# DESIGN, DEVELOPMENT AND VALIDATION OF AN ENHANCED INSTRUCTIONAL DESIGN MODEL FOR BLENDED LEARNING

**ONG WEI SIANG** 

**UNIVERSITI SAINS MALAYSIA** 

2024

# DESIGN, DEVELOPMENT AND VALIDATION OF AN ENHANCED INSTRUCTIONAL DESIGN MODEL FOR BLENDED LEARNING

by

# **ONG WEI SIANG**

Thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

April 2024

#### ACKNOWLEDGEMENT

This study would not have been possible without the support of many people. I am indebted to my supervisor, Professor Dr. Irfan Naufal bin Umar for his patience, and endless support and continued guidance to complete this study. I am indebted also to my co-supervisor, Dr. Nurullizam binti Jamiat provided invaluable feedback, a number of helpful comments and suggestions. I have benefited greatly from your wealth of knowledge and meticulous editing. Thank you to my ex-supervisor, Professor Dr. Wan Mohd Fauzy bin Wan Ismail for your guidance before your retirement. Thank you to the Delphi panels for all of the kind words, assistance and detailed feedback you have provided. Thank you to the teachers took part in the interview and survey, who so generously took time out of their schedules to participate in my study and make this research possible. Thank you to the teachers and their pupils, who took part in the lessons and survey. Very special thanks to the experts who reviewed the items and questionnaires at different stages. I acknowledge the generous financial support from the Ministry of Education, Malaysia. Most importantly, I am grateful for my family, who endured this long process with me, always offering unconditional, unequivocal, and loving support. A special thanks for my love, Wong Choy Wan for always being there for me and for always reminding me of the end goal. Lastly, thanks to all the USM CITM's lecturers for the guidance directly or indirectly as well as CITM's staffs and IPS' staffs for the administration supports.

# **TABLE OF CONTENTS**

ACKNOWLEDGEMENT		
TABLE OF CONTENTS		
LIST	OF TABLES	ix
LIST	OF FIGURES	xii
LIST	OF ABBREVIATIONS	XV
LIST	OF APPENDICES	xvi
ABST	RAK	xvii
ABST	RACT	xix
CHAI	PTER 1 INTRODUCTION	1
1.1	Introduction	1
1.2	Background of the Study	3
1.3	Problem Statement	6
1.4	Research Objective	8
1.5	Research Questions	9
1.6	Significance of Research	11
1.7	Theoretical Framework	12
1.8	Conceptual Framework	17
1.9	Delimitations and Limitations of Research	22
1.10	Definition of Terms	23
1.11	Summary	26
CHAPTER 2 LITERATURE REVIEW		
2.1	Introduction	27
2.2	Blended Learning	27

	2.2.1	The Approaches and Models of Blended Learning	34
	2.2.2	Past and Current Research Topics on Blended Learning	36
	2.2.3	Issues and Challenges of Blended learning in Malaysia	41
2.3	Learning Learning	g Theories, Principles and Frameworks Employed in Blended	43
	2.3.1	Learning Theories in Shaping Teaching Strategies and Learning Activities	44
	2.3.2	Cognitive Flexibility Versus Learning Styles	46
	2.3.3	Constructive Alignment of Learning Activities to Learning Outcomes	49
	2.3.4	Theories and Principles Related to Online Learning	50
	2.3.5	Interactions of FTF Learning and Online Learning Modes in Blended Learning	52
2.4	A Blend	led Learning Framework	55
	2.4.1	Component of Learning Environment for Blended Learning	58
	2.4.2	Component of Media for Blended Learning	60
	2.4.3	Component of Learning Materials for Blended Learning	61
2.5	Indicato	rs in Determining the Success Design of Blended Learning	63
2.6	Instructi	ional Design (ID) Model for Learning	69
2.7	Design	and Development Research	76
2.8	Researc	h Methods Employed for Model Research	80
	2.8.1	Expert Review via Modified Delphi Technique	82
	2.8.2	In-Depth Interview	83
	2.8.3	Survey Using a Questionnaire	84
	2.8.4	Field Evaluation Using a Survey	85
2.9	Summar	ry	85

СНА	PTER 3	METHO	DOLOGY	86
3.1	Introduc	ction		86
3.2	Researc	h Design		86
	3.2.1	Method f Design (II	For Internal Validation of the Initial Instructional D) Model (Stage 4)	93
		3.2.1(a)	Participants	94
		3.2.1(b)	Procedures	95
		3.2.1(c)	Instrumentation	97
		3.2.1(d)	Data Analysis Procedure	99
	3.2.2	Method fo (Stage 5)	or Internal Validation of the First Refined ID Model	99
		3.2.2(a)	Participants	100
		3.2.2(b)	Procedures	100
		3.2.2(c)	Instrumentation	103
		3.2.2(d)	Data Analysis Procedure	106
	3.2.3	Method f Model (St	For Internal Validation of the Second Refined ID tage 6)	106
		3.2.3(a)	Participants	106
		3.2.3(b)	Procedures	107
		3.2.3(c)	Instrumentation	108
		3.2.3(d)	Data Analysis Procedure	110
	3.2.4	Method f Model (St	for External Validation of the Second Refined ID tage 7)	111
		3.2.4(a)	Participants	111
		3.2.4(b)	Procedures	112
		3.2.4(c)	Instrumentation	112
		3.2.4(d)	Data Analysis Procedure	115

3.3	Summar	ry 1	115
CHAI	PTER 4 I	DESIGN AND DEVELOPMENT 1	117
4.1	Introduc	ction 1	117
4.2	The De Model .	sign and Development of an Initial Instructional Design (ID)	117
	4.2.1	Components of Analysis Stage	119
	4.2.2	Components of Design and Development Stages	121
		4.2.2(a) Develop Assessment Instruments	123
		4.2.2(b) Select Media for Assessments	125
		4.2.2(c) Develop Instructional Strategy	127
		4.2.2(d) Develop and Select Instructional Contents	129
	4.2.3	Develop Instructional Package	133
	4.2.4	Design and Conduct Formative Evaluation of Instruction	134
	4.2.5	Implementation	134
	4.2.6	Design and Conduct Summative Evaluation	135
4.3	The Init	ial Instructional Design Model for Blended learning	135
4.4	Summa	<b>ry</b> 1	140
CHAI	PTER 5	RESULTS AND DISCUSSIONS 1	141
5.1	Introduc	etion 1	141
5.2	Results	of Modified Delphi Technique	141
	5.2.1	Results of the First Round Delphi	142
	5.2.2	Results of the Second Round Delphi	147
	5.2.3	Results of the Third Round Delphi	152
5.3	Results	of In-Depth Interview	153
	5.3.1	Overall Use of ID Model	154

