Integrating Screening Tasks with DleksiaGame	229
4.8.1	Possible Screening Tasks	230
4.8.2	DleksiaGame Screening Tasks	230
4.9	Summary	233
<b>5.</b>	<b>RESULT AND FINDING</b>	<b>234</b>
5.1	Introduction	234
5.2	Preliminary Result Analysis	234
5.2.1	Preliminary Questionnaire	235
5.2.1.1	Identify Teacher's perception towards dyslexia screening process (SP)	236
5.2.1.2	Identify the teacher's experience in the mobile game (GE)	238
5.2.1.3	Identify teacher's perception towards the Mobile game approach as a Dyslexia screening tool (GS)	239
5.2.2	Summary	240
5.3	Expert Review	240
5.4	Data Analysis Result	241
5.4.1	Research Objective 1	242
5.4.1.1	Research Question 1	242
5.4.2	Research Objective 2	245
5.4.2.1	Research Question 2	245
5.4.2.2	Research Question 3	257
5.4.3	Research Objective 4	263
5.4.3.1	Research Question 4	264
5.4.3.2	Research Question 5	274
5.4.3.3	Research Question 6	279
5.4.3.4	Research Question 7	287
5.5	Summary	300
<b>6.</b>	<b>DISCUSSION, CONCLUSION AND RECOMMENDATION</b>	<b>301</b>
6.1	Introduction	301
6.2	Discussion of Result and Findings	301
6.2.1	Mobile Dyslexia Screening Test Parameter	302
6.2.2	Dyslexia Screening Test Mobile Game Development	303
6.2.3	The engagement, the effectiveness and the acceptance of the Mobile Screening Test to classify the dyslexic children	306
6.3	Research Conclusion	311
6.4	Contribution	313
6.4.1	Contribution towards the Predefine Dyslexia Screening Parameter	313
6.4.2	Contribution on the Game Content Design	314
6.4.3	Contribution on the serious game motivational strategy for Dyslexic Children	314
6.4.4	Contribution to the Design Study	315

6.4.5	Contribution to Research Instrument	316
6.4.6	Summary of contribution	317
6.5	Research Limitation	318
6.5.1	Participant	318
6.5.2	Dyslexia screening tool in Malaysia	319
6.6	Future Research	319
6.7	Summary	320
<b>REFERENCES</b>		<b>321</b>
<b>APPENDIX</b>		<b>360</b>



## LIST OF TABLES

TABLE	TITLE	PAGE
1.1	Dyslexia Children Characteristic	2
1.2	Special Education Enrolment	4
1.3	Summaries of research objectives, research questions, research methods and data analysis	14
2.1	Dyslexia by countries	22
2.2	Stage of dyslexia according to Ismail and Zulkurnain (2019)	23
2.3	Scholars' estimation of dyslexia population with 5 % probability	26
2.4	Dyslexia known deficit	28
2.5	Dyslexia deficit theory	30
2.6	Dyslexia theories according to Skills (2004)	31
2.7	The existences of multiple deficits in dyslexia	34
2.8	Fundamental Dyslexia theories	35
2.9	Deficit Theories in the influential Dyslexia screening tool	36
2.10	Example of Dyslexia Screening tool Approaches	43
2.11	Dyslexia screening tool being examined	52
2.12	Matric of investigated Dyslexia screening tool	53
2.13	The mapping of examined Dyslexia screening tool with the Dyslexia deficit theories	57

