MOBILE GAME APPLICATION FRAMEWORK WITH PERSUASIVE TECHNOLOGY FOR LEARNING ENGLISH VOCABULARY AMONG PRIMARY SCHOOL STUDENTS

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FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

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MOBILE GAME APPLICATION FRAMEWORK WITH PERSUASIVE TECHNOLOGY FOR LEARNING ENGLISH VOCABULARY AMONG PRIMARY SCHOOL STUDENTS

ABSTRACT

English is increasingly becoming an essential second language as well as a language for communication. M-learning is receiving global attention especially among English language learners. Non-native English students like Arabic students face difficulties in such a way that they lack motivation which leads to poor performance in learning English vocabulary. However, if they are persuaded, it may improve their performance. Therefore, persuasive technology is important in improving user motivation and engagement. It is designed to change the behaviours or attitudes of the users. However, unlike many other fields of endeavour, it is difficult to find any application that uses persuasive technology in the field of mobile game-based English learning. Thus, this research aims to develop a mobile game framework based on persuasive guideline with the purpose to enhance motivation and performance of Arabic students in learning English vocabulary. This study proposes a mobile game framework using a specific guideline extracted from persuasive principles. Design Science Research Method has been used for this research which includes identification of the problems and motivation such as the definition of the objectives of a solution, the design and development, the demonstration, the evaluation, and communication. The proposed framework comprised a guideline developed and validated by experts in the domains of education, gaming, and software development. While, the mobile game application was developed based on the proposed framework and evaluated by primary school's students selected from International Modern Arabic School, Putrajaya, Malaysia. Experimental method was used to measure the performance and motivation. The results showed that there is an increase

in the experimental group performance. Additionally, the experimental group showed significant increase in terms of motivation when the time factor was included. This study concluded that mobile game framework with persuasive guideline can improve Arabic students' motivation and performance in learning English language. This framework can assist practitioners and developers in designing mobile game application for learning English vocabulary. Moreover, students can use the application to improve their English language skills. This research also contributes to the literature of persuasive technology by incorporating its concept into theory of game-based English learning that form the bases for further research.

Keywords: M-learning, English language, Motivation, Persuasive technology, Mobile game framework.

KERANGKA KERJA APLIKASI PERMAINAN MUDAH ALIH DENGAN TEKNOLOGI PERSUASIF UNTUK MEMPELAJARI PERBENDAHARAAN KATA DALAM BAHASA INGGERIS DI KALANGAN PELAJAR SEKOLAH RENDAH

ABSTRAK

Bahasa Inggeris semakin menjadi bahasa kedua terpenting dan juga bahasa untuk berkomunikasi. Pembelajaran mudah alih semakin menjadi tren global yang popular, terutama di kalangan pelajar Bahasa Inggeris. Pelajar bahasa Inggeris bukan asli seperti pelajar Arab menghadapi masalah seperti kurang motivasi yang membawa kepada prestasi kurang baik dalam mempelajari perbendaharaan Bahasa Inggeris. Walaubagaimanapun, sekiranya mereka dapat diyakinkan, ia mungkin dapat meningkatkan prestasi mereka. Oleh itu, teknologi persuasif penting dalam meningkatkan motivasi dan penglibatan pengguna. Iaa direka untuk mengubah tingkah laku atau sikap pengguna. Walaubagaimana pun, tidak seperti dalam bidang lain, agak sukar untuk mencari aplikasi yang menggunakan teknologi persuasif dalam bidang permainan mudah alih berlatarkan pembelajaran Bahasa Inggeris. Oleh itu, penyelidikan ini bertujuan untuk membangunkan kerangka kerja permainan mudah alih dengan garis panduan daripada prinsip-prinsip persuasif dengan tujuan untuk menigkatkan motivasi dan prestasi pelajar Arab dalam mempelajari Bahasa Inggeris. Kajian ini mencadangkan kerangka kerja pembelajaran mudah alih menggunakan garis panduan khusus yang dihasilkan daripada prinsip-prinsip persuasif. Kaedah Penyelidikan Sains Reka bentuk telah digunakan untuk kajian ini yang merangkumi mengenalpasti masalah dan motivasi, mengenalpati objektif penyelesaian, merekabentuk dan membangunkan, menunjukkan, menilai, dan berkomunikasi. Kerangka kerja yang dicadangkan terdiri daripada beberapa garis panduan yang telah dibangunkan dan disahkan oleh pakar dari bidang akademik, permainan dan pembangunan aplikasi. Kemudian, aplikasi permainan mudah alih

dibangunkan berdasarkan kerangka kerja yang dicadangkan dan dinilai oleh pelajar sekolah rendah yang dipilih iaitu Sekolah Arab Moden Antarabangsa, Putrajaya, Malaysia. Kaedah eksperimen telah digunakan untuk mengukur prestasi dan motivasi. Keputusan menunjukkan bahawa terdapat peningkatan dalam prestasi kumpulan eksperimen. Selain itu, kumpulan eksperimen menunjukkan peningkatan yang signifikan dalam tempoh motivasi apabila faktor masa telah ditambah. Kajian ini menyimpulkan bahawa kerangka kerja permainan mudah alih dengan garis panduan persuasif mampu meningkatkan motivasi dan prestasi pelajar bahasa Arab dalam pembelajaran bahasa Inggeris. Kerangka kerja ini boleh membantu pengamal dan pembangun dalam membangunkan aplikasi permainan mudah alih untuk belajar perbendaharaan kata bahasa Inggeris. Lebih-lebih lagi, pelajar boleh menggunakan aplikasi itu untuk meningkatkan keupayaan perbendaharaan bahasa Inggeris mereka. Kajian ini juga menyumbang kepada kesusasteraan teknologi persuasif dengan menggabungkan konsepnya dalam teori pembelajaran Bahasa Inggeris berasaskan permainan yang dapat dijadikan asas untuk kajian pada masa hadapan.

Kata kunci: Pembelajaran mudah alih, bahasa Inggeris, motivasi, teknologi persuasif, rangka kerja permainan mudah alih.

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3D	:	Three-dimensional
ANCOVA	:	Analysis of covariance
ANOVA	:	Analysis of variance
API	:	Application programming interface
APP	:	Application
AR	:	Augmented reality
CALL	:	Computer assisted language learning
CD-ROM	:	Compact disc, read-only-memory
CEVLP	:	Cognitive English vocabulary learning program
CSS	:	Cascading style sheet
Df	:	The degrees of freedom in the source
DML	:	Disability Malay language
DRAS	:	Digital reading annotation system
DSR	:	Design science research
DSRM	:	Design science research methodology
EA	:	English application
E-learning	:	Electronic learning
ELLPP	:	English language learning persuasive principles
ELLs	:	English language learners
ELs	:	English Learners
EMGA	:	Educational MGA

EMGALL	:	Educational MGA for language learning
EPLOT	:	Euro POLT
EVG	:	English vocabulary game
F	:	The F-statistic
FBM	:	Fogg behaviour model
FESPTD	:	Fogg's eight steps of persuasive technology design
FPS	:	Frames per second
GBL	:	Game-based learning
GLM	:	General linear models
GPRS	:	General packet radio service
GUI	:	Graphical user interface
HCI	:	Human-computer interactive
HTML	:	Hypertext mark-up language
IDE	:	Integrated development environment
IE	:	Information engineering
IEEE	:	Institute of electrical and electronics engineers
IMAS	:	International modern Arabic school
IS	:	Information system
ISD	:	Instructional systems design
ISDMs	:	Information systems development methodologies
IT	:	Information technology
JiTT	:	Just-in-time teaching

L2	:	Foreign language
LRS	:	Learner response system
MALL	:	Mobile assisted language learning
MELL	:	Mobile English language learning
MGA	:	Mobile game application
MGF	:	Mobile game framework
m-Health	:	Mobile health
M-learning	:	M-learning
MMCD	:	Multimedia mobile content development
MMS	:	Multimedia messaging service
PMGALL	:	Persuasive mobile game application for language learning
Pre-test	:	Preliminary test
PSD	:	Persuasive systems design
RWA	:	Reading and writing application
SDK	:	Software development kit
SEVCLS	:	Situated vocabulary and conversation learning system
Sig	:	P-value approach
SMS	:	Short message service
SPSS	:	Statistical package for the social sciences
SSADM	:	Structured systems analysis and design method
SSM	:	Soft systems methodology

STRADIS	:	Structured analysis, design and implementation of information systems
XML	:	Extensible mark-up language

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter presents an introduction to the concept of using mobile technology in learning English Language in a global context and persuasive technology. The research background, research questions, objectives and significance of the study are also presented.