	5.3.2	Compone	nts of Analysis	155
	5.3.3	Compone	nts of Design and Development	157
	5.3.4	Compone	nt of Media	158
	5.3.5	Diffusion		159
	5.3.6	Compone	nt of Blended Learning Module	160
	5.3.7	Compone	nts of Implementation and Reflection	161
5.4	Results	of Teacher	Survey	161
5.5	Results	of Field Eva	aluation	184
5.6	Summa	ry		191
CHAI	PTER 6	DISCUSS	SIONS, CONCLUSION AND FUTURE	
		RECOM	MENDATIONS	193
6.1	Introduc	ction		193
6.2	Discuss	ions		193
	6.2.1	Discussion Instruction	n on the Results of Internal Validation of the Initial nal Design (ID) Model	193
	6.2.2	Discussion Refined II	n on the Results of Internal Validation of the First D Model	198
	6.2.3	Discussion ID Model	n on the Results of Validation of the Second Refined	209
		6.2.3(a)	Discussion on the Results of Internal Validation of the Second Refined ID Model	209
		6.2.3(b)	Discussion on the Results of External Validation of the Second Refined ID Model	213
		6.2.3(c)	Discussion on the Findings Integration of Both Internal and External Validations on the Second Refined ID Model	219
6.3	Researc	h Implicatio	ons	225
6.4	Conclus	ion		227
6.5	Recomm	nendations	for Future Research	229

REFERENCES ...... 231

APPENDICES

LIST OF PUBLICATION

# LIST OF TABLES

		Page
Table 1.1	The learning theories and frameworks that are of relevance to blended learning	13
Table 2.1	Definitions of blended learning	29
Table 2.2	A continuum of blended learning	31
Table 2.3	The approaches of blended learning	34
Table 2.4	The four models of blended learning	36
Table 2.5	The past and current research topics on blended learning	37
Table 2.6	Research topics on blended learning in Malaysia	39
Table 2.7	The issues and challenges of blended learning reported in Malaysia	42
Table 2.8	Types of media to be used for schools	61
Table 2.9	Criteria related to learning material	62
Table 2.10	Factors that affect student satisfaction in blended learning	66
Table 2.11	The common phases in a comprehensive ID model	70
Table 2.12	The taxonomy of ID model	70
Table 2.13	The scope of development and evaluation in a research context	77
Table 2.14	A summary of the two major types of design and development research	77
Table 2.15	The methodological direction to guide researchers for design and development research (DDR)	79
Table 2.16	Types of questions used in in-depth interviews	84
Table 3.1	Questions and Feedbacks of need analysis	89
Table 3.2	Types of validation used in this study	93
Table 3.3	The taxonomy of Delphi technique in this study	94
Table 3.4	Brief description of panels for Delphi technique	94

Table 3.5	Items distribution in questionnaire of Delphi Round One	98
Table 3.6	Items distribution in questionnaire of Delphi Round Two	99
Table 3.7	Brief description of teacher practitioners for in-depth interview	100
Table 3.8	The interview guide for the in-depth interview	103
Table 3.9	The content mapping questions for the in-depth interview	104
Table 3.10	Some examples of probes used as content mining questions for the in-depth interview	105
Table 3.11	Brief description of the teacher panels participated in the model validation of the second refined ID model	107
Table 3.12	Brief description of items used in teacher survey	109
Table 3.13	Classification of items in questionnaire for teacher survey	110
Table 3.14	Items distribution in BLSS	113
Table 3.15	Some modifications done for BLSS	114
Table 3.16	Cronbach alpha coefficients for each subscale in BLSS	114
Table 3.17	Summary of stages and phases involved in model development and model validation	116
Table 4.1	The essential components and subcomponents	118
Table 4.2	Analysis of Learning Context of this study	120
Table 4.3	The description for the components of Analysis stage in this study	121
Table 4.4	Levels of learning outcome and related assessment types	124
Table 4.5	A description on Development of Assessment and Selection of Media in this study	127
Table 4.6	Suggested instructional strategies and the related media can be used for each learning mode in blended learning	128
Table 4.7	Five types of learning content	130
Table 4.8	Major principles of designing multimedia learning that employed in developing the online learning contents	131
Table 4.9	Description of the initial ID model for blended learning	138

Table 5.1	Feedbacks of Delphi Round One	142
Table 5.2	Agreement percentage of Delphi Round One	144
Table 5.3	Feedbacks of Delphi Round Two	147
Table 5.4	Agreement percentage of Delphi Round Two	150
Table 5.5	Feedbacks of Delphi Round Three	152
Table 5.6	Themes created based on the feedbacks of in-depth interview	153
Table 5.7	Mean value, standard deviation and ranking obtained in the different aspects	162
Table 5.8	Mean value and standard deviation obtained by each item in the different aspects	163
Table 5.9	Agreement percentage for the feedbacks of teacher survey	170
Table 5.10	Frequency count and percentage of response for a dichotomous multiple response set	182
Table 5.11	Feedbacks for the open-ended items	183
Table 5.12	Mean value, standard deviation and ranking obtained by each item in the BLSS	185
Table 5.13	Mean value and standard deviation scored by each category	189
Table 5.14	Rank, mean value and standard deviation obtained by each item in the BLSS in an ascending order regardless of the subscale categories	190

# LIST OF FIGURES

		Page
Figure 1.1	Theoretical framework used in this study	16
Figure 1.2	Conceptual framework used in this study	21
Figure 2.1	The Kolb's Experiential Learning Cycle and his model of individual's learning style	47
Figure 2.2	Degree of direct student involvement in various teaching methods (Svinicki & Dixon, 1987)	48
Figure 2.3	The TPACK Framework (Mishra and Koehler, 2006)	51
Figure 2.4	Holden's Blended Learning Framework (Holden, 2008; Holden & Westfall, 2010)	57
Figure 2.5	Components of Blended Learning proposed by Holden (2008)	59
Figure 2.6	Four perspectives of learning environment (Bransford et al., 2000)	60
Figure 2.7	The Keller's MVP model of motivation, volition, and performance (Keller, 2008)	68
Figure 2.8	Dick, Carey and Carey ID Model (Dick et al., 2009)	72
Figure 2.9	The Flipped Learning (FL) design model (Lee et al., 2017)	74
Figure 2.10	The Framework of Complex Adaptive Blended Learning Systems (CABLS), proposed by Wang et al., (2015)	75
Figure 3.1	The exploratory sequential mixed method of model research and the respective stages employed in this study	88
Figure 3.2	The phases of the modified Delphi technique used in this study	96
Figure 3.3	The steps of the model validation of the first refined ID model	101

