

**SUSTAINABLE GAME DESIGN (SUSGAD) FRAMEWORK  
FOR GAME-BASED LEARNING DEVELOPMENT  
(i-TAJWEED) TO MOTIVATE STUDENTS  
IN LEARNING TAJWEED**

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**UNIVERSITI SAINS ISLAM MALAYSIA**

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Thesis submitted in partial fulfilment for the degree of  
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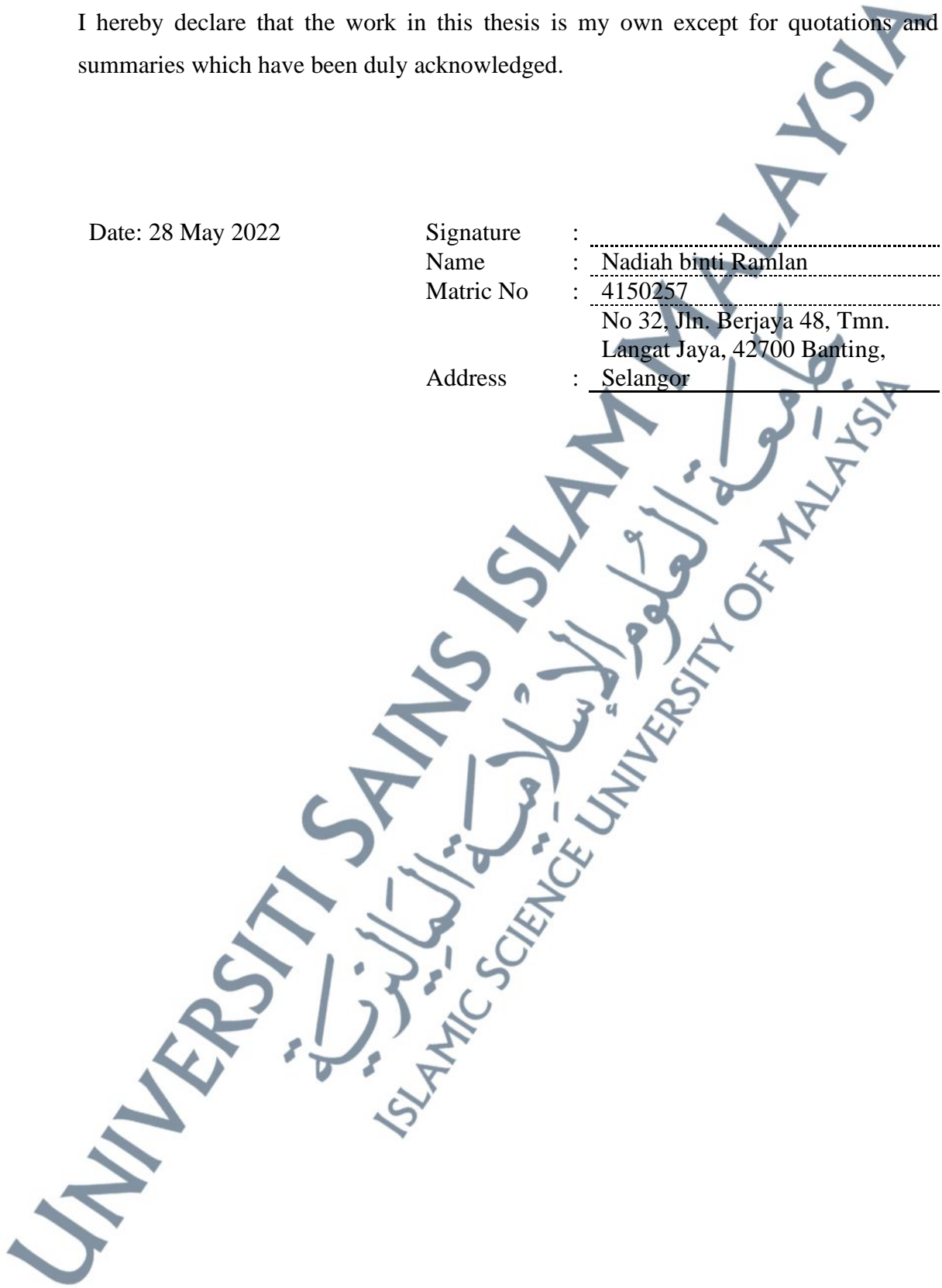
MAY 2022