1.2 Background and Motivation

Today, the number of mobile devices are very close to the number of people around the world which has never happened in the history of electronic devices (Boren (2014). In addition to that, mobile usage is omnipresent in business and education. It has impacted positively on humanity in terms of an improved standard of living (Sam-Oloyede, 2017; West, 2015).

According to Weiss (2017, June 20), the number of mobile device users around the world has grown to 5.035 billion. The latest development is the addition of about 1billion users in the last four years. This means that about 5 billion of the world's 7.5 billion people now use mobile devices from smartphones to tablets to cell phones.

Mobile learning (m-learning) is defined as "*Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies*" (Briz-Ponce, Juanes-Méndez, García-Peñalvo, & Pereira, 2016, p. 136). In the educational domain, m-learning aid learners to acquire vital information, create a conducive environment that support their movement and facilitate learning at any time (Al-Emran, Mezhuyev, Kamaludin, & ALSinani, 2018; Han, Kong, Liu, & Zhou, 2010). Hockly (2012) opined that m-learning enable learners to navigate their target information

through their mobile devices. Therefore, this indicates that m-learning refers to the use of mobile devices for learning purposes.

Currently, English language is used globally in most fields of endeavour and international academic community is fully aware of its importance in terms of educational development (Cheng, 2013). However, according to Al-Shamiry and Alduais (2013) and Khan (2016), in the Arabic world such as Yemen and Saudi Arabia, learning English language is very difficult. Because, children only begin to learn English language in their seventh year after kindergarten; that is English language learning commence at the ages between 12 to 13 (Rababah, 2003). Abbad (1988) and AL-Mamri and Hameed (2019) confirmed the weaknesses of learning English language by Yemen Arab learners. Despite the low-level proficiency in English of most applicants who wish to study in universities, majority of them are accepted to further their education. This is common happening amongst Arabian universities. High school graduates are accepted into English language department without taking in account their level of proficiency and regardless of their ability to communicate effectively in English language (Al-Nasser, 2015; Rababah, 2003).

The learner who masters English language vocabulary may comprehend English better due as a of the influence of vocabulary in any language learning (Ahmad, Armarego, & Sudweeks, 2013; Rezaei, Mai, & Pesaranghader, 2013). On the other hand, after school, some learners are not motivated to study further and review English language vocabulary (Ma, Hwang, Chen, & Ding, 2012). This could be attributed to the lack of engagement in learning and flow with speakers of English Language. A state of flow is described as "*a match between the challenge experienced and the perception of one's own level of knowledge and skill*" (Sandberg, Maris, & Hoogendoorn, 2014, p. 212). Furthermore,

Arab learners feel troubled when involved in communicative interactions with their peers due to their low level vocabulary (Diaab, 2016).

Another important aspect is persuasive technology. It is defined as technology designed to change behaviour or users' attitudes through social influence and persuasion, but not through coercion (Fogg, 2002). This kind of technology is commonly used in any area of human-computer interaction. Interactive computational technologies include Internet services, mobile devices, video games and desktop computers are the most self-identified persuasive technology (Oinas-Kukkonen & Harjumaa, 2008). Nevertheless, this incorporates and build on the results, theories, rhetorics and experimental psychology methods and human-computer interaction. While rhetorics are "*arguments are made not through the construction of words or images, but through the authorship of rules of behaviour and construction of dynamic models*" (Wright & Bogost, 2007, p. 230).

The design of persuasive technology is a specific case of design with intent (Lockton, Harrison, & Stanton, 2010). According to Halko and Kientz (2010), persuasive technology can inspire extrinsic motivation by persuading the users through external motivators. For instance, in the case of extrinsic motivation, every completed task is rewarded with things such as winning trophies and intrinsic motivation persuade the users through internal motivators such as good feeling which the users would have by achieving a goal or being healthy.

1.3 Problem Background

Currently, English language is considered as the most acceptable worldwide language (Cheng, 2013; Lanvers, 2017). Acquiring mastery of English language is a skill that stand to benefit learners immensely. However, the learners face many difficulties in this task especially in learning vocabulary (The Glossary of Education Reform, 2015, July 07). Vocabulary enables learners to perform better and comprehend English language better (Ahmad et al., 2013; Rezaei et al., 2013). Some of the problems faced by learners is the

disparity between the learners' specific culture and the English language (Yang & Liao, 2014). Traditional learning system such as excessive amount of decontextualized information, indirect and abstract knowledge, second-hand experience confined to the classroom and the corresponding lack of motivation (Wong & Looi, 2010a).

Motivation is really one of the important problems in English language learning (Cook, 2001; Wlodkowski & Ginsberg, 2017). When learners lack motivation, they tend to give up easily (Souriyavongsa, Abidin, Sam, Mei, & Aloysius, 2013; Weger, 2013). According to Zughoul (1987), only very few Arabic learners are interactively motivated. Majority of Arabic learners are not genuinly motivated to learn foreign languages (Mohammed, 2015).

Electronic Learning (E-Learning) has been used in education for language learning since 1960s (Fryer, Bovee, & Nakao, 2014). However, research findings show that the use of e-learning has little effect on learners performance (Culp, Honey, & Mandinach, 2005; Fryer et al., 2014). Because most learners do not have personal computers or are not motivated (Yu, Chen, Yang, Wang, & Yen, 2007). Therefore, m-learning technology seems to be an adequate substitute for e-learning, offering the advantage of universal access, privacy and efficiency. Moreover, the technology is cost effective and interactive as compared to others and enables immediate feedback. This encourages learners to come back for later updates and further study (Goundar, 2011).

M-learning enables learners to acquire information and creates environmentally friendly mobile supports to learners with various resources in real time (Han et al., 2010). However, "mobility" is not limited only to movement from one place to another, it also includes human relations and interactions. Therefore, mobility can be viewed from three interconnected dimensions: temporal, spatial and contextual (Kakihara & Sorensen, 2002). Recently, increased visibility and importance of m-learning has been observed in

higher education (Traxler, 2007). M-learning provides constant communication with technology and improves learning experience in younger generation. It also encourages interaction among learners both in virtual and real world by offering learning support beyond classrooms and encourage conversation throughout our daily life's (Sharples, Taylor, & Vavoula, 2010).

Mobile game is one of the m-learning applications that are used to aid learning. According to Šćepanović, Vujičić, Matijević, and Radunović (2015), mobile educational game for learning is a game specifically used for learning which is played on mobile devices. The main purpose of mobile education games is to use gameplay to motivate and engage learners in knowledge acquisition. This approach result to effectiveness in learning content transfer.

The use of mobile game applications in education has great potential as it combines fun and active learning in an excellent manner (Huizenga, Admiraal, Akkerman, & Dam, 2009). According to Bjoerner and Hansen (2011), an educational games motivate learners and deliver higher quality learning outcome. However, these types of games are very difficult to source. Currently, develop quality games for learning propose could be complex, challenging, and costly process (Boyle et al., 2016), these issues from both conceptual and a technical standpoint (Carvalho, 2017). The challenging due to the principles of learning and gameplay are different and frequently conflicting (Arnab et al., 2015).

Nowadays, software designers, developers, and investigators are exploring novel ways to engage learners or users. Improvement by adding persuasive principles to mobile game applications may influence the behavior of users. However, there is no guideline to develop mobile game applications for learning English language by adopting the persuasive technology. The importance of the guidelines is to deal with the lack of

theoretically grounded mobile frameworks and the limitation in mobile game patterns of most related frameworks. Furthermore, if persuasive technology aspect and game patterns are added in games, better result-oriented outcome would be achieved. In the absence of guidelines in developing mobile game application, one will not be able to proceed easily. One particular importance of having a good guideline is to enable development of an articulated mobile apps (Leung et al., 2016).

To date, only few studies have included the persuasive technology aspect in their studies (Devincenzi et al., 2017). This has posed a great challenge that requires great effort in the learning domain. This drives back to the notion concerning the value of persuasive technology toward motivation in learning.

Language learning requires a different mobile framework (Berking, Haag, Archibald, & Birtwhistle, 2012; Teall, Wang, & Callaghan, 2011) thus, the need to include theoretically grounded concepts in the mobile framework (Park, 2011). Therefore, guidelines and frameworks are required to develop mobile applications that would aid in learning English language.