Figure 3.4	The integration of quantitative and qualitative findings in validating the second refined ID model	111
Figure 4.1	The development of assessment instruments, instructional strategies, and instructional contents are based on the learning outcomes in different modes of learning	122
Figure 4.2	The development of assessment instruments, and the selection and use of instructional media	126
Figure 4.3	The pathway for the design and development of instructional strategies, and the selection of related media	129
Figure 4.4	The pathway for the design and development of instructional contents in line with the developed instructional strategies and the selected media	133
Figure 4.5	The initial ID model for blended learning in teaching an academic subject at lesson level	137
Figure 5.1	Bar chart of teachers' feedback on the items for aspect of Analyse Learning Outcome	173
Figure 5.2	Bar chart of teachers' feedback on the items for aspect of Analyse Learning Contexts	174
Figure 5.3	Bar chart of teachers' feedback on the items for aspect of Analyse Learner	175
Figure 5.4	Bar chart of teachers' feedback on the items for aspect of Priority in Analysis	175
Figure 5.5	Bar chart of teachers' feedback on the items for aspect of Diffusion	176
Figure 5.6	Bar chart of teachers' feedback on the items for aspect of Design and Development	177
Figure 5.7	Bar chart of teachers' feedback on the items for aspect of Media	178

Figure 5.8	Bar chart of teachers' feedback on the items for aspect of	
	Blended Learning Module	179
Figure 5.9	Bar chart of teachers' feedback on the items for aspect of	
	Implementation	180
Figure 5.10	Bar chart of teachers' feedback on the items for aspect of	
	Reflection	181
Figure 5.11	Bar chart of teachers' feedback on the items for the Overall	
	aspect	182
Figure 6.1	Evolution of components of Analysis after two-round Delphi	195
Figure 6.2	Component of Design and Develop Blended Learning Module	196
Figure 6.3	The first refined ID model for blended learning after three-	
	round Delphi	198
Figure 6.4	Phase of Pre-Design and Development	200
Figure 6.5	Phase of Design and Development	202
Figure 6.6	Phase of Post-Design and Development	205
Figure 6.7	The second refined ID model for blended learning	208
Figure 6.8	Layout for the phase of Pre-Design and Development	221
Figure 6.9	Layout for the phase of Design and Development	222
Figure 6.10	Layout for Post-Design and Development phase	223
Figure 6.11	Enhanced ID model for blended learning at lesson level	224

# LIST OF ABBREVIATIONS

BL	Blended Learning
BLSS	Blended Learning Satisfaction Survey
CABLS	Complex Adaptive Blended Learning Systems
CAST	Complex Adaptive System Theory
DCC	Dick, Carey and Carey
DDR	Design and Development Research
FTF	Face-to-Face
ID	Instructional Design
MoE	Ministry of Education
RQ	Research Question
SME	Subject Matter Expert
ТР	Teacher Practitioner

## LIST OF APPENDICES

- APPENDIX A THE INITIAL ID MODEL FOR BLENDED LEARNING AT LESSON LEVEL
- APPENDIX B INITIAL QUESTIONNAIRE FOR DELPHI ROUND ONE
- APPENDIX C THE FIRST REFINED ID MODEL FOR BLENDED LEARNING AT LESSON LEVEL WITH ITS DESCRIPTION (DELPHI ROUND TWO)
- APPENDIX D QUESTIONNAIRE FOR DELPHI ROUND TWO
- APPENDIX E THE FIRST REFINED ID MODEL FOR BLENDED LEARNING AT LESSON LEVEL WITH ITS DESCRIPTION (DELPHI ROUND THREE)
- APPENDIX F THE FIRST REFINED ID MODEL FOR BLENDED LEARNING AT LESSON LEVEL WITH ITS DESCRIPTION (FINAL VERSION OF DELPHI TECHNIQUE)
- APPENDIX G QUESTIONNAIRE FOR THE IN-DEPTH INTERVIEW
- APPENDIX H CODING OF TEACHER PRACTITIONER'S FEEDBACKS FOR IN-DEPTH INTERVIEW
- APPENDIX I THE SECOND REFINED ID MODEL FOR BLENDED LEARNING AT LESSON LEVEL (SECOND VALIDATION VIA IN-DEPTH INTERVIEW)
- APPENDIX J QUESTIONNAIRE FOR TEACHER SURVEY (GOOGLE FORM)
- APPENDIX K BLENDED LEARNING SATISFACTION SURVEY (BLSS)
- APPENDIX L THE ENHANCED ID MODEL FOR BLENDED LEARNING AT LESSON LEVEL (FINAL VERSION)
- APPENDIX M PERMISSION TO USE AND MODIFY THE STUDENT SATISFACTION QUESTIONNAIRE FROM ASSOCIATE PROFESSOR DR. DORIS U. BOLLIGER

# REKA BENTUK, PEMBANGUNAN DAN PENGESAHAN MODEL REKA BENTUK INSTRUKSI DIPERTINGKATKAN BAGI PEMBELAJARAN TERADUN

### ABSTRAK

Pembelajaran teradun mengintegrasikan mod pembelajaran dalam talian dengan mod pembelajaran bersemuka (FTF) sebagai satu sistem pembelajaran yang menyeluruh dengan menyediakan lebih fleksibiliti kepada pelajar untuk menyesuaikan pengalaman pembelajaran mereka. Di Malaysia, banyak kajian berkaitan pembelajaran teradun telah dijalankan di peringkat pengajian tinggi berbanding pendidikan menengah. Namun begitu, tiada satu pun daripada penyelidikan menumpukan pada reka bentuk dan pembangunan model reka bentuk instruksi untuk pembelajaran teradun. Tambahan pula, Kementerian Pendidikan Malaysia telah mengesyorkan guru-guru sekolah untuk menggunakan pembelajaran teradun sebagai salah satu pendekatan pedagogi abad ke-21 dalam pengajaran dan pembelajaran. Satu pendekatan berstruktur dan sistematik yang berdasarkan asas pengajaran dan teori diperlukan bagi guru-guru sekolah untuk mereka bentuk dan membangunkan suatu pengajaran pembelajaran teradun. Oleh yang demikian, kajian ini merupakan penyelidikan model bagi Penyelidikan Reka Bentuk dan Pembangunan (DDR), iaitu model reka bentuk instruksi awal untuk pembelajaran teradun direka dan dibangunkan berdasarkan asas teori. Ini dikenali sebagai Pembangunan model, salah satu penekanan projek dalam penyelidikan model. Kemudian, reka bentuk kaedah gabungan penerokaan berbilang urutan telah digunakan untuk mengesahkan model reka bentuk instruksi awal oleh pakar mata pelajaran, guru sekolah dan pelajar. Ini dikenali sebagai Pengesahan model, satu lagi penekanan projek dalam penyelidikan model. Tiga jenis pengesahan dalaman digunakan mengikut urutan untuk mengesahkan model reka bentuk instruksi oleh pakar mata pelajaran dan guru-guru sekolah melalui teknik Delphi, temu bual mendalam, dan tinjauan guru. Ini diikuti dengan pengesahan luaran oleh pelajar dengan menggunakan penilaian lapangan untuk mengesahkan model reka bentuk instruksi melalui pelaksanaan pengajaran pembelajaran teradun yang telah dibangunkan daripada model reka bentuk instruksi oleh guru mereka. Dapatan kajian menunjukkan bahawa model reka bentuk instruksi telah disahkan oleh pakar mata pelajaran, guru sekolah dan pelajar dengan berjaya menjadi model reka bentuk instruksi dipertingkatkan yang sistematik dan fleksibel untuk pembelajaran teradun. Model reka bentuk instruksi dipertingkatkan yang sistematik dan fleksibel ini merupakan gambaran visual proses reka bentuk instruksi dan boleh digunakan untuk membimbing guru-guru sekolah Malaysia dalam mereka bentuk dan membangunkan