2.14	The summary of ISD screening motivation	59
2.15	ISD elements and score	60
2.16	DAM tests and score	64
2.17	Serious game for screening/diagnosing	67
2.18	Serious game to screen dyslexia	74
2.19	Serious game challenge	77
2.20	Trend of the Dyslexia screening Research from 2009-2020 (a)	89
2.21	Trend of the Dyslexia screening Research from 2009-2020 (b)	90
2.22	Motivational Strategies in the serious game	92
2.23	The manipulation of the ARCS model	93
2.24	Subcomponent of the ARCS model according to Keller (2010)	97
2.25	The factor of TAM model for Serious Game validation	102
2.26	Extended TAM factors	103
2.27	The Usability factor	106
2.28	Game User Research Methods according to Nacke (2015)	108
3.1	Dependent Variable of MDysS	120
3.2	The distribution of Participant	125
3.3	Method of data collection	126
3.4	Student motivation questionnaire element	129
3.5	Observation criteria	132
3.6	The factor of Serious Game Acceptance	134
3.7	Serious Game Acceptance Questionnaire	135
3.8	DleksiaGame ADDIE Phases	137
3.9	Test Plan for Need Analysis	140
3.10	Test Plan for Content Analysis	141

3.11	Selected Screening Parameter Matrix	142
3.12	The screening parameter and selected Mini-games	146
3.13	Interview result on the DleksiaGame main concept	148
3.14	The DleksiaGame game content	151
3.15	DleksiaGame UI principle	154
3.16	DleksiaGame selected Motivational Variable	155
3.17	ARCS motivation strategies applied in DleksiaGame	156
3.18	Test Plan for Pilot Test	166
3.19	Perception toward the DleksiaGame	167
3.20	Expert review on DleksiaGame	170
3.21	Testing conducted in the Evaluation Phase	174
3.22	Test Plan for Non-equivalent (pre-test and post-test) control group	175
3.23	Test Plan for Game Usability Test- User's motivation Survey	176
3.24	Test Plan for Serious Game Acceptance	178
3.25	MDysS Framework Research Analysis Method	178
4.1	Colour and user's interpretations	186
4.2	DleksiaGame action	194
4.3	DleksiaGame action by domain	199
4.4	Screening Matric used in the DleksiaGame	230
4.5	DleksiaGame Screening Task and Screening Metric	232
5.1	Respondent's Demography	235
5.2	Teacher's knowledge of Dyslexia Screening	236
5.3	Teacher's perception toward dyslexia screening process	237
5.4	Mobile game usage	238
5.5	Teacher's Perception of Mobile Games	239



5.6	Teacher's Perception toward Mobile game Approach (GS)	239
5.7	Expert validation on the screening parameter to be used in MDysS Framework	243
5.8	Mini-games of DleksiGame	248
5.9	Screening Matric used in the DleksiaGame	249
5.10	Non-Phonological Mini-games Screening Matric	251
5.11	Phonological Mini-games Screening Matric	252
5.12	DleksiaGame Score	253
5.13	Dyslexia Screening Expert review	255
5.14	Serious game concept validation	262
5.15	Motivational Survey Demographic	264
5.16	Distribution of responses for Ease of Use (EOU)	267
5.17	Distribution of responses for Usefulness (U)	269
5.18	Distribution of responses for Self-Confidence (SC)	270
5.19	Distribution of responses for Enjoyment (E)	271
5.20	Summaries of the Gameplay Observation	273
5.21	Correlation between Learnability and Playability	277
5.22	Quasi-Experiment Participant	280
5.23	Control group DleksiaGame pre-engagement and post-engagement result	281
5.24	Experiment group 1 DleksiaGame pre-engagement and post-engagement result	282
5.25	Experiment group 2 DleksiaGame pre-engagement and post-engagement result	283
5.26	Categorization of Screening Test	284
5.27	Result of Wilcoxon Signed-Rand test on different group	286
5.28	Participant's Demography	288
5.29	Reliability Test	288
5.30	Distribution of response for Behavioral Intention	289

5.31	Distribution of response for Perceived Usefulness	291
5.32	Distribution of response for Perceived Ease of Use	292
5.33	Model Regression Results with full SEM Analysis of Original model	297
5.34	Model Regression Results with full SEM Analysis of Modified model	297
5.35	Summary of the factor relationship with modified model	298
6.1	Summary of research contribution	317
6.2	Summary of Contribution through Publication	318