1.3.1 Problem Statement

Most Arabic students are not motivated to learn foreign languages like English. This has led to their graduation from high schools and universities with poor language skills. In the other hand, mobile game applications are popular tools used for languages learning. Currently, developing quality mobile game applications for learning proposes could be complex, challenging and costly both from a conceptual and technical point of view. The sets of challenges related to learning and gameplays are different and frequently conflicting. Moreover, inadequate mobile game frameworks in English vocabulary language learning for primary school students has affected the development of a good quality mobile game applications. Persuasive technology is highly imperative for

enhancement of motivation and development of interactive interfaces through mobile game application design. However, the use of this technology is very limited especially in English language learning. To address the aforementioned issues, there is need to develop a framework that incorporates a guideline using the principles of persuasive technology to enhance both the motivation and academic performance of primary-aged students in the domain of English vocabulary language.

1.4 Research Questions

The following research questions (RQ) are formulated for this research to cover the research objectives:

RQ1: What are the suitable persuasive principles required in developing a guideline for primary school students?

RQ2: What are the important components required while designing the mobile game framework for primary school students?

RQ3: How to develop a mobile game application using the proposed framework?

RQ4: How to evaluate the mobile game application in order to validate the proposed framework?

1.5 Research Objectives

The research objectives are outlined as follows:

i. To identify suitable persuasive principles for mobile game framework.
ii. To design a mobile game framework for English language vocabulary learning based on the persuasive principles identified in objective (i).
iii. To develop a prototype based on the proposed framework.

iv. To evaluate the framework by testing the effectiveness of the prototype among primary school students.

1.6 Research Scope

The research provides a framework to develop mobile game application for Arabic primary school learners who can potentially learn English language as a second language better at tender age. It is a well-known philosophy that the earlier learners begin learning new or second language the better would be their performance (Cenoz, 2002; Kalberer, 2007; Lenneberg, 1967; Mayo & Lecumberri, 2003). The experimental study was implemented in the International Modern Arabic School (IMAS) in Putrajaya. In addition, this research defines the principles to be used in developing a mobile game framework for primary schools learners. Drawing on the analogy of persuasive principles, this has enabled the development of a mobile game framework with fewer pitfalls regarding the behavioural change among the English language learners. As the persuasive attributes improve the motivational level, the user behaviour would improve. Furthermore, persuasive technology has been applied to attain features that lead to motivational change. By doing so, the game framework is designed to motivate the learners towards the use of innovative technologies besides the traditional learning methods.

1.7 Significance

According to Yoganathan and Kajanan (2013), persuasive technology is becoming more popular and the need for research to explore its effectiveness and viable design approach is highly imperative. Previous research works by (e.g., Sandberg et al., 2014; Thang et al., 2012) on games frameworks has indicated that lack of motivation to use an application is one of the obstacles in accomplishing primary aim of game framework such as English language learning. For instance, the game framework may not be effective if the user is not motivated. In this scenario, the incorporation of the persuasive technology

in game framework can effectively function as a crucial element to advance the motivation of users. Thus, the novel contribution to the body of knowledge in this research work is development of framework that includes persuasive guideline to help in the design of an effective mobile game application to learn English language. The guideline was developed and implemented, and the effectiveness of the framework was assessed using real users. The framework offers a guideline to designers working with mobile game applications for learning languages.

1.8 Thesis Outline

This thesis consists of seven chapters and is presented as follows:

- **Chapter 2**: Focuses on the literature review related to English language learning, e-learning, m-learning, mobile game, mobile learning framework, persuasive technology, and educational theories and modules.
- **Chapter 3**: This chapter elaborates on the details of the research methodology (DSRM) applied in this study. At the end of the chapter the summary of research flow gives a full picture of the whole study.
- **Chapter 4**: This chapter shows the framework and guideline development. The process involves in developing the framework and guideline are discussed.
- **Chapter 5**: This chapter explains the development of the prototype based on the proposed framework. The reflection of each persuasive principles on the prototype is listed and explained.
- **Chapter 6**: This chapter clarifies the evaluation of the prototype and it discusses the result of the study and makes comparisons among the groups of studies. Reaction and learning levels of the Kirkpatrick model is discussed as well.

- **Chapter 7**: The final chapter concludes the whole thesis (summary of findings, the contribution of the study, and the study limitations) and provides recommendations and future works.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents critical review of the key research works conducted so far in the area of e-learning, m-learning and m-learning in the area of English language. The thorough review of m-learning in learning English language will give a vivid picture of the benefits and limitations of mobile technologies. Also, it will ensure m-learning games are current and ensure improvement in future technologies to help learners improve their performance in learning English language. Next, the current m-learning frameworks are reviewed as well. The models and principles of persuasive technology are presented to provide an insight into mode of operation of these models and principles. This research investigated the application of persuasive technology in other to know the current realities and technologies most appropriate in the educational domain. The study is accompanied by a thorough review of English language learning acquisition and research methodologies.

This chapter is divided into sections; that is (1) English language learning acquisition, (2) e-learning, (3) m-learning, (4) mobile game, (5) mobile game framework, (6) persuasive technology and (7) educational theories and models.

2.2 English Language Learning Acquisition

This section presents what English language learners actually need to know and the meaning of English language learning. According to The Glossary of Education Reform (2015, July 07), English Language Learners (ELLs) are defined as *"students who are unable to communicate fluently or learn effectively in English, who often come from non-English-speaking homes and backgrounds and typically require specialized or modified instruction in both the English language and their academic courses".* English is not only the most useful language in the world but also the easiest one to learn and use (Antimoon,

n.d.). There are many factors and views why studying languages are important and necessary activity. Studying foreign languages offer greater personal, social, professional and economic advantages (Vistawide, n.d.). According to Bohdanska (2012), there are some advantages which arise from the language learning:

i. The understanding of global issues.
ii. Working and studying opportunities.
iii. Connection to the mother tongue.
iv. The improvement of life and cognitive abilities.
v. Easy and enjoyable traveling.
vi. Get Satisfaction.

2.2.1 English Acquisition Problems

There are many problems faced by second language learners who want to study foreign language such as English. Some of these problems are shown in Table 2.1 and the rest are explained intensely after the table due to its relationship with this study. Additionally, many research works have attempted to study and resolve other problems such as poor or inadequate equipment, tools, software, or technology, and insufficient reports, reviews, discussion.

Table 2.1: English Acquisition Problems

Problem	Authors / Year	Findings
The difficulty of language to learners	Luster (2011)	Most learners who have come from non-native speaking families properly will not graduate from high school in the United State of America.
Culture	Thang et al. (2012)	Even if the Malaysian school curriculums have been done by an expert, they do not meet the Asian culture.
Teaching style	Wong and Looi (2010b)	There are many problems with traditional learning systems such as indirect and abstract knowledge.

One of the basic problems in learning English is motivation (Kondo et al., 2012). Motivation refers to *"enthusiasm for doing something"* (Mladenović, Žanko, & Mladenović, 2015). Dörnyei and Skehan (2003) defined motivation as being *"responsible for why people decide to do something, how long they are willing to sustain the activity, and how hard they are going to pursue it*" (p. 614). It has been identified that motivational learning environments need learners to feel valued, mutually joined, intellectually challenged.

The motivation as a psychological construct involves five fundamental needs which determine the individual's motivation. The individuals attempt at gratifying these fundamental needs namely are; physiological, societal, self-respect, self-actualization and protection (Kanfer, Frese, & Johnson, 2017). This implies that as a psychological processes motivation stimulates excitement and perseverance of voluntary action intended at some aim (Green, Finkel, Fitzsimons, & Gino, 2017). To this end, motivation is regarded as a very individualized process. The higher an individual feels the need to intend an action, the more motivated he/she is likely to be (Liu, Fang, Wan, & Zhou, 2016). Thus, to motivate a person so that he/she may engage in doing an action such as language learning, one needs to use a variety of tactics or comprehensive design to address diverse needs.