# DESIGN, DEVELOPMENT AND VALIDATION OF AN ENHANCED INSTRUCTIONAL DESIGN MODEL FOR BLENDED LEARNING

#### ABSTRACT

Blended learning integrates online learning mode with face-to-face (FTF) learning mode as a whole learning system by providing students more flexibility to customize their learning experience. In Malaysia, many studies related to blended learning were conducted in tertiary education compared to the secondary education. However, none of the research focus on the design and development of an ID model for blended learning. In addition, the Ministry of Education Malaysia has recommended school teachers to employ blended learning as one of the 21<sup>st</sup> century pedagogical approaches in teaching and learning. A structured and systematic approach based on instructional and theoretical foundations is required for school teachers to design and develop a blended learning lesson. Therefore, this study utilizes Design and Development Research (DDR) approach, in which an initial instructional design (ID) model for blended learning was designed and developed based on theoretical foundations. This is known as model development, one of the projects emphases in the model research. Then, an exploratory multi-sequential mixed method design was employed to validate the initial ID model by subject matter experts, school teachers and students. This is known as model validation, another project emphasis in the model research. Three types of internal validations were used in sequence to validate the ID model by the subject matter experts and school teachers via Delphi technique, in-depth interview, and teacher survey. This was followed by an external validation by students who used field evaluation to validate the ID model through the implementation of blended learning lessons developed by their teachers from the ID model. The findings showed that the initial ID model was successfully validated by the subject matter experts, school teachers and students. This validation process led to the development of a systematic and flexible enhanced ID model for blended learning. This systematic and flexible enhanced ID model is a visual representation of the ID process and can be used to guide Malaysian school teachers in designing and developing a blended learning lesson.

#### **CHAPTER 1**

## **INTRODUCTION**

#### **1.1** Introduction

The term "Blended learning" first appeared around year 2000 due to weaknesses of online learning, and at the time the e-learning was simply associated with traditional classroom learning (Azizan, 2010; Marsh, 2012). Today, blended learning is widely used to describe as learning activities that combine practical use of digital communication tools with face-to-face (FTF) learning (Allan, 2007). As claimed by Marsh (2012), the FTF learning is extended from traditional learning approach in the beginning to active learning approaches in facilitating teaching and learning. The blended learning has emerged as a major global trend in education to provide a continuous teaching and learning process (Allen, Seaman & Garrett, 2007) with a multimodal instruction such as a variety of assessments, instructional strategies, deliveries and media to meet the needs of students with different learning preferences (Picciano, 2009). Furthermore, blended learning provides a flexible environment for teaching and learning (Wahab, Othman, & Warris, 2016).

The development of e-learning in Malaysia has undergone a process of evolution from electronic-based e-learning in earlier 1990's to today's network-based e-learning (Mohd Salleh, & Hussin, 2008). During the electronic-based e-learning, electronic gadgets such as video, ebook, slide projector, overhead projector, and CD-ROM were used to display non-interactive learning materials to students without using internet connection. In contrast, in the network-based e-learning, internet connection in cable forms was introduced in the beginning and now with wireless connection. The electronic gadgets used for teaching and learning in the network-based e-learning are computer, laptop, tablet, and mobile phone. In other words, the e-learning employed in Malaysia progresses gradually from technology-enhanced to web-enhanced learning, and then now are moving from solely online learning into blended learning (Bunyarit, 2006; Haron, Abbas, & Rahman, 2012), especially during the pandemic and post-pandemic of COVID-19 (Tan, Zakuan, & Abd Aziz, 2022; UNICEF, 2020). Furthermore, the education world is changing rapidly and increasingly complex presents new prospects and challenges on teaching and learning approaches, especially blended learning.

In line with the current digital technology, the Ministry of Education (MoE), Malaysia suggested the use of blended learning in schools as one of the pedagogical approaches in the era of 21<sup>st</sup> century education as proposed in the Malaysia Education Blueprint (Pelan Pembangunan Pendidikan Malaysia, PPPM) 2013 – 2025: Preschool to Post-Secondary Education. However, in a study conducted by Noh, Abdullah, Teck, and Hamzah (2019), Malaysian teachers are not prepared to conduct and implement blended learning because they have no idea how to conduct and implement blended learning in the best way. Freeland, Bushko, and White (2017) also claimed that over 90% respondents (Malaysian teachers) employed technology-rich model rather than blended learning in teaching and learning. Furthermore, Ibrahim, Nasri, and Ibrahim (2021) claimed that Malaysian teachers required to focus on the use of blended learning in teaching and learning. This "how to blend" can be achieved by having a guidance to help teachers in designing and developing blended learning. As other instructions, an instructional design (ID) model is required in order to design and develop blended learning lessons (Freeland et al., 2017; Mohd Salleh & Hussin, 2008; Noh et al., 2019; Nor & Kasim, 2015). An appropriate design of blended learning is required in order to maintain the momentum and motivation of student learning (Ibrahim, Yasin, Ibrahim, & Abdullah, 2020). Mustapha, Hilmi, Mansor, and Saad (2022) also claimed that a proper teaching and learning plan will have a positive impact on influence blended learning, whereas poor planning and neglect will have a negative impact on blended learning. Noh et al., (2019) asserted that for the purpose of designing and developing the best blended learning lesson, the instructional events should be structured through systematic planning and based on accurate instructional foundations by taking into account the elements of blended learning. Hence, teachers would need to design and develop a blended learning lesson systematically by using an ID model specifically designed for blended. As claimed by Mustapha et al., (2022) and Freeland et al., (2017), the success design of blended learning is determined by teaching and learning plans where the ID model supported.