## AUTHOR DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

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## ABSTRAK

Terdapat banyak kajian berkaitan kelestarian telah dijalankan dalam pelbagai bidang. Walau bagaimanapun, kajian yang sedia ada lebih tertumpu kepada kesan terhadap produk dalam domain kejuruteraan perisian dan bukannya terhadap elemen kelestarian dalam proses pembangunan. Memandangkan reka bentuk permainan merupakan aspek penting ke arah keberkesanan pelaksanaan sesuatu permainan berasaskan pembelajaran (GBL), kajian konseptual mengenai elemen kelestarian dalam reka bentuk permainan adalah diperlukan. Oleh itu, tiga objektif kajian telah dirangka seperti berikut: 1) Mengenal pasti elemen kelestarian dalam permainan berasaskan pembelajaran (GBL) untuk pembelajaran Tajwid, 2) Membangunkan permainan interaktif tajwid menggunakan elemen kelestarian yang telah dipilih, 3) Menilai impak permainan berasaskan pembelajaran (GBL) terhadap: a) Motivasi murid, b) Pencapaian murid dan, c) elemen kelestarian dalam permainan berasaskan pembelajaran. Pendekatan reka bentuk dan pembangunan (DDR) telah digunakan dalam kajian ini yang mana melibatkan tiga fasa. Model ADDIE (Analyze, Design, Develop, Implement and Evaluate) telah digunakan dalam proses mereka bentuk dan membangunkan permainan. Fasa pertama DDR melibatkan analisis keperluan untuk mengenal pasti elemen kelestarian. Enam elemen kelestarian yang dipilih telah dinamakan sebagai kandungan yang relevan, reka bentuk antara muka, cara permainan, kebolegunaan, ganjaran dan motivasi telah disahkan oleh enam pakar melalui temu bual separa berstruktur. Pada masa yang sama, fasa kedua telah melibatkan proses reka bentuk dan pembangunan prototaip yang dinamakan i-Tajweed. Elemen kelestarian, Teori Kognitif Pembelajaran Multimedia (CTML), model reka bentuk pengajaran (ID), dan teknik motivasi Nabi telah disepadukan ke dalam i-Tajweed. Fasa ketiga melibatkan penilaian prototaip dan pengesahan elemen kelestarian dengan menjalankan Kuasi-Eksperimen. Analisis inferensi yang digunakan ialah ujian-t dan ujian korelasi Pearson. Dapatan analisis ujian-t sampel bebas menunjukkan terdapat perbezaan yang signifikan dalam pencapaian pelajar antara kumpulan kawalan dan kumpulan rawatan, dengan nilai signifikan yang diperolehi ialah .002 ( $p < .05$ ). Bagi hasil analisis korelasi Pearson pula, hubungan yang signifikan ditunjukkan antara aspek kelestarian dengan pencapaian pelajar selepas pendedahan kepada GBL dalam pembelajaran Tajwid, dengan nilai signifikan yang diperolehi ialah .018 ( $p < .05$ ). Begitu juga dengan aspek motivasi dan aspek pencapaian pelajar selepas didedahkan dengan GBL dalam pembelajaran Tajwid juga menunjukkan terdapat hubungan di antara kedua-duanya iaitu dengan nilai signifikan yang diperolehi ialah .016 ( $p < .05$ ). Kesimpulannya, dapatan kajian menunjukkan bahawa penggunaan GBL dalam pembelajaran Tajwid dapat meningkatkan motivasi pelajar dan seterusnya meningkatkan pencapaian pelajar dalam pembelajaran Tajwid.