Thus, many reviews have attempted to solve the issue of motivation viewing as how learning can be improved and keep the targeted persons motivated enough to engage in learning activities (e.g. Billings & Mathison, 2012; Nah, 2011; Wicha & Temdee, 2013). For instance, Szalma (2014) stated that motivation serves as the driving force in human-computer interaction. Some other studies on human-computer interaction also include motivation, technology acceptance and intrinsic motivation (Venkatesh, 2000), pleasurable design (McLaughlin, Gandy, Allaire, & Whitlock, 2012), extrinsic motivation

(Kurkovsky, 2013), and boredom (Scerbo, 1998). Dekhane, Tsoi, and Johnson (2016), argued that the motivation triggers the learning experience of the learners by using game apps.

Table 2.2: Motivation Problem in Learning English

Problem	Year	Authors	Vocabulary
Lack of motivation	2014	He, Ren, Zhu , Cai, and Chen	Yes
	2014	Lee	Yes
	2014	Sandbery, Maris, and Hoogendoorn	Yes
	2013	Ahmad, Armarego and Sudweeks	Yes
	2013	Wicha, and Temdee	Yes
	2013	Lucht and Heidig	Yes
	2013	Lamb	Yes
	2013	Hsu , Hwang, Chang and Chang	Yes
	2012	Ma, Chen, Hwang, and Ding	Yes
	2012	Thang et al.	Yes
	2012	Muhanna	Yes
	2012	Yang	Yes
	2012	Kondo et al.	Yes
	2011	Billings and Mathison	Yes
	2011	O'Neill and Geoghegan	Yes
	2010	Cheng, Hwang, Wu, Shadiev and Xie	Yes
	2010	Hewagodage and O'Neill	Yes
	2010	Chang , and Tung	Yes
	2014	Chu, and Chen	No
	2013	Gill	No
	2012	Kamaruzaman , and Zainol	No
	2012	Biggs.	No
	2011	Chang and Hsu	No
	2011	Chen and Chang	No
	2011	Lousado , Costa, Oliveira, and Roberto	No
	2011	Park, Kim , and Lee	No
	2011	Nah	No

Additionally, motivation is one of the several aspects that are associated with language learning tendency (Thurairaj, Hoon, Roy, & Fong, 2014). According to Shih and Reynolds (2015) motivation components are: motivational intensity, intrinsic motivation, extrinsic motivation and required motivation. Murty, LaBar, Hamilton, and Adcock

(2011), found that the high level of the motivation is directly related to the performance of the participants. Subsequently, in a given situation wherein participants get expose to the gamified learning app, it is likely to improve their performance as it may arouse their motivation. Therefore, motivating aims to help learners to focus on learning tasks which may, in turn, improve their performance. Furthermore, mobile application-based tasks can help learners who are faced with low motivation problem in their traditional coursebook materials because it can motivate learners to study harder (Falloon, 2013).

Table 2.2, shows all the articles that have been published from 2010 to 2014 on Web of Science, ProQuest and IEEE databases. These research works used m-learning to solve motivation problem facing learners of English language. Additionally, motivation has been identified the main problem of the research in some of the articles or has combined as one of many. Moreover, most of these articles focused on improving learners' vocabulary performance. So, this review has shown that motivation as problem and vocabulary as English skills are studied and investigated together in most of this kind of study. Moreover, these studies provided a good clue on how technology can assist in motivation limitation by using technology to enhance vocabulary level of learners.

2.2.2 Arab Learners' Motivation and Performance in English Language Learning

According to Alrashidi and Phan (2015) and Rababah (2003), it is no longer news that Arab learners of English language are faced with problem regarding English language learning and this is clearly stated in many research publications. This is because, English language is not used in their day-to-day activities. However, Arabic learners use Arabic language everywhere in their daily endeavours. Alrabai (2016) and Rababah (2003) believed that Arabic language speakers in Jordan find it difficult to engage in communication with English language even if they graduated from schools thought in English language. As such, they cannot express what they want in authentic

communicative situations due to inefficiency in the vocabulary or other language issues. Some Arabic speakers could face problem in keeping the interaction going for an extended period. According to Al-Nasser (2015), Khan (2016), Mukattash (1983) and Suleiman (1983), there exists great deficiency of English proficiency among university graduates even among those that generally learn English language as majors in Arabic countries as well as other nations.

According to Dmour (2015) and Rababah (2003), even though Communicative Language Teaching approach clearly state the importance of teaching vocabulary items in context. Vocabulary items is still taught in isolation rather than in context. In addition, they are stated that the weakness of Arabic English language learners is caused by many factors: teaching methodology, learners' motivation, English language department and school curricula, lack of target language environment and inadequate knowledge on the part of school graduates when admitted into universities.

Any technology such as mobile device, Internet, computer, etc that is used to support and improve learners' learning experience is considered an educational tool (Fraga, n.d.). Thus, Sections 2.3 and 2.4, present discussion on these technologies to find out the most suitable to be adopted.

2.3 E-learning

Globally, stakeholders and governments across the world have recognized the importance and value of digital technologies in language learning. Any technology (such as Internet, computer or information communication technology) that is used to support and improve the learners' learning experience, is considered an educational tool (Fraga, n.d.).

Clark (2002) described e-learning as the content and instructional methods that are delivered on computers such as Compact Disk- Read Only Memory (CD-ROM), Internet and intranet. The main aim is to achieve organizational or individual targets through knowledge based and skills related developments. E-learning has two types which comprise of computer-based and the Internet-based e-learning (Arkorful & Abaidoo, 2015).

Arkorful and Abaidoo (2015) listed out some benefits of e-learning as follows:

i. It is flexible in terms of time and place.
ii. It offers easy access to an enormous amount of information.
iii. It builds bonds between learners with the use of discussion forums.
iv. It saves money because learners do not need to travel.
v. It provides information relevant to a diverse group of learners.
vi. It helps to cope with the lack of academic staff.
vii. It allows self-pacing.

According to Oye, Salleh, and Iahad (2012), e-learning can be integrated into many categories such as educational courses, informal learning, blended learning, communities, knowledge management, and learning networks. Each category addresses several aspects such as addition of simulation to courseware, wikis, blogs, combination of face-to-face, online learning and communities. Therefore, these would strongly contribute to the flow of tacit knowledge.

One specific area where e-learning is thriving in medical education. E-learning is successfully deployed to train future physicians (Dhir, Verma, Batta, & Mishra, 2017). The advancement in technology as well as access to broadband connection from distant training sites enable synchronous learning delivery. The synchronous learning mode such

as through webcast comprises live video/audio broadcasting training session and storage of training information to be accessed later by the participants. The various benefits of e-learning in this particular sector consist of connection of learners remotely to live training sessions. Trainers and learners can interact in real time and receive peer to peer feedback. Learners or participants can access training materials and go through them at their own pace (Dhir et al., 2017; Kim, 2006).

2.3.1 E-learning in learning the English language

McGinnis, Goodstein-Stolzenberg, and Saliani (2007) defined e-learning as "*heterogeneous, hybrid texts or a new communication medium where youth can publicly express their ideas through symbols, moving images, photographs, pictures, and texts they have downloaded from other Internet sites*" (p. 286). They investigated the effect of weblogs or blogs on English language learners and how e-learning types can aid in improving language skills. The research also examined the learners' attitudes toward digital technology. The results have shown that weblogs have enhanced Thai learners' writing ability and self-confidence. Also, learners are motivated to learn English even outside the classrooms.

Moreover, Thajakan and Sucaromana (2014) carried out a study using multimedia Computer-Assisted Language Learning (CALL). The term CALL was explained by Levy (1997) as: "*the search for and study of applications of computer in language teaching and learning*" (p. 1). This includes multimedia, texts, sounds, animations and pictures which can be used with the aid of CD-ROM. It is used to ascertain the applicability of such technology in enhancement of student's phonemic awareness. This is because Thai learners in 1st grade face challenges of learning English language. To get more accurate results, the learners were divided into two groups based on their performance in the phonemic awareness test. The learners' view on the CALL program were positive.

Chen, Wang, and Chen (2014), developed and applied web-based Digital Reading Annotation System (DRAS) to improve reading performance of 7th Grade learners. This study also found that it is not easy to use computer-assisted learning forms or tools in learning English for non-English speakers. The main purpose of this study was to explore the effect of the proposed system on English learners. The results showed that there was a distinct improvement in the learners' reading skills.

According to Kim (2014), non-native English speakers need vocabulary range between 3000 to 5000 words during their university years to enable better understanding of university textbooks. That amount of vocabulary words was too high for most Korean learners. Hence, the study prepared a Cognitive English Vocabulary Learning Program (CEVLP) to figure out the necessary way to move forward from the traditional style of teaching vocabulary to adopt CEVLP. Very encouraging results were obtained from this study.