Generally, an ID model consists of several phases and components. A complete ID model would have all the five phases: Analyse, Design, Develop, Implement and Evaluate in designing and developing an instruction. However, blended learning is the 21<sup>st</sup> century pedagogical approach that integrates with digital technology, in which it is different to traditional learning and solely online learning. As a complete instruction, the ID model for blended learning would comprise of all the five phases. But, what are the specific components to be considered in an ID model for blended learning? How to design and develop an ID model based on instructional foundations? How to validate the newly developed ID model?

## **1.2 Background of the Study**

Blended learning comprises both online learning and FTF learning modes, appeared more complicate compared to solely online or FTF learning. Blended learning perceived as an innovative teaching approach that combines diverse delivery

media, which support a meaningful and exciting learning experience in higher education (Wahab, Othman, & Warris, 2016). Blended learning takes the best parts of both face-to-face learning and online learning modes as well as viewed positively by educators in higher educations. As a result, the Ministry of Education (MoE), Malaysia has highly recommended the use of blended learning approach in schools as proposed in the Malaysia Education Blueprint 2013 – 2025: Preschool to Post-Secondary Education. However, this learning approach is not fully employed by school teachers as they need a systematic guidance to help them in designing and developing blended learning lessons successfully (Freeland et al., 2017; Ibrahim et al., 2020; Ibrahim et al., 2021; Mustapha et al., 2022; Noh et al., 2019). In terms of research, most of the blended learning research were conducted in higher education institutions rather than in primary and secondary schools, especially in Malaysia (Embi, Mohd Nordin & Panah, 2014; Graham, 2019; Rahman, Yunus, & Hashim, 2019; Tan et al., 2022; Yahaya & Mohd Jawi, 2020). Furthermore, most of the research focused on the effectiveness of blended learning (Graham, 2019) rather than the design and development of blended learning, especially in designing and developing an ID model for such learning.

Instructional design (ID) models are visualized representations of an instructional design process, guideline or framework, showing the main phases or elements, and their systematic relationships to guide instructional designers in order to create, direct and manage a workshop, a course, a curriculum, an instructional program, or a training session effectively (Gustafson, & Branch, 2002; Moore, Bates & Grundling, 2002; Sink, 2008). There are many ID models available for designing an instruction. For examples, those ID models are ADDIE (Analysis, Design, Development, Implementation, and Evaluation), Dick, Carey, and Carey ID model,

and Kemp ID model as the traditional ID models, while Instructional Design Model for Online Learning (IDOL), and Roblyer's ID model are the examples of online instructional design models (Chen, 2016). In addition, Rouhollah and Abu Samah (2012), and Sun (2001) claimed that the traditional ID models were not appropriate for blended learning because they are incompatible with current perspectives on the online learning and blended learning, while the existing online ID models are strictly for designing pure online learning, ignoring the needs of students in FTF learning. As recommended by Freeland et al. (2017), teachers need to step back to rethink the ID model that best fit to their students need when implementing the blended learning. An appropriate ID model for blended learning provides a direction or guidance for teachers to design and develop blended learning carefully (Mustapha et al., 2022; Nor & Kasim, 2015). Therefore, an effective ID model specifically for blended learning benefits both teachers and students by providing guidance for design, structure, and organization of learning materials of a blended learning is needed. As claimed by Mustapha et al., (2022) and Freeland et al., (2017), the success design of blended learning is determined by teaching and learning plans where the ID model supported.

Most of the ID models compose phases of Analyse, Design, Develop, Implement and Evaluate that can guide teachers to design and develop their lessons accordingly. Each phase of the ID model is made up of different procedural components that may or not arrange in sequence. For example, the phase of Analyse typically includes needs analysis, learner analysis, context analysis, and content analysis. The output of this phase will serve as the input to the phase of Design, and so on. However, the detail for each phase could be differ specifically for different ID models.

As blended learning is a 21<sup>st</sup> century pedagogical approach, a specific ID model is required (Freeland et al., 2017; Ibrahim et al., 2020; Ibrahim et al., 2021; Mustapha et al., 2022; Noh et al., 2019). This study employed Model research in order to design and develop an ID model for blended learning. Model research is a type of Design and Development Research (DDR) that studies model development, validation, or use, and it often seek to identify and describe the conditions that facilitate successful design and development of an ID model (Richey, Klein, & Nelson, 2004; Richey & Klein, 2007; Ross et al., 2008). This study consisted of three phases: Need analysis, Model development, and Model validation. In phase one, need analysis identifies, evaluates and provides feedbacks for phase two. In phase two, Model development, the theoretical foundations of blended learning and ID model were examined to guide the design and development of ID model for blended learning, in which the model components were determined and an initial ID model for blended learning was constructed. In phase three, the initial ID model was validated through exploratory multi-sequential mixed method design, and the result was an enhanced ID model for blended learning.

## **1.3 Problem Statement**

Most of the research for blended learning was focused on learning effectiveness, cost effectiveness, convenience and access (Graham, 2009; Wahab et al., 2016). However, less research has focused on systematic and effective design methods for blended learning. Particularly, there is a gap in understanding how to create a complete and effective learning environment by balancing and blending online and face-to-face (FTF) learning, rather than simply combining the two modalities (Mustapha et al., 2022). Furthermore, there is no ID model for blended learning in the research literature as claimed by Lee, Lim and Kim (2017), and Shakeel, Al Mamun and Haolader (2023). This "how to blend" rather than whether they blend becomes one of the main challenges in blended learning (Bryan & Volchenkova, 2016; Embi et al., 2014; Kerres & de Witt, 2003; Mustapha et al., 2022). As mentioned by Branch and Kopcha (2014), an ID model is intended to be an iterative process of planning learning outcomes, selecting effective teaching strategies, choosing relevant and appropriate learning materials and media to help students to achieve real-world performance.

In order to create a meaningful blended learning, it requires an effective ID model to link both FTF and online learning as a cohesive whole program for blended learning (Lee et al., 2017; Shakeel et al., 2023; The Oxford Group & Kineo, 2013). This can be achieved by developing a new or enhanced ID model that govern their development to meet the real-world practice (Richey & Klein, 2007; Seels & Richey, 1994). Furthermore, the use of blended learning approach was highly recommended by MoE in the Malaysia Education Blueprint 2013 - 2025: Preschool to Post-Secondary Education (MoE, 2013). This raises a problem whether the teachers are ready for blended learning. The design and development of the "best" blended learning lesson should be through a structured and systematic planning that is based on accurate instructional foundations (Noh et al., 2019). They asserted that the teachers would need a systematic process in designing and developing blended learning by considering the components of blended learning, employing appropriate teaching strategies, always assessing and reviewing the effectiveness of each phase and design of the blended learning developed as well as re-planning the instructional process by improving the identified weakness. As reported by Freeland et al., (2017), Malaysian school teachers need guidance in all aspects of blended leaning implementation, not just ICT training during their professional development sessions. Hence, the challenges of "how to blend" are due to lack of specific ID model to be used as a guide, and also lack in

competency to create a harmony between the FTF and online learning that best fit to students' needs in Malaysia context and constraints (Ma'arop & Embi, 2016; Freeland et al., 2017). According to the challenges discussed above, there is a need to conduct a study of design and development research (DDR) in order to develop an ID Model for blended learning to guide Malaysian teachers in designing and developing blended learning lessons effectively and meaningfully. Focusing on how to create an ID model for blended learning can help teachers to design and develop their lessons rather than just implementing those lessons in order to study its effectiveness.