## ABSTRACT

Many studies related to sustainability have been conducted in numerous fields. However, existing studies in sustainability focus more on the product's environmental impact of the software engineering domain than sustainability elements in the development process. Since game design is a crucial aspect towards the successful implementation of game-based learning (GBL), the conceptual research on sustainability elements in game design is needed. Therefore, three research objectives were formulated as follows: 1) To identify sustainability elements for GBL in learning Tajweed, 2) To develop interactive GBL in Tajweed using the selected sustainability elements, 3) To evaluate the impact of games-based learning on students' motivation, students' achievement and, sustainability elements in GBL. The design and development research (DDR) approach has been utilized in this research by dividing into three phases. ADDIE model (Analyze, Design, Develop, Implement and Evaluate) was used in the process of designing and developing the game. The first phase in DDR involved the need analysis in identifying the sustainability elements. Six sustainability elements, named relevant content, interface design, gameplay, usability, reward, and motivation, have been constructed, designed and validated by eight experts through semi-structured interviews. At the same time, the second phase involved the design and development of a prototype named i-Tajweed. The sustainability elements, Cognitive Theory of Multimedia Learning (CTML), model of instructional design (ID), and motivational technique has been integrated into i-Tajweed. The third phase involved evaluating the prototype and verifying the sustainability elements by conducting the Quasi-Experiment. The inferential analysis used was the t-test and Pearson correlation test. The findings of the independent sample t-test analysis showed that there was a significant difference in students' achievement between the control group and the treatment group, with a significant value obtained being .002 ( $p < .05$ ). For the results of Pearson correlation analysis, a significant relationship was shown between sustainability aspects with students' achievement after exposure to GBL in Tajweed learning, with a significant value obtained being .018 ( $p < .05$ ). Similarly, there was a relationship between the element of motivation and student's achievement after being exposed to GBL in Tajweed learning, with the significant value reached being .016 ( $p < .05$ ). In conclusion, the results show that the use of GBL in learning Tajweed can increase student motivation and, in turn, improve student achievement in learning Tajweed.

## المخلص

تم إجراء العديد من الدراسات المتعلقة بالاستدامة في مجالات مختلفة. ومع ذلك، أن الدراسات الحالية في مجال الاستدامة تركز بشكل أكبر على التأثير البيئي للمنتج في مجال هندسة البرمجيات بدلاً من عناصر الاستدامة في عملية التطوير. نظرًا لأن تصميم اللعبة يمثل جانبًا مهمًا نحو التنفيذ الناجح للتعليم المستند إلى الألعاب (GBL)، إن الدراسة المفاهيمية حول عناصر الاستدامة في تصميم الألعاب ضرورية. لذلك، تمت صياغة ثلاثة أهداف بحثية على النحو التالي : (1) لمعرفة عناصر الاستدامة للتعليم القائم على الألعاب (GBL) في تعلم التجويد، (2) لتطوير التعلم التفاعلي القائم على الألعاب في تعلم التجويد باستخدام عناصر الاستدامة المختارة، (3) لتقييم تأثير التعلم القائم على الألعاب على: (أ) تحفيز الطلاب، (ب) إنجازات الطلاب، (ج) عناصر الاستدامة في التعلم القائم على الألعاب. تم استخدام منهجية بحث التصميم والتطوير (DDR) في إجراء الدراسة مقسمة إلى ثلاث مراحل. مستخدمًا نموذج أدي " ADDIE model " (التحليل والتصميم والتطوير والتنفيذ والتقييم) في عملية تصميم اللعبة وتطويرها. تضمنت المرحلة الأولى في (DDR) تحليل الحاجة في تحديد عناصر الاستدامة. ستة عناصر لتصميم ألعاب الاستدامة والتي تم تسميتها بالمحتوى ذي الصلة، وتصميم الواجهة، واللعب، وقابلية الاستخدام، والمكافأة، والتحفيز، تم إنشاؤها وتصميمها والتحقق من صحتها من قبل ستة خبراء من خلال مقابلة شبه منظمة. في الوقت نفسه، تضمنت المرحلة الثانية تصميم وتطوير نموذج أولي يسمى i-Tajweed. تم دمج عناصر الاستدامة والنظرية المعرفية لتعلم الوسائط المتعددة (CTML) ونموذج التصميم التعليمي (ID) والتقنية التحفيزية في i-Tajweed. تضمنت المرحلة الثالثة تقييم النموذج الأولي والتحقق من عناصر الاستدامة من خلال إجراء شبه تجربة. كان التحليل الاستنتاجي المستخدم هو اختبار ت (t-test) واختبار معامل ارتباط بيرسون. أظهرت نتائج تحليل اختبار t للعينة المستقلة أن هناك فرقًا معنويًا في تحصيل الطلاب بين المجموعة الضابطة والمجموعة التجريبية المعرضة لـ GBL في تعلم التجويد، حيث تم الحصول على قيمة معنوية تبلغ  $p < 0.05$  002. بالنسبة لنتائج تحليل ارتباط بيرسون، ظهرت علاقة مهمة بين جوانب الاستدامة مع تحصيل الطلاب بعد التعرض لـ GBL في تعلم التجويد، حيث تم الحصول على قيمة معنوية تبلغ  $p < 0.05$  018. وبالمثل، فإن جانب التحفيز مع جانب تحصيل الطالب بعد التعرض لـ GBL في تعلم التجويد أظهر أيضًا أن هناك علاقة بين الاثنين، مع القيمة المعنوية التي تم الحصول عليها  $p < 0.05$  016. في الختام، تظهر النتائج أن استخدام GBL في تعلم التجويد يمكن أن يزيد من تحفيز الطلاب، وبالتالي تحسين تحصيل الطلاب في تعلم التجويد.