Muhanna (2012), investigated the effect of online games in learning vocabulary among learners who were less motivated to learn English. The study revealed that games are powerful ways to make learning effective and interesting. In addition, Lucht and Heidig (2013) used a game called HOPSCOTCH to engage elementary school learners in a vocabulary learning activity. In this exercise, learners could easily memorize and correctly spell the new words after using HOPSCOTCH. Moreover, Cardoso (2011) investigated the effect of using Learner Response System (LRS) among learners or learners of English as a foreign language (L2). This led to a rise in student engagement and participation during English classes. In general, most of the studies claimed that e-learning has improved, and enhanced learner's language performance and e-learning has made the study more interesting and are motivated.

2.3.2 E-learning Limitations and Challenges

To achieve the best learning outcome, it is paramount to have an understanding of learners' learning styles. Online learners' learning style could be inadequate; this has implications on how academics develop learning material. Some learners learn through interaction, some prefer learning through visual presentation, while some through listening to instructions and writing notes. This challenge has implication on the learning outcomes and pose serious challenge on academics. Because, it is not easy to understand the different learning styles of learners in e-learning environment. Islam, Beer, and Slack (2015), listed out some challenges in e-learning as follows:

- Pedagogical e-learning challenges

E-learning requires a different approach to pedagogy especially in areas like individual and group interaction and online assessment. However, these skills are not unfamiliar, distance education has existed for decades using postal services, TV, and telephone. However, not only are the technical skills an issue but content should be appropriately designed for distance learning; it is not simply about "dumping large amounts of text in a web page" as this is inefficient for learners.

- Technological challenges

The quality of e-learning system has been criticized in many works found in literature. Some of the issues raised are: bad performance, usability problems, institutions being unable to customize their data according to their requirements and sometimes criticised for having a teacher centered system rather than a learner-centred system.

- Technical training challenges

In reviewing e-learning literature, there are various criticisms of poor training provided by institutions to academics. The issues raised include inadequate training, ineffective training styles that do not fit academics personal preferences, lack of hands-on practice and ability to create materials according to pedagogical requirement was missing from the training scenario.

- Time management challenges

Academics have difficulty in keeping pace with postings on the discussion boards and forums. The volume of traffic data in the forum affect the time required to be up to date and this eventually cause academics to sometimes skim over posted messages. It was also observed that other academics that are persistent in checking every posting become selective when increased traffic is observed.

Additionally, Qureshi, Ilyas, Yasmin, and Whitty (2012) identified some challenges faced by university learners and are outlined below: -

i. Developers lack quality experts of information and communication technology and there is no equal access to university computers for learners. Due to poor English comprehension, many learners give up using e-learning.
ii. Learners still need the traditional style of education to achieve more significant learning outcomes.
iii. Learners who are not aware of the benefits of e-learning get frustrated easily.
iv. Learners who are not conversant with the use of computer and Internet obviously cannot use e-learning.

v. Learners who are reluctant to adopt new technologies will find e-learning challenging to use.

vi. Without technical support, such learners will not form positive attitude toward advances in technology.

vii. Security issues also discourage learners from accepting e-learning.

Following these limitations of the usage of e-learning, it shows that learners learning new language obviously have difficulties with e-learning. This is more reasons why the need to seek the support of m-learning in terms of easy access, wider coverage in usage and portability is highly imperative.

2.4 M-learning

According to Mehdipour and Zerehkafi (2013) m-learning has many definitions. Generally speaking, m-learning is concerned with education or training that is affected using portable computing devices such as tablet computers or smartphones. It can also be defined as any kind of learning that can be done in motion or when learners take advantage of advances in mobile technology to learn.

New technologies are hardly valued if they are introduced to a community that is not familiar with that technology. However, m-learning is not subject to this drawback. According to Malaysian Communications and Multimedia Commission (2013), Malaysia, China, South Korea, Hong Kong, and Singapore lead the world in smartphone usage. Surprisingly, percentage of smartphone users recorded about 51% which outnumbered personal computer users that recorded 39%. It is noteworthy note that most Malaysians prefer to access the Internet through mobile devices (Yapp, 2014, October 29).

Figure 2.1 shows that more than 46% of the users are under 30 years old and therefore young people contribute a good percentage in mobile phone usage among the Malaysian population.

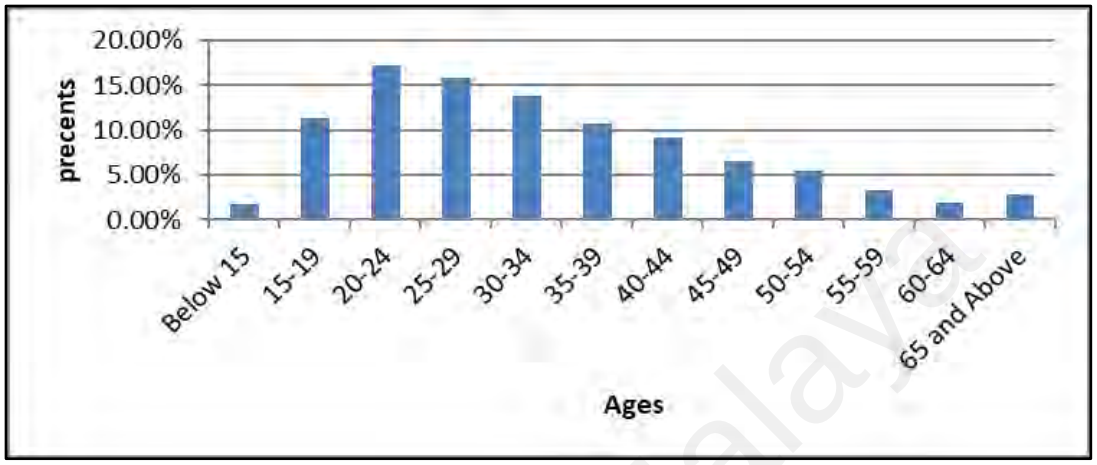

Figure 2.1: Age Classification of Mobile Usage among Malaysian Population

2.4.1 M-learning Benefits

Investigation has shown many benefits in relation to mobile devices as outlined below:

- Benefits of portability/mobility of mobile devices

Lai and Hwang (2015) posited that portability/mobility signifies the micro sized nature of mobile devices. Jung (2015) indicated that it handiness and easy to carry about in a pocket. Ahmed and Nasser (2015) and Mingyong (2015) inferred that it is a device that is readily available for use 'anytime and anywhere. Moreover, Ho and Lin (2015) argued that mobile devices create new ways of teaching better than the traditional teaching methods in classroom situations.

- Benefits related to social interaction and connectivity

Social interaction and connectivity signifies collaborative learning which means users can communicate and share information easily (Rahimi & Soleymani, 2015; Simonova, 2015).

- Benefits related to context sensitivity

Context sensitivity is the affordability and multi-functionality that make mobile devices more flexible (Gheytasi, Azizifar, & Gowhary, 2015; Munteanu et al., 2014), which make their use more flexible (P. Lee, 2014) and accessible (Suwantarathip & Orawiwatnakul, 2015), thus reinforcing the concept of anytime and anywhere learning.

- Benefits related individuality

Individuality is the ability of mobile appliances to be personalise and customised for use by individual learners based on their learning styles, needs and interests (Hsu et al., 2013; Sung, Chang, & Yang, 2015).

- Benefits related to feasibility/affordability

The affordability of mobile devices (Oz, 2014) compared with computers make it more accessible to users across the world.

- Benefits related to functions/features and applications/software

Users of mobile devices can easily take pictures, make voice, video recordings, listen to music, use language study software or bilingual dictionaries, watch audio or visual materials, send text messages, play games, listen to radio, make regular phone calls and engage in social networking (Gromik, 2012).

- Benefits related to its global usage

Most mobile devices are gaining wide coverage and acceptance more than ever before (Liu, Yuen, Leung, & Meng, 2012).

- Benefits related to improved learning style beyond the traditional method

Great paradigm shift in technology has been observed to a mobile device aided classrooms. Such advances in technologies improves learning, increase retention, encourage remote learning for busy learners that may to get the chance to undergo traditional classrooms (Jung, 2015).

- Benefits related to convenience

Mobile devices are often with users almost all the time, thus making it more convenient and accessible than computers and textbooks (Wu, 2015).