## **1.4 Research Objective**

In response to the problem statement, the aim of this study is to design and develop an ID model for blended learning to be used by Malaysian school teachers. Model research, a type of DDR proposed by Richey and Klein (2007) was employed in this study. The ultimate objective of Model research is to produce knowledge in the form of a new or enhanced ID model that oriented toward generalized conclusions of design and development processes (Richey & Klein, 2005; Richey & Klein, 2007; Richey et al., 2004; Ross et al., 2008; Tracey, 2009; Tracey & Richey, 2007).

This study focused on designing and developing an ID model for blended learning at lesson level. It also focused on validating the ID model via internal and external validations. The ID model will be served as a guidance for teachers to design, develop, and implement their blended learning effectively. In this study, a well-known traditional ID model (Dick, Carey and Carey ID model) is initially used as a fundamental model in order to develop an enhanced ID model for blended learning in Malaysia context. The ID model is known as an enhanced ID model because an existing traditional ID model was modified and enhanced specifically for blended learning. Furthermore, a unit of lesson is the smallest planned teaching and learning activity in any classroom. It should focus on guiding school teachers to design and develop blended learning at lesson level rather than course level.

Therefore, the objective of this study is to design, develop, and validate an initial ID model into an enhanced ID model to guide school teachers systematically and effectively throughout the design, development, and implementation of blended learning at lesson level in teaching and learning. An ID model composed of several components that interconnect to each other. What components should be included in the ID model for blended learning, and how the components integrate to provide a meaningful learning are the main considerations in designing a blended learning.

# 1.5 Research Questions

For design and development research (DDR), research questions are used rather than hypotheses (Richey & Klein, 2005; Richey et al., 2004). Based on the research objective, one general question for this study was addressed: "How to design and develop an initial ID model for blended learning?". The question reflects two doubts: "What are the components to be included in the enhanced ID model?" and "Is the enhanced ID model valid and reliable to be implemented in classroom?". Therefore, four research questions were derived from the doubts as follow:

In model development,

RQ 1: What are the components of an initial ID model for blended learning in developing a blended learning lesson?

In model validation,

- RQ 2: What are the components of the first refined blended learning ID model to be considered by subject matter experts (SMEs) throughout the design, and development of a blended learning lesson?
- RQ 3: What are the components of the second refined blended learning ID model to be considered by teachers throughout the design, development and implementation of a blended learning lesson?
- RQ 4: What are the components of the enhanced blended learning ID model based on the teacher surveys and students' satisfactions after going through the blended learning lesson?

This study involved model development and model validation. The first research question (RQ 1) emphasised on investigating the required components of an initial ID model for blended learning in order to guide school teachers in designing, and developing a blended learning lesson systematically and effectively. Research question 1 will be answered by model development based on literature review. The second research question (RQ 2) emphasised on investigating the essential components of the first refined ID model for blended learning to be considered by subject matter experts (SMEs) throughout the design, and development of a blended learning lesson. It will be answered by validating the initial ID model internally into the first refined ID model for blended learning. Then, the first refined ID model for blended learning will be validated by teachers, who are the practitioners to design, develop and implement the blended learning lessons via in-depth interview. This internal validation of the first refined ID model for blended learning answered RQ 3

in which the second refined ID model for blended learning would be developed. Finally, the fourth research question (RQ 4) focused on another internal validation of the second refined ID model by teacher panels as well as external validation by investigating students' satisfactions in studying the blended learning lessons that developed by their teachers (teacher panels) based on the second refined ID model. The success design of the enhanced ID model for blended learning is determined by internal and external validations of ID model from designers to SMEs, and then to the end users such as teachers and students (Richey, 2005).

### **1.6** Significance of Research

The ultimate outcome of this study is to design and develop an enhanced ID model that can serve as a guide to facilitate school teachers in designing and developing blended learning lessons. In terms of DDR, findings from this study will contribute to Model research in Malaysia in producing an enhanced ID model for blended learning. In terms of teaching and learning, the enhanced ID model will provide practical principles and systematic guideline for school teachers in designing, developing, and implementing an effective blended learning. In terms of research, the developed blended learning will provide opportunities for researchers to investigate the effectiveness of the blended learning in different contexts. Therefore, this study will create a research platform to researchers in conducting research from DDR to evaluation research in educational institutions.

## **1.7** Theoretical Framework

Blended learning first appeared around year 2000 in educational research, and evolved from instruction that solely involves online learning. The blended learning also evolves internally from simply associated online learning with traditional classroom learning to the combination practical use of digital communication tools with active face-to-face (FTF) learning. Hence, the blended learning has emerged as a major global trend in education to provide a continuous teaching and learning process regardless of time and place. In Malaysia, the implementation of blended learning is more common in higher learning institutions (Masrom, Nik Mohd Alwi, & Nor Asshidin, 2019) compared to primary and secondary schools.

The question, "*How to develop a blended learning lesson?*" appeared in mind as blended learning is not simply uploading the learning materials online. Hence, the blended learning needs to be considered in a current and broader view as the delivery of instruction using multiple media (integration of instructional media) in both FTF and online learning modes, and combine with different pedagogical approaches within a new learning environment in order to produce an optimal learning outcome rather than focusing on a ratio of delivery modalities. The main pedagogical approaches in blended learning are based on the Blended learning framework, Framework of Technological, Pedagogical and Content Knowledge (TPACK), Social constructivism, and Connectivism due to the combination of both FTF and online learning modes. Therefore, a blend of theories should be employed in designing and developing the ID model for blended learning (Table 1.1).

Learning theories/ Frameworks	Focus
Blended learning framework	- Emphasises on types of learning environment, instruction and media required in blended learning
TPACK	- Emphasises on the relationships and interactions between the technology, pedagogy and content knowledge in delivering and presenting multimedia learning to students by the most appropriate teaching strategies and media.
Social constructivism	<ul> <li>Emphasises on learner control and the capability of the learner to manipulate information</li> <li>Emphasises on social negotiation among students and between students and teacher towards conceptual reframing</li> </ul>
Connectivism	- Emphasises only on the conceptual and external levels, where the nodes such as students, media, FTF learning materials and online learning materials are connected in different learning environments that are also interconnected

Table 1.1The learning theories and frameworks that are of relevance to blended<br/>learning

Blended Learning Framework (Holden, 2008) proposed the essential components in blended learning as (1) Learning environment, (2) Instruction, and (3) Media. The learning environment in blended learning can either be occurring in realtime (synchronous) with a teacher or occurring without the presence of a teacher (asynchronous). The synchronous learning environment can be occurred in both online and FTF learning modes, whereas the asynchronous learning environment only occurs in online learning mode. Selection of instruction and media in different learning modes ensures the most optimum use of resources in achieving determined learning outcomes (Holden, 2008; Holden & Westfall, 2010). This will work together with Framework of TPACK, Social constructivism, and Connectivism in designing and developing an enhanced ID model for blended learning.