## TABLE OF CONTENTS

CONTENT	PAGE
AUTHOR DECLARATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRAK	iv
ABSTRACT	v
AL-MULAKHKHAS	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xii
LIST OF FIGURES	xv
LIST OF APPENDICES	xvii
LIST OF ABBREVIATIONS	xviii
CHAPTER 1: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	3
1.3 Research Gap	8
1.4 Research Questions	10
1.5 Research Purpose	10
1.6 Research Objectives	10
1.7 Hypothesis	11
1.8 Research Scope	12
1.9 Operational Definition	13
1.10 Research Significance	15
1.11 Research Organization	17
CHAPTER 2: LITERATURE REVIEW	19
2.1 Overview	19
2.2 Educational Games in Education System	19
2.2.1 Teaching and Learning in the Industry Revolution (IR 4.0)	20
2.2.2 The Advantages of Games in Education	23
2.2.3 The Comparison of Games Evolution	26
2.3 Game-based learning (GBL)	30
2.3.1 Classification of Games	34
2.3.2 Genre on a Computer Game for Education	35
2.3.3 Comparison of GBL in the Marketplace	37
2.4 Game Development and Design	40
2.4.1 Components of the Game	41
2.4.2 Game Characteristics	43
2.4.3 Game Development Framework (GDF)	45
2.5 Sustainability Elements in Software Development and Game Development	46
2.5.1 Sustainability Elements in Software Development	46
2.5.2 Sustainability Elements in Game Development	49
2.5.3 Game Development Approach	53
2.5.3.1 Steps in Identifying the Sustainability Elements	55