- Benefits related to formal and informal learning

Instruction and language learning can be revolutionized m-learning with the aid of mobile devices. This device can be used individual as a learning tools to synergise in-class and out-of-class language learning spaces (Wong & Looi, 2010b).

- Benefits relation to supportive day to day activities

Daily learning activities can be improve with the aid of mobile devices; this indicates that learning can go on freely in an unplanned setting outside the classroom or conventional environment such as office or home (Valk, Rashid, & Elder, 2010).

- Benefits related to the method of instructional activities and assessment

Mobiles devices can be used by learners as complementary to traditional approach to assessment and instruction (Alemi, Sarab, & Lari, 2012).

- Benefits related to the learner-centred method

Learner-centred method can be reinforced using mobile devices due to the ability a learner begin learning whenever he/she wants (Boyinbode, Bagula, & Ng'ambi, 2012).

- Benefits related to attractive/enjoyable presentation

M-learning positively influence learners' commitment and make learning more enjoyable and participative (Hargis, Cavanaugh, Kamali, & Soto, 2014).

- Benefits related to availability of information and quick response or feedback

Real-time and quick response or feedback based on availability information as provided by mobile devices aid and serve as a teaching tool (H.-c. Lee, 2014).

- Benefits related to self-study

Learners receive great benefits from mobile devices due to its ability to encourage development, self-learning habit and enables review of what have been taught whenever they want (Wong & Looi, 2010a).

2.4.2 M-learning Limitations and Challenges

M-learning has some general limitations and challenges that may affect its usage and extension. According to Asabere (2013), the general challenges that can be encountered are as follows: -

i. Learners may easily get the opportunity to cheat if they are not monitored or under observation.
ii. Learners who are familiar with technology have an advantage over learners who are not as technology literated.
iii. It can cause feelings of isolation for non-experts in technology.

iv. Because of rapid upgrades, some content may be outdated.
v. Learners from a non-technical background may need an additional learning curve.
vi. It does not add any value in augment practical hands-on lessons for some fields.

E-learning and m-learning come with many benefits and applications. However, they have their own challenges. It is clear that both have benefits and limitations in English language learning by learners. There are many techniques that can be adopted in this field, but m-learning indicated easier usage and application by learners due to:

i. Global usage and hold.
ii. Easy to replace computer without loses.
iii. Highly desirable to use in learning English language among learners and teachers.

Educational development and distance learning can be divided into three stages: 1) the paradigm shift from distance learning (d-learning) to Stage (2) electronic learning (e-learning), and lastly to Stage (3) m-learning (Keegan, 2002; Korucu & Alkan, 2011) as shown in Table 2.3. Industrial revolution during the eighteenth and nineteenth centuries activated the quest for the development of d-learning due to in advances technology. e-learning was introduced in the 1980s during electronics revolution associated. This development is as a result of the development in the telecommunications sector. While, m-learning evolved during the late twentieth century as a result of revolution in mobile and wireless communication (Lam, Yau, & Cheung, 2010). Therefore, currently, mobile and wireless technologies are the most recent advances among the three learning approaches (Sarrab, Elbasir, & Alnaeli, 2016). Korucu, Alkan, and Sciences (2011) reviewed the transition process from e-learning to m-learning and highlight the

fundamental features and changes in these two learning environments as shown in Table 2.3.

Table 2.3: Comparison of Characteristics between E-learning and M-learning

e-learning	m-learning
Computer	Mobile
Bandwidth	GPRS, GPS, Bluetooth
Multimedia	Objects
Interactive	Spontaneous
Hyperlinked	Connected
Collaborative	Networked
Media-rich	Lightweight
Distance learning	Situated learning
More Formal	Informal
Simulated situation	Realistic situation
Hyper learning	Constructivism, situations, collaborative

Therefore, there is a very high desire to use an m-learning technology because it shows a good effect on enhancing performance and increase motivation. Furthermore, this research is going to review the empirical evidence. There is already research according to literature related to (1) the positive impacts and outcomes of m-learning on English language education, (2) the least technologies which have been applied and used, and (3) the recommendations, benefits, and possible challenges of using m-learning in this field.

2.4.3 M-learning Improves Performance of Learners of English Language

As compared to e-learning, m-learning offers different range of benefits. M-learning provides useful access to information required at the moment and it is suited for short courses that can be easily reviewed. Situated Vocabulary and Conversation Learning System (SEVCLS) were implemented by Wicha and Temdee (2013) to make English vocabulary learning enjoyable for school learners coming from rural areas. It was reported that significant rise in user satisfaction was recorded as a result of implementing such

system. According to Lamb (2013), similar methods were used to increase motivation among rural English learners. This study showed that there are many constraints and challenges faced by adolescents in rural areas and the study also argued that mobile technologies could improve learners of English in the future.

On the other hand, H.-c. Lee (2014) divided learners into three groups, the first group studied vocabulary based on one traditional book, the second group studied vocabulary through a mobile application, and the last group combined both the traditional instructional methods with the mobile application. It was found that the learners in the second and third groups exhibited an enhanced performance. In addition, Rezaei et al. (2013) studied the effect of using mobile applications on English as a second language for learners' and their results revealed that the application improved learners' vocabulary, confidence and class participation.

He et al. (2014), studied the problems that non-native English language learners have with English vocabulary. These problems include an out-dated teaching style, poor enunciation, and teachers who fail to motivate learners sufficiently. To overcome these problems, they provided Augmented Reality (AR) technology to design and develop mobile English learning software for pre-school learners to improve their vocabulary. They found that the learners who used the application learned significantly more than the control group.

According to Garris, Ahlers, and Driskell (2002), attitudes can be influenced through games. For that, Schwabe and Göth (2005) applied mobile game learning to support the learners in their studies and enhance their motivation. The game moved the learners to become more receptive and this made learning easier. In another study Sandberg et al. (2014) employed a gaming application (MEL-original) that add value to their previous vocabulary application. The learners quickly lost interest in the original version. The

MEL-enhanced was observed to be interesting and consequently gets more engagement by learners than the older version.

In addition, many researchers like (see Kondo et al., 2012; Liu & Chu, 2010) have applied different types of mobile games to enhance learners' motivation and engagement. Most of the results gotten were found to be encouraging in terms of improved learning outcomes. In general, most of the studies that used game applications claimed that m-learning has improved and enhanced learner's language performance by making the study interesting and have increased motivation. Table 2.4 shows comparison between the findings in studies that used m-learning for English language learning.

Table 2.4: **Comparison of the Findings Found by Various Authors While Investigating the Importance of M-learning in Studying a Language.**

Authors	**m-learning benefits on English language learning and on learners**
Lamb (2003)	Increase motivation
Lee (2014)	There is significant learning improvement when both mobile and traditional learning are involved as well as on m-learning as compared to traditional type of learning only.
He et al (2014)	Significant learning improvement among learners
Rezaei et al (2013)	Improve vocabulary confidence among learners
Garry et al (2002)	Influence attitudes of learners
Schwabe and Goth (2005)	Learners are more receptive
Sandberg et al (2014)	Increased interests
Kondo et al (2012) and Liu & Chu (2010)	Improved motivation and engagement

Investigation was carried out on various research works pertaining to m-learning in English language in other to find out factors that influence the use of m-learning in learning English language. Most of the studies indicated satisfactory outcome from the learners when m-learning is used, but satisfaction is the lowest level of outcomes when evaluating an intervention. For more understanding, a Systematic Literature Review

(SLR) was undertaken to investigate the strength of m-learning in terms of learning English. This would enable the latest technologies that have been used in this field to be assessed.

SLR of 133 research was conducted and published on primary search from online articles between 2010 and 2015. The outcome of the research was obtained from databases such as Web of Science (WoS), IEEE Xplore, Education Resources Information Centre (ERIC), SpringerLink, ScienceDirect, Wiley Online Library, conference proceedings and journal publications. The detailed review includes but not limited to English language acquisition problems, demographic, English language skills, assessments and evaluations and significance of use.