Framework of Technological, Pedagogical and Content Knowledge (TPACK) proposed by Mishra and Koehler (2006) revealed the relationships and interactions

between the components of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) in delivering and presenting multimedia learning to students by the most appropriate teaching strategies and media. These components are in line with the components of Instruction and Media in Blended learning framework. As the TPACK framework does not inform how the FTF learning mode integrates and interacts with the online learning mode, this can be strengthened by Blended learning framework that reveals the relationships among the components. The integration of theories and those relevant models is a balance, supportive and productive approach used to facilitate learning with appropriate learning activities rather than extreme end in any learning approach (Grabe & Grabe, 2007).

Social Constructivism that was proposed by Lev Vygotsky in 1968 emphasises on how students interact among themselves in order to construct their own knowledge (Akpan, Igwe, Mpamah & Okoro, 2020). Interaction, discussion and sharing among students as well as students with information are essential in blended learning. The implication of Social Constructivism that can be implemented in online learning mode is to regularly assign students to interact with each other and with the past and current learning contents (Hu & Spiro, 2021). It is also essential for Social Constructivism to be implemented to transit from one learning mode to another, where the students can interact regularly among themselves and with the information given.

As claimed in Connectivism, learning is a process of connecting specialised nodes (information sources) between students in the right context (Siemens, 2005). In this study, the conceptual and external levels of connectivism will be employed to emphasise the network connections between students, media, and learning materials in a learning environment as well as within different learning environments which are connected to each other. In conceptual level, all the components involved in FTF learning are grouped and connected in the FTF learning mode. These components are interconnected to each other. Similarly, all the components that involved in online learning are grouped and connected in the online learning mode. In external level, these different learning modes are connected to create blended learning.

Learning environment in blended learning composed of two learning modes, in which each learning mode consists of many independent components that interact to each other as claimed by Connectivism. The components are constantly changed accordingly as a dynamic network system due to the nature of courses, subjects, learning areas, instructors or students. The interactions between these components also allow each component to adapt by modifying the components leading to emergent outcomes. In other words, the blended learning environment is a dynamic network of components that constantly interact and form relationships between different components, which in turn gives rise to the collective behaviours and decisions of the network as a whole (Csete & Doyle, 2002). For instance, in homeostasis topic, various organ systems in human respond as a whole to the change of internal factors such as body temperature or blood pH in order to stabilise those factors from deviation. The interactions of organs in these organ systems are constantly adapting to the internal environment. These complex physiological processes are commonly described in human biology. In a narrow scope of view, these physiological processes can be separated and simplified by linear systems of negative feedback.

Figure 1.1 shows the schematic diagram of theoretical framework in this study to design, develop and validate an enhanced ID model for blended learning. This reveals that the blended learning blends theories and frameworks within two different learning modes in designing, developing and validating an enhanced ID model for blended learning. This study adopted model research (Richey & Klein, 2007), in which model development and model validation were employed to develop the final version that is, an enhanced ID model for blended learning at lesson level. In model development, TPACK framework, Social Constructivism and Connectivism were used to support the components within the Blended Learning Framework as proposed by Holden and Westfall (2010). The Blended Learning Framework focuses on the essential components and their relationships in blended learning, whereby the TPACK framework emphasises on the components of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) as well as their relationships in a learning environment. Meanwhile, the Social Constructivism and Connectivism place the focus on interactions between students and the involved components. Furthermore, Connectivism emphasises on the levels of interactions between students and the involved components.



Figure 1.1 Theoretical framework used in this study

In conclusion, Dick, Carey, and Carey ID model (2009) provides a fundamental guideline in developing the enhanced ID model for blended learning at lesson level, while adapting the Blended Learning Framework (Holden & Westfall, 2010), and TPACK framework (Mishra & Koehler, 2006) to attain the most appropriate "blend" for the developed lessons. As blended learning has made learning and interactions more complex and dynamic than ever before, Social Constructivism (Akpan et al., 2020) and Connectivism (Siemens, 2005) described relationships and interactions among students as well as between students and information presented.

## **1.8** Conceptual Framework

The blended learning components could be mapped onto a well-known existing systematic ID model to design and develop an enhanced ID model for blended learning that can be used as a guide to develop a blended learning lesson. A systematic study of design, development, and validation could be used for this purpose as asserted by Richey and Klein (2007), and Seels and Richey (1994). The systematic ID model comprises all the Analysis, Design, Development, Implementation, and Evaluation stages required (Dick et al., 2009), while the Blended Learning Framework and TPACK framework provide essential components for designing and developing an effective blended learning lesson (Holden & Westfall, 2010; Mishra & Koehler, 2006). As claimed by Richey et al., (2004) and Ross et al., (2008), validation processes can evaluate and facilitate the successful design and development of the enhanced ID model by using multiple research methods and sources of data. Natural classroom setting instead of controlled setting was applied in this study in order to meet the criteria of internal consistency and effectiveness in real classroom practices. In addition, the research methods were conducted sequentially in order to refine the

developing ID model into an enhanced ID model that appropriately fits to contexts of Malaysian education system.

This study employed model research (Richey & Klein, 2007), in which model development and model validation were employed to develop the final version, an enhanced ID model for blended learning at lesson level. Three main phases were included as (1) need analysis, (2) model development, and (3) model validation. In this study, the enhanced ID model for blended learning was designed and developed for teaching an academic subject in schools by enhancing a well-known traditional ID model, Dick, Carey, and Carey ID model (DCC ID model). The DCC ID model was chosen because it is empirical and replicable due to the repeated use in DDR as well as research that is relevant to instructional design. In addition, the systematic process of the DCC ID model enables students to engage with the learning materials based on the learning outcomes (Morrison, Ross, & Kemp, 2001). The systematic process also allows teachers to develop a blended learning orderly as a scientist conducted a scientific experiment by following a set of procedure in which the procedure can be modified and adapted for different situations. Furthermore, the ID model for blended learning should differ with conventional ID model due to the blended learning not only comprises two different modes of learning environment, and the critical point is the meaningful connection between both learning modes (Chen, 2016; Lee et al., 2017). In order to have an ID model for a specific situation, for example in this study is blended learning, an existing ID model can be modified to fulfil the need since the existing ID model is well developed and implemented (Seels & Glasgow, 1998). This can be achieved by conducting model research, a type of DDR that emphasised on the development, validation, or use of a new or an enhanced ID model (Richey et al., 2004; Richey & Klein, 2005; Ross et al., 2008).