2.6	Theories about Games That are Related to Design and Development	63
2.6.1	Models of Instructional Design (ID)	63
2.6.1.1	ADDIE Model	65
2.6.1.2	Hannafin and Peck Design Model	66
2.6.2	Instructional Strategy	66
2.6.3	Games Development Model	70
2.6.3.1	Game Model of Input-Process-Outcome	70
2.6.3.2	Game Design Life Cycle Model (GDLC)	72
2.6.4	Multimedia and Learning Theory	75
2.6.4.1	Cognitive Learning Theory	76
2.6.4.2	Cognitive Theory of Multimedia Learning (CTML)	76
2.6.4.3	Gagne's 9 Events of Instruction	77
2.6.5	Motivation Theories	78
2.6.5.1	ARCS Model	78
2.6.5.2	Maslow Theory of Motivation	79
2.6.5.3	Motivation Technique of Prophet Muhammad pbuh	80
2.6.5.4	Motivational Elements that are Used for This Research	83
2.7	Game Tajweed Research	84
2.7.1	Teaching and Learning Tajweed	84
2.7.2	Learning Tajweed in a Digital Environment	87
2.7.3	Tajweed Games Application Comparisons	88
2.7.4	GDF for i-Tajweed	89
2.8	Design and Development Research (DDR)	91
2.9	Theoretical Framework	93
2.10	Summary	97
CHAPTER 3: METHODOLOGY		98
3.1	Overview	98
3.2	Research Design	98
3.3	Research Framework	102
3.3.1	Analysis	105
3.3.1.1	Interview with Experts	106
3.3.2	Design	107
3.3.3	Development	109
3.3.4	Implementation	110
3.3.5	Evaluation	112
3.4	Data Collection Technique	113
3.5	Population and Sampling	116
3.5.1	Population	116
3.5.2	Sample	118
3.5.3	Simple Random Sampling	118
3.6	Research Instruments	120
3.6.1	Instruments Development	120
3.6.2	Instrument Validity and Content Validity	122
3.6.3	Pilot Test Implementation	123

3.6.4	Validity and Reliability	127
3.6.4.1	The Validation of the i-Tajweed Game	128
3.6.4.2	Advantages of Multi-Method	129
3.7	Research Procedures	130
3.7.1	Procedure	130
3.7.2	Step by Step Research Procedures	132
3.8	Data Analysis	133
3.9	Summary	135
CHAPTER 4: GAME DESIGN AND DEVELOPMENT		136
4.1	Overview	136
4.2	The Design and Development Process of the i-Tajweed Game	136
4.2.1	The Design Phase	136
4.2.1.1	Need Analysis	138
4.2.2	Learning Theories Embodied in the i-Tajweed Game	138
4.2.2.1	Applying Gagne's 9 Events of Instruction in i-Tajweed Game	139
4.2.3	Employing Game Component in i-Tajweed	142
4.2.3.2	Gameplay Mechanics	144
4.2.4	Designing Game Development Document (GDD)	148
4.2.4.1	Design Project Timeline	149
4.2.4.2	Designing the Canvas of Storyboard of i-Tajweed Game	150
4.2.4.3	Design Principles (DP)	152
4.3	Development Phase of the i-Tajweed Game	153
4.3.1	Pre-Production Stage	153
4.3.1.1	Main Development Tools Used in Designing i-Tajweed Game	154
4.3.2	Production Stage	156
4.3.2.1	i-Tajweed Gameplay with the Explanation	159
4.4	Implementation Phase	162
4.5	Evaluation Phase:	163
4.6	The output of i-Tajweed game	164
4.6.1	Opening Screen	164
4.6.2	Main Menu Screen	164
4.6.3	Gameplay Screen	165
4.6.4	Pause Screen	166
4.6.5	Main Topic Screen	167
4.6.6	Motivation Screen	168
4.6.7	Reward Screen	169
4.7	Evaluation of Sustainability Elements in Game Design	169
4.8	Summary	170
CHAPTER 5: FINDINGS		171
5.1	Overview	171
5.2	Demographic of the Respondents	171
5.2.1	Gender for Control Group	171
5.2.2	Gender for Treatment Group	172
5.3	Student's Achievement in Learning Tajweed	173