2.4.3.1 Systematic literature review (SLR) of m-learning for English language learning

The review showed that about 30.8% of research works developed applications to resolve the issues of low motivation amongst learners of English language (Table 2.5 and Table 2.6). Learners lose interest often in learning English language (Souriyavongsa et al., 2013; Weger, 2013). Therefore, paradigm shift in research related to learning English language by learners is being witnessed toward improving motivation (Liu & Chu, 2010). Other problems needed to be addressed in parallel is the effects of applying the new technology in classrooms (Rahimi & Asadollahi, 2010). Review has shown that there exist limited research works in the area of m-learning (Li & Li, 2011; Yang, 2012). Nguyen and Pham (2012) recommended testing of these technologies in education sector. The use of mobile technology may help learners of English language to acquire the necessary skills to survive in a complex, highly technological knowledge-based economy (Edutopia, 2008).

Table 2.5: The Ranking (High Percentage to Low Percentage) of the Sort of Problems that are Encountered in Learning English Language

Problems encountered	Ranking
Motivation	1
inadequate identifying of reports, needs, studies, or effective test of technologies	2
Language barriers, inadequate reading materials or limitations of vocabulary	3
Others	4
Inadequate and poor equipment (Software and hardware)	5
Culture	6
Lack of standardised curriculum and teaching method	7
Poor teaching quality or unqualified English teachers	8

Table 2.6: Percentage for Each Specific Problem Related to English Language Learning

Challenges of learning English language	Percentage (%)
Motivation	30.82
inadequate identifying of reports, needs, studies, or effective test of technologies	29.32
Language barriers, inadequate reading materials or limitations of vocabulary	12.78
Others	12.03
Lack of equipment or poor current equipment, technique, or software	6.02
Culture	3.76
Lack of standardized curriculum and teaching methods	3.76
Poor teaching quality or unqualified English teachers	1.51

Other challenges of vocabulary development and limitations (Chang & Hsu, 2011), inadequate reading materials (Hsu et al., 2013), and disabilities related to language learning (Chen & Chang, 2011). This combines two English language skills due to the robust relationship between the reading comprehension and the reader's vocabulary (Burkhour, 1999). The challenges of missing or poor equipment (Meurant, 2010), technique (Liu et al., 2012), or software (Kwon, Kim, & Moon, 2014) are also important. Chi, Kuo, and Lin (2012) also explained that culture is an additional challenge when it

comes to embracing and dealing with different socio-cultural environments or new culture. Moreover, some learners are more in tendon with informal than with the formal learning due to socio-cultural factors: social inclusion, exclusion issues and the available support for language learning (Ahmad et al., 2013).

Inadequate teaching method and non-standardisation of curriculum creates more challenges. Teaching non-English courses is discouraging due to the traditional curriculum, approach, over-crowded classrooms, teaching methods of traditional classroom and the limited teacher duration for each student (Xiao & Luo, 2014). Another challenge is the shortage of properly trained and qualified English teachers. According to Hwang and Chen (2013), learners' performance can be to enhanced if the teachers well-trained, skilled and qualified. Finally, the 'others' fall within the category of all the remaining problems of English language such as context-aware learning (Sun & Chang, 2016) and pedagogical needs (Khazaie & Hayati, 2013).

The outcome based on the literature review showed that researchers are utilising mobile technologies to resolve issues pertaining to learning English Language. One key factor that mobile technology can be used to address is motivation factor as the motivation factor have received tremendous attention by researchers (Cook, 2001; Wlodkowski & Ginsberg, 2017).

Demographic aspect based on a thorough review carried out shows that most of the articles in this field investigated the influence of m-learning among tertiary institution learners. One hundred and two (102) publications referred to the perception of participants taken from the same class and about 13 from mixed classes, such as teachers and learners together. It is also noteworthy that six articles did not mention their research participants at all. About 41% of the research in this field investigated the effects of m-learning among university learners. Most research works have their participants (learners)

in the same class while some percentage of research works take learners from mixed classes. Generally, in these various researches, teachers and educators were not included as participants in the research works. The participants are classified based on the sample taken in this research as presented in Table 2.7.

Table 2.7: Demographic Factors

Participants	Percentage
University students	41.35
Pre-school/school students	15.03
Users/students/Learners (non-specific)	14.28
Others	9.02
Mixed: Teachers, students and university/school	8.27
None	4.52
Migrant or foreign workers and learners	3.01
Teachers	3.01
Mixed: University and school students	1.51

This review showed another exciting finding in respect of the participant's background of research. The results revealed that 41.35% of the articles undertook their research with university learners as participants. Moreover, most of the participants were from the same class and not mixed with others, such as learners with teachers. In fact, mixed participants can be used to achieve excellent efficiency of the instructional technique, especially in studies related to educators and learners. Moreover, younger learners have greater tendency to yield better results in terms of language acquisition techniques (Johnstone, 2002; Muhammed, 2017). Therefore, there is need for research that focus on young learners to get a clear perspective in this field. This may also be one of the factors that resulted in inefficiency in the interventions of 27% of the articles in this field. Therefore, there exists the need for further research in this area to know more about the factors that can influence mobile technology usage.

English language skills, the result according to the review are sub-divided into three main groups: (1) English language skills such as listening, reading, speaking, vocabulary, writing, and translation, (2) two or more English language skills but not all of them and (3) all of these English skills or not specified. Figure 2.2 presents the total number of publications based on English skills group. This review also demonstrates the taxonomy of English skills. Furthermore, about 45.11% of the papers inferred that their investigations are for all English skills while some didn't provide such information. About 22.56% of the papers carried out their research works to improve or study two or more English skills at the same time, but not all English skills. Finally, about 19.55% of the articles focused on vocabulary acquisition and improvement. Therefore, vocabulary acquisition is the most targeted single English skill.

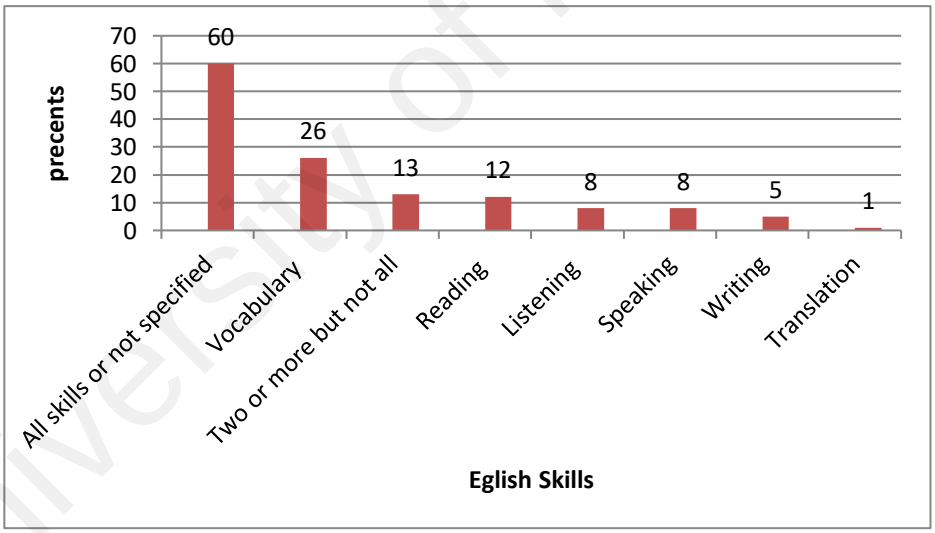

Figure 2.2: Number of Articles based on English Skills

In terms of English language skills, nearly half of the papers investigated all the language skills or "English language" without necessarily providing further details. Furthermore, in the case of studies that investigated English language skill only, vocabulary was placed at a second place. According to Ahmad et al. (2013), mastering vocabulary can to necessarily lead to a better performance and comprehension of English

language. This is could be true with the findings of this review support; however, the trial did not consider any studies related to grammar.

Assessments and evaluations, the research articles in this regard were used to assess the learners' achievement and acceptance of m-learning. The review shows Surveys/questionnaires recorded about 68.12% and tests 44.93. Specifically, pre-test and post-test were employed as assessment tools to measure the learners' performance. The result indicated 29.32% and 34.79% respectively. Basically, the learners were randomly assigned and categorised into two except in the investigation carried out by (Chang, Tseng, & Tseng, 2011; Chen & Chang, 2011; Shen, 2014) who divided the learners based on their performance in English language. The lower performing groups were assigned to the m-learning technology.

Assessment of learners' performance showed that only two real methods are adopted by field researchers. Such methods are test and survey and are obtained by separating the learners into two or more groups. However, more research works are needed to determine the best selection method for participants with different sampling techniques. Because, most of the chosen articles use random sampling techniques to select their research participants. The articles use interviews, surveys and exams to assess learners' performance and study their levels and opinion of engagement.