## LIST OF FIGURES

FIGURE	TITLE	PAGE
1.1	SNE definition under the Malaysian legal framework	3
1.2	Scope of the study	13
2.1	Comparison of Dyslexia enrolment from 2016 to 2020	25
2.2	Dyslexia Deficit Theories according to Ramus and Ahissar (2012)	33
2.3	The Dyslexia Deficit Theories used in the study	37
2.4	ISD screening procedure adapted from (Ministry of Education of Malaysia, 2011) with the identified educational factor	59
2.5	Screening process at the Dyslexia Association of Malaysia	61
2.6	The entrance procedure at DAM ( <a href="http://www.dyslexiamalaysia.org">www.dyslexiamalaysia.org</a> )	63
2.7	Game genre according to Wikipedia (2018)	65
2.8	Multiplatform games for Dyslexia identification in preschoolers' interface	69
2.9	DIESEL-X tablet game interface	70
2.10	DyTECTIVE game interface	71
2.11	Tucker (2014) platformer game interface	72
2.12	Jarkko Hautala, et al. (2020) digital game base assessment game	73
2.13	GraphoLearn Interface	74
2.14	Legaframework for mobile games	80

2.15	Framework of mobile game design for children with motor disabilities	81
2.16	Mobile learning games framework	82
2.17	Mobile game framework for multiple devices in educations	82
2.18	Percentile of expected effectiveness factor	88
2.19	Motivational Strategies according to (i) Toussaint and Brown (2018) and (ii) Mattheiss et al. (2009)	92
2.20	Intrinsic and Extrinsic Motivation	97
2.21	Original Technology Acceptance Model (TAM) (Davis, 1989)	100
2.22	TAM model for Serious Game by Yusoff et al. (2010)	101
2.23	Extended TAM model by Chen et al. (2017)	103
2.24	Framework to study the mobile game playfulness according to Liang and Yeh (2011)	104
2.25	Mobile game user adoption model by Jiang et al. (2015)	104
3.1	Research Design Framework	114
3.2	Theoretical Framework	117
3.3	Multiple-Deficit Dyslexia Screening Mobile Game Framework (MDysS)	122
3.4	Likert scale using emoji.	129
3.5	Serious Game Acceptance adapted from Yusoff et al. (2010)	133
3.6	DleksiaGame Development Model	138
3.7	The Analysis Phase	139
3.8	The Design Phase	144
3.9	Comparison between Sea Quest Concept and House Development Concept	148
3.10	The storyline of DleksiaGame journey.	150
3.11	Age-specific for a different level of the mini-game	152
3.12	Motivational Variable of DleksiaGame	155

3.13	The Development Phase	161
3.14	Iteration process in DleksiaGame	164
3.15	Game Content domains	165
3.16	The Implementation Phase	169
3.17	Refined MDysS Framework	172
3.18	The Evaluation Phase	173
4.1	DleksiaGame Architecture	181
4.2	The DleksiaGame main interface with aesthetic design	185
4.3	DleksiaGame final design (b) compared to initial prototype design (a)	185
4.4	The Background colour scheme of the game	186
4.5	The Foreground colour scheme of the game	186
4.6	Screenshot of mini-games ' <i>Pilihan Sepat</i> ' with different colour schemes.	187
4.7	Open Dyslexic typeface.	187
4.8	Comparison between double-story lowercase and single story lowercase a	188
4.9	Different typeface before and after expert review on DleksiaGame	188
4.10	The game character ' <i>Sepat</i> '	189
4.11	' <i>Sepat</i> ' with sad emotion	189
4.12	The narrator of the game	190
4.13	Game element and mechanics according to Schell (2014)	192
4.14	Selected gesture for DleksiaGame	194
4.15	Touch gesture in the Mini-game <i>Pilihan Sepat</i>	195
4.16	The visual keyboard for phonological testing	195
4.17	The Drag gesture used in the <i>Teka-teki Ikan</i> mini-games	196
4.18	The game objects are being dragged from bottom to upper location	197
4.19	Drag gesture in the ' <i>Suaikan nombor</i> ' mini-games	197