5.3.1	Student`s Achievement in Learning Tajweed for Control Group	174
5.3.2	Student`s Achievement in Learning Tajweed for Treatment Group	175
5.3.3	Total Gender	176
5.3.4	Comparison of Student`s Achievement in Learning Tajweed between Control Group and Treatment Group	177
5.4	The Findings for Experimental Design	178
5.4.1	Descriptive Analysis	178
5.4.1.1	Descriptive Analysis of Mean Values of Sustainability and Motivation Aspects for the Control group	179
5.4.1.2	Descriptive Analysis of Mean Values of Sustainability and Motivation Aspects for Treatment Group (TG) Tested with GBL in Tajweed Learning	185
5.5	Result for Normality Test	191
5.5.1	Normality for Sustainability Elements and Motivation for Control Group and Treatment Group (Pre - Test)	192
5.5.2	Normality for Sustainability Aspects of Motivation for Control Group and Treatment Group (Post Test)	193
5.6	Inferential Analysis	194
5.6.1	t-Test analysis	194
5.6.1.1	Hypothesis Testing 1	195
5.6.2	Correlation Analysis	197
5.6.2.1	Hypothesis Testing 2	197
5.6.2.2	Hypothesis Testing 3	198
5.6.2.3	Summary of Hypothesis Testing in the Research	199
5.7	Experts` Evaluation on i-Tajweed Game	200
5.7.1	The Validity Value of the Questionnaire	201
5.8	Summary	203
CHAPTER 6: DISCUSSION, RECOMMENDATIONS, AND CONCLUSION		205
6.1	Overview	205
6.2	Research Summarization	205
6.3	Discussion	207
6.3.1	Sustainability Elements in Game Design	211
6.3.2	Design and development of an interactive game (i-Tajweed) and its advantages	212
6.3.3	Evaluation of the Sustainability Elements in Game Design Toward Motivation and Student Achievement	214
6.4	Research Output	216
6.4.1	Sustainability Elements	216
6.4.2	Sustainable Game Design Framework	217
6.4.3	i-Tajweed Game	217
6.5	Contribution of the Research	218
6.5.1	Empirical Implications	218

6.5.2	Theoretical Implications	220
6.5.3	Practical	222
6.6	Recommendation for Future Works	224
6.6.1	The Domain of Knowledge in a Designing Framework	224
6.6.2	Theories or Models	224
6.6.3	Gameplay Method	225
6.6.4	Method of Data Collection	225
6.6.5	Respondents of the Research	226
6.6.6	Other Context	226
6.6.7	Web-based Platform	226
6.7	Concluding Remarks	227
	REFERENCES	229
	APPENDICES	248

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## LIST OF TABLES

<b>Table</b>	<b>Page</b>
<b>Table 1.1:</b> j-QAF Percentage in Year 2019-2020 (For Standard Six)	6
<b>Table 1.2:</b> Summary of the Problem Statement and Proposed Solution	7
<b>Table 1.3:</b> Summary of the Research Gap	9
<b>Table 2.1:</b> Comparison of the Evolution of Games	28
<b>Table 2.2:</b> The Comparison of Four Types of Game with Example	39
<b>Table 2.3:</b> The Area of Sustainability Research for the Various Field, Classification, and Game Design	51
<b>Table 2.4:</b> Game Development Approach	54
<b>Table 2.5:</b> Sustainability Guidelines Used in the Research	55
<b>Table 2.6:</b> Number of Articles and Searching String	57
<b>Table 2.7:</b> Search Results from the Digital Database	58
<b>Table 2.8:</b> Explanation on Six Sustainability Elements Used in the Research	61
<b>Table 2.9:</b> Prophet Muhammad Pbuh Motivation Techniques	80
<b>Table 2.10:</b> Motivation Elements and Their Impacts Used in i-Tajweed	83
<b>Table 2.11:</b> Analysis of students' achievement (Year 6), JQAF in Kuala Langat District ( <i>Model Khatam Quran</i> ) 2017-2019	86
<b>Table 2.12:</b> Type 2 of DDR	92
<b>Table 3.1:</b> Research Design	100
<b>Table 3.2:</b> DDR and ADDIE Model Relationship	101
<b>Table 3.3:</b> Application Gagne Nine Event of Instruction in i-Tajweed	108
<b>Table 3.4:</b> Research Design and Data Collection	115
<b>Table 3.5:</b> Summary Sample of Research	119
<b>Table 3.6:</b> Results of Reliability Analysis for Sustainability Aspects and Motivational Aspects	125
<b>Table 3.7:</b> Summary of Instruments	127