In need analysis, the researcher requires to determine whether there is a need or not to design and develop an ID model for blended learning. This ensures that the developed ID model fulfil the needs of school teachers in the Malaysian education context. In model development, the Blended Learning Framework was mapped onto a well-known systematic ID model, that is, the DCC ID model (2009) in order to design and develop an initial ID model for blended learning. The model development in this study was used to answer RQ 1. In model validation, this study also adapted research methods, such as Delphi technique, in-depth interview, and survey that was suggested by Richey and Klein (2007). These research methods were conducted sequentially to refine the initial ID model into the final version, an enhanced ID model for blended learning. Therefore, RQ 2, RQ 3, and RQ 4 were answered in sequence.

Figure 1.2 shows the conceptual framework used in this study for designing, developing and validating an enhanced ID model. The development of an initial ID model was described in Model development by overlapping the Blended Learning Framework (Holden & Westfall, 2010) onto the DCC ID model (2009). Thereafter, the refinement and validation of the initial ID model for blended learning was described in Model validation through a series of validations, such as Delphi technique, in-depth interview, teacher survey and student survey. The Delphi technique, in-depth interview, and teacher survey are characterised as internal validation because the SMEs and teachers validated the components of ID model directly (Richey & Klein, 2007). This was begun with Delphi technique in which the SMEs provide comprehensive feedbacks in validating the initial ID model. The outcome of Delphi technique was the first refined ID model to be validated by teacher practitioners through in-depth interview. The initial ID model was refined to suit school teachers for designing and developing blended learning lessons. The second refined ID model was the outcome of the in-depth interview, and it was validated by teachers in a survey after implementing blended learning lessons developed by using the second refined ID model. During the implementation of blended learning lessons in a natural classroom setting, students acted as participants of the external validation, that is, student survey. The satisfaction level of students is used as the ultimate resultant of learning outputs as proposed by Keller (2008) in the MVP model of motivation, volition, and performance. Furthermore, Bolliger and Halupa (2012) also asserted that student satisfaction is an important factor in evaluating the success design of a blended learning program. As a result, an enhanced ID model was developed through a series of sequential validations.

As claimed by van den Akker (2003), not all teachers have an absolute autonomy in planning curriculum frameworks for learning over various levels, ranging from the macro-level of the system, nation, state or society, through the meso-level of the school or institution, to the micro level of the classroom, and ultimately to the nanolevel of the individual student. However, teachers still play a dominant and influential role at the micro-level in designing and developing lessons with regard to what and how students learn (McKenney, Nieveen & van den Akker, 2006). In any learning approach including the blended learning, the individual student learning at nano level is almost always attached to the lesson development at the micro level. Hence, it is necessary to narrow the learning context into a unit of lesson.



Figure 1.2 Conceptual framework used in this study

#### **1.9** Delimitations and Limitations of Research

This is a DDR study, which delimited to identify, design, develop and validate an ID model for blended learning used in Malaysian schools rather than to investigate the effectiveness of blended learning. Hence, the study will end at the formative evaluation of the ID model, which also means that summative evaluation will not be conducted. The types of formative evaluation used in this study were delimited to internal validations such as Delphi technique, in-depth interview and survey as well as field evaluation for external validation. In the Delphi technique, the Delphi panels must be subject matter experts qualified not only in instructional design or technology, but also have experience in practicing blended learning or e-learning. For other internal validations, the teacher practitioners must have an experience in developing e-learning lessons. The final validation of the ID model is an external validation which was used to study the impact of the instructional product (blended learning lesson developed from the ID model) on students.

Due to time, COVID-19, and resource constraints, the study is limited to a small sample size for each validation, which may affect the generalizability of the findings to a larger population. The participation of subject matter experts is limited to those with expertise in instructional design, whereas the participation of teachers is limited to those who have experience and are interested in blended learning. For external validation, the participation of students is limited to those who are enrolled in the volunteered teacher panels' classes because the external validation was conducted during the COVID-19 pandemic. This restricted access to certain groups and locations, which may limit the diversity of the sample, potentially leading to biased results.

#### **1.10** Definition of Terms

For the purpose of this study, there are several terms that should be understood in context as to their relationship with Malaysian education system, learning theories, and blended learning approach. The terms, along with definitions and concepts, are provided in the context in which they are studied.

#### Blended learning

Blended learning combines different pedagogical approaches within a new learning environment in order to produce an optimal learning outcome rather than focusing on a ratio of delivery modalities (Dziuban, Hartman & Moskal, 2004; Holden, 2008; Driscoll, 2002; Stacey & Gerbic, 2008). For the purpose of this study, blended learning is defined as the delivery of instruction using multiple media (integration of instructional media) in both face to face (FTF) and online learning modes as well as transition from one learning mode to another.

#### Design and Development Research (DDR)

Design and development research (DDR) is a study that seeks to create knowledge grounded in data systematically derived from practice and based upon a systematic analysis of specific cases (Ross et al., 2008). It involves the identification of an instructional problem, analysis of needs and requirements, design and development of an intervention, and then implements and evaluates the practicality and effectiveness of intervention in the real world (Alias, 2015). The DDR in this study is to employ model research to construct an enhanced ID model for blended learning at a unit of lesson. The model research employed includes model development and model validation.

#### Dick, Carey and Carey ID Model

Dick, Carey and Carey ID Model is the most widely cited ID model published by Walter Dick Lou, Carey, and James Carey. This ID model has become the standard ID model for designing a systematic instruction based on a reductionist model of breaking instruction down into smaller components. Each component represents the step to be conducted in sequence during the process of design and development.

## Diffusion

Diffusion is a transition phase to connect two different learning modes in a lesson of blended learning, in which the learning materials in a learning mode can be diffused or shifted meaningfully to another learning mode.

## Enhanced ID Model

An enhanced ID model is an ID model specifically designed for a specific situation by modifying an existing ID model (Richey et al., 2004). In this study, the enhanced ID model is specifically designed for Malaysian school teachers in designing and developing blended learning lessons by modifying the DCC ID model into a more flexible ID model for blended learning.

#### Lesson

A lesson is a fixed period of time when people are taught about a particular subject or taught how to do something. A unit of lesson can be defined as the smallest teaching and learning activity that may cover a subtopic, a topic or several related subtopics. In this study, a lesson may involve a subtopic, or a topic identified by the teacher in designing and developing a blended learning lesson.

24