4.20	The mini-game <i>Mutiara Hitam dan Putih</i> using tilt-gesture	198
4.21	Static game object in mini-game ‘Pilihan Sepat’	201
4.22	Dynamic game object in mini-game ‘ <i>Mutiara Hitam dan Putih</i> ’	202
4.23	The mini-game with discrete space	203
4.24	User view of DleksiaGame at level 6.	205
4.25	DleksiaGame content	206
4.26	Mini-games <i>Pilihan Sepat</i> interface	207
4.27	Mini-games <i>Laluan sempit</i> interface	208
4.28	Mini-games <i>Laluan merbahaya</i> interface	208
4.29	Mini-games <i>Rakan berpasangan</i> interface	209
4.30	Mini-games <i>Ikan dalam susunan</i> interface	210
4.31	Mini-games <i>Memori Sepat</i> interface	211
4.32	Mini-games <i>Susunan abjad ikan</i> interface	212
4.33	Mini-games <i>Susunan haiwan</i> interface	212
4.34	Mini-games <i>Susunan objek</i> interface	213
4.35	Mini-games <i>Warna dan bunyi</i> interface	214
4.36	Mini-games <i>Ikan yang sama</i> interface	215
4.37	Mini-games <i>Ingatan nombor</i> interface	216
4.38	Mini-games <i>Ingatan nombor terbalik</i> interface	216
4.39	Mini-games <i>Cari ikan yang berbeza</i> interface	217
4.40	Mini-games <i>Hapuskan ikan yang jahat</i> interface	218
4.41	Mini-games <i>Mutiara hitam dan putih</i> interface	218
4.42	Mini-games <i>Kira mutiara</i> interface	219
4.43	Mini-games <i>Cari nombor yang betul</i> interface	221
4.44	Mini-games <i>Suaikan nombor yang betul</i> interface	223

4.45	Mini-games <i>Bunyi huruf</i> interface	223
4.46	Mini-games <i>Bunyi vokal</i> interface	224
4.47	Mini-games <i>Corak huruf</i> interface	225
4.48	Mini-games <i>Suaikan sukukata</i> interface	228
4.49	Mini-games <i>Sepat mengeja</i> interface	229
5.1	Integration of Screening Parameter and the Game approach of MDysS Framework	246
5.2	Dleksagame Screening Algorithm	250
5.3	Version of MDysS Framework	256
5.4	DleksiaGame user interface development processes	258
5.5	Motivational factor and Design Consideration of the MDysS Framework	259
5.6	The motivational factor, variable and strategies	259
5.7	Player's Motivation	265
5.8	Percentage of DleksiaGame overall response	266
5.9	Scatter Plot between Learnability and Usefulness, Self-Confident and Enjoyment	278
5.10	Percentage of Behavioral Intention	290
5.11	Percentage of Perceived Usefulness	291
5.12	Percentage of Perceived Ease of Use	293
5.13	TAM model for Serious Game by Yusoff et al. (2010) with selected changes	294
5.14	Result of Structural Equation Model Testing of Original Model	296

## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Survey Questionnaire For Preliminary Analysis	360
B	Screening Parameter Expert Validation	364
C	Motivation Survey Questionnaire	367
D	Online Data Collection	370
E	Gameplay Observation Rubric	371
F	User Acceptance Questionnaire	372
G	Game Content Validation (Dyslexia Screening Expert)	375
H	Game Design Validation	378
I	Parental Consent	380
J	Dam Dyslexia Screening Report (Ahmad Hafezuddin Bin Saifuddin)	381
K	Pilot Test Question And Result	383
L	Initial Game Concept	384
M	List Of Expert	385
N	Online Data Collection	386
O	Modified Sem Model	389