<b>Table 3.8:</b>	Summary of the Form	127
<b>Table 3.9:</b>	Data Analysis	134
<b>Table 4.1:</b>	Gantt Chart of Game Development	149
<b>Table 4.2:</b>	Implementation of Sustainability Elements in Game Design	152
<b>Table 5.1:</b>	Gender of Student for Control Group	172
<b>Table 5.2:</b>	Gender of Student for Treatment Group	173
<b>Table 5.3:</b>	Gender of Student for Control and Treatment Group	176
<b>Table 5.4:</b>	The Interpretation of Mean Score	179
<b>Table 5.5:</b>	Descriptive Analysis of Sustainability Aspects for Relevant Content Elements for the Control Group	180
<b>Table 5.6:</b>	Descriptive Analysis of Sustainability Aspects for Interface Design Elements for the Control Group	180
<b>Table 5.7:</b>	Descriptive Analysis of Sustainability Aspects for Gameplay Elements for the Control Group	181
<b>Table 5.8:</b>	Descriptive Analysis of Sustainability Aspects for Usability Elements for the Control Group	182
<b>Table 5.9:</b>	Descriptive Analysis of Sustainability Aspects for Reward Elements for the Control Group	183
<b>Table 5.10:</b>	Descriptive Analysis of Sustainability Aspects for the Control Group	183
<b>Table 5.11:</b>	Descriptive Analysis of Sustainability Aspects for Design Elements for the Control Group	184
<b>Table 5.12:</b>	Descriptive Analysis of Sustainability Aspects for Relevant Content Elements for the Treatment Group	186
<b>Table 5.13:</b>	Descriptive Analysis of Sustainability Aspects for Interface Design Elements for the Treatment Group	186
<b>Table 5.14:</b>	Descriptive Analysis of Sustainability Aspects for Gameplay Elements for the Treatment Group	187
<b>Table 5.15:</b>	Descriptive Analysis of Sustainability Aspects for Usability Elements for the Treatment Group	188
<b>Table 5.16:</b>	Descriptive Analysis of Sustainability Aspects for Reward Elements for Treatment Groups	189

<b>Table 5.17:</b>	Descriptive Analysis of Aspects of Sustainability for the Treatment Group	189
<b>Table 5.18:</b>	Descriptive Analysis of Motivational Aspects for Treatment Groups	190
<b>Table 5.19:</b>	Skewness and Kurtosis Values for Sustainability aspects (Pre-Test)	192
<b>Table 5.20:</b>	Skewness and Kurtosis Values for Motivation Aspects (Pre-test)	192
<b>Table 5.21:</b>	Skewness and Kurtosis Values for Sustainability aspects (Post Test)	193
<b>Table 5.22:</b>	Skewness and Kurtosis Values for Motivation Aspects (Post Test)	194
<b>Table 5.23:</b>	Post -Test Descriptive Analysis for Control and Treatment Groups	196
<b>Table 5.24:</b>	t-Test for Mean Post - Test comparison for Control and Treatment Groups	196
<b>Table 5.25:</b>	Interpretation of Pearson Correlation Coefficients by McBurney (2001)	197
<b>Table 5.26:</b>	Pearson Correlation Analysis to Determine the Correlation Between Aspects of Sustainability and Student Achievement	198
<b>Table 5.27:</b>	Pearson Correlation Analysis to See the Relationship Between Aspects of Motivation and Student Achievement	199
<b>Table 5.28:</b>	Summary of Research Hypothesis Testing Findings	199
<b>Table 5.29:</b>	Expert Profile	200
<b>Table 5.30:</b>	The validity value of the Questionnaire for Sustainability Aspects according to Sub-Elements based on evaluation by three expert panels	201
<b>Table 5.31:</b>	Validity Values of the Questionnaire for Motivation Aspects based on Evaluation by 3 Expert Panels	203
<b>Table 6.1:</b>	Summary of Findings	215

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
<b>Figure 2.1:</b> Flowchart of Games Classification	35
<b>Figure 2.2:</b> Three Dimensions of Sustainability in General	47
<b>Figure 2.3:</b> Dimensions for Sustainable Software Development	48
<b>Figure 2.4:</b> Steps in Identifying Sustainability Elements	57
<b>Figure 2.5:</b> Sustainability Elements in Game Development	60
<b>Figure 2.6:</b> Input-Process-Outcome Game Model	71
<b>Figure 2.7:</b> GDLC	72
<b>Figure 2.8:</b> Arnold Hendrick`s GDLC	73
<b>Figure 2.9:</b> Doppler Interactive GDLC	74
<b>Figure 2.10:</b> GDLC of Heather Chandler	75
<b>Figure 2.11:</b> Cognitive Theory of Multimedia Learning (CTML)	77
<b>Figure 2.12:</b> Sustainable in Game Design of the Research	89
<b>Figure 2.13:</b> Theoretical Framework	94
<b>Figure 3.1:</b> Detail of Research Framework	103
<b>Figure 3.2:</b> Flowchart of Experimental Design	111
<b>Figure 3.3:</b> Quasi-Experimental Design Diagram	112
<b>Figure 4.1:</b> Heather Chandler GDLC	154
<b>Figure 4.2:</b> The Flowchart of Game Design	157
<b>Figure 4.3:</b> Main Menu Screen	164
<b>Figure 4.4:</b> Gameplay Screen	165
<b>Figure 4.5:</b> Pause Screen	166
<b>Figure 4.6:</b> Sub Topic Screen	167
<b>Figure 4.7:</b> Mad Lazim Screen	167
<b>Figure 4.8:</b> Motivation Screen	168

<b>Figure 4.9:</b>	Reward Screen	168
<b>Figure 5.1:</b>	Gender of Student for Control Group	172
<b>Figure 5.2:</b>	Gender of Student for Treatment Group	173
<b>Figure 5.3:</b>	Student`s Achievement in Learning Tajweed for Control Group	174
<b>Figure 5.4:</b>	Student`s Achievement in Learning Tajweed for Treatment Group	175
<b>Figure 5.5:</b>	Gender of Student for Control and Treatment Group	176
<b>Figure 5.6:</b>	Student`s Achievement in Learning Tajweed for Control Group and Treatment Group	177
<b>Figure 6.1:</b>	Sustainability Elements in Game Design	216
<b>Figure 6.2:</b>	Sustainable Game Design Framework (SUSGAD)	217
<b>Figure 6.3:</b>	Frontpage of i-Tajweed Game	218

## LIST OF APPENDICES

Appendices	Page
Appendix A: Questionnaires for Expert	248
Appendix B: Expert (IT) Validation Form	255
Appendix C: Approval Letter From Ministry of Education	270
Appendix D: Expert Interview Checklist	271
Appendix E: Interview Result	271
Appendix F: Student Questionnaire	272
Appendix G: Application Letter for District Education Office	276
Appendix H: Quasi Experiment Session	278
Appendix I: Pilot Test	283
Appendix J: Normality Test for Treatment Group (Post Test)	294
Appendix K: Normality Test Result for Treatment Group (Pre Test)	301
Appendix L: Normality Test Result for Control Group (Post Test)	308
Appendix M: Normality Test Result for Control Group (Pre test)	315
Appendix N: t Test and Correlation	322

## LIST OF ABBREVIATIONS

ADDIE	Analysis, Design, Development, Implementation, Evaluation
AI	Artificial Intelligence agent
CG	Control Group
CTML	Cognitive Theory of Multimedia Learning
DDR	Design and Development Research
DP	Design Principals
DGBL	Digital-Game-based Learning
GBL	Game-based learning
GDF	Game Design Framework
GDLC	Game Design Lifecycle
ICT	Information and Communication Technology
ID	Instructional Design
IE	Islamic Education
IR 4.0	Industrial Revolution 4.0
j-QAF	Jawi, Quran, Arabic, Fardhu 'ain
MABS	Multi Agent-Based Simulation
MOE	Ministry of Education
NPCs	Non-Player characters
Pbuh	Peace be Upon Him
RPG	Role Playing Game
SDGs	Sustainable Development Goals
SG	Serious Game
SPSS	Statistical Package for Social Sciences
SUSGAD	Sustainable Game Design Framework
TG	Treatment Group