Significance of using m-learning, based on the outcome of the research reached by some of the authors of the articles reviewed, m-learning improves users learning ability. The remaining 21 papers showed no evidence or did not show any significant difference between the other teaching styles when mobile technology is applied. However, the remaining six articles concluded that the studies had shown insignificant results.

This review showed that most publications demonstrated the importance of applying m-learning technologies. Even though it an improvement in result is observed, it is

unclear why the technology has not been applied and implemented in education, most especially in learning languages. This needs to be further investigated to determine factors that affect the integration of this technology into educational system.

2.4.3.2 Lessons have been learnt from studying the use of m-learning in English language

i. Most of the articles used an applied system (application), studied all English language skills or did not mention them at all, and vocabulary was the skill that was studied the most.
ii. Investigation surveys were carried out through pre- and post-tests methods were mostly used in publications in which the learners are divided into groups.
iii. University and school learners were the most commonly used as participants and it is unusual to use mix of participants.
iv. Most investigations attempt to resolve the challenges motivation in terms of learning English language, followed by attempt to tackle need identification issues, test the influence of technology and reports.
v. Motivation has been identified as the major problem with English language learners based on yearly trend review on language limitation and difficulties. The use of vocabulary and inadequate reading materials come second on the yearly trend. Even though it was rated third among the problems discussed in the sample.
vi. Most investigations did not indicate the kind of mobile devices used in their studies. Also, no reviews so far regarding the use of different kind of mobile devices.

Review has shown that games and media have the greatest chance to enhance learners' outcomes in technology. This may result to increased engagement and enjoyment under use. Moreover, Multimedia Messaging Services (MMS) and Short Messaging Services (SMS) can similarly improve learners' performance.

So far, it is observed that interest in the use of mobile devices to learn English language is on the increase. Moreover, review of most articles in this area have shown that m-learning can significantly impact on English language learning due to the attractiveness, sheer power and convenience attributed to mobile technologies. Moreover, review indicated that more resources are needed to create game-based applications in future educational endeavour. However, more research works are needed to ensure improved language acquisition in the future using Mobile English Language Learning (MELL).

Precisely, an in-depth investigation is required regarding effective design and delivery modes of MELL to cover more population effectively. In the near future, investigation on the values, role of learners' culture, and local contexts on the failure or success of a particular technology would be carried out. More are expected from mobile technology toward language acquisition and support due to its attractive and huge potentiality features. These include portability, spontaneous learning flexible and social aspects that encourage learners. Currently, emphasis on vocabulary lead to memorization and rote learning. Moreover, vocabulary is an encouraging approach to learn second language. It is no longer news that mobile devices are becoming common in learners' pockets and in classrooms. Therefore, educators and researchers should take the advantage to help programmers design effective language learning programs that are engaging.

The main finding of this review is that by combining these two key technologies (games as learning tools and mobile phones) an enhanced form of English language learning could be achieved. This learning mode utilizes both the ease of accessibility

provided by mobile as well as the motivational drive offered by games. Mobile game is going to be studied and reviewed to gain more understanding in terms of contribution and the current state of the art development in the area.

2.5 Mobile Game

Before introducing the mobile game application, a brief description on game-based learning is provided as mobile game application is a subset in this category.

2.5.1 Game Based-Learning Background

Game-Based Learning (GBL) is a systematic way of exploiting the benefits of mobile technology while at the same time solving some problems that have led to the obsolescence of education system. GBL is engaging, hence require schools to create inherently attractive learning methods (Christensen, Johnson, & Horn, 2010; Powell, 2018). Everyone has the desire to learn. It starts in early childhood (Gheaus, 2018; Gopnik, Meltzoff, & Kuhl, 2001), but now a days, schools are no longer interesting for students. The education system must find a way to help students discover this motivation. According to Annetta and Cheng (2008) and Sweidan and Darabkh (2018), educational games motivates and increase students' interest in the subject taught, and create higher level of positive emotional engagement from students. According to Perrotta, Featherstone, Aston, and Houghton (2013), GBL is a teaching and learning technique through the use of games. It is indeed a reputable concept. This definition has been deduced from principles and mechanisms as shown in Figure 2.3.

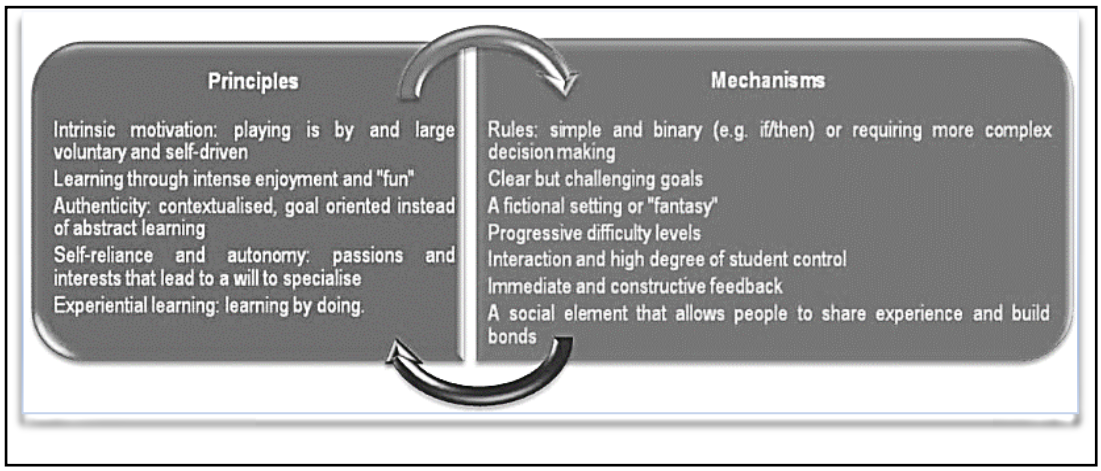

Figure 2.3: Game-Based Learning *(Perrotta, et al., 2013)*

Teachers and educators suggest that GBL can advance the understanding of engagement and motivation. A better way of including gaming into teaching is to consider its usage within a clear educational process and more precisely:

i. Place academic content and learning activity within the video games, entertainment and fictional environment and maintain balance between learning and fun.
ii. Integrate academic content within the game rather than as an add-on.
iii. Wisely plan the roles designers and teachers would take on games. The teacher should play roles that enable them to facilitate the experience of their learners by providing direction if needed; ensure that such rules are followed and sustained in a deferential atmosphere.
iv. Do not try to split-up decontextualized mechanisms of games such as a badge, score, or leader board from the fictional context and games' roles.

Some people who study games scarcely comprehend the relationship between learning and play. Brown (2009) recognized that game is not an enemy to learning. Playing is like a fertilizer to brain growth, it is unthinkable to underutilise it. Business world is also aware of the importance of games. Piaget (2013) inferred that principle there is a link

between play and learning, and play-based learning is a way of impacting deep learning. It was also noted that insatiable curiosity of a child influences his learning. Moreover, during play, a child can control and initiate activity in such a way that they assimilate their learning better (Piaget, 2013).

According to Negroponte (1996) and Orlando (2017), most adults do not see how children learn with electronic games. Unfortunately, educational games are an emerging area of research (Young et al., 2012). However, evidence of their effectiveness have not been established (National Research Council, 2011). In order to draw certain conclusions, Bressler (2014) examined literature and performed meta-analysis repeatedly. She reported that the evidence is still inconclusive. Some of her findings from that review are positive results, negative results, limited results, barriers to implementation.

2.5.1.1 Positive results

To better comprehend the field, meta-analysis is employed to synthesize and re-analyse past research works. By examining several meta-analytic studies, some researchers found positive results. It was that regardless of the situation or person, cognitive outcomes are more dominant for simulations and games than the traditional system of education. Other researchers inferred that instruction in games yield better learning outcome than the traditional system of education. Their study also ascertained that students who play in groups learn better. Finally, other researchers found that players scored better in terms of measuring factual knowledge than those who obtain knowledge through traditional methods.

2.5.1.2 Negative results

In the early 1990s, review was conducted to examine the effectiveness of game play over conventional system of education. Out of the 67 studies, 38 results were observed to show no significant difference between student performance and formal education. The

remaining studies showed acceptable control with about 22 favourable games, while 3 are in favour of conventional instruction. Some might argue that the educational games available now are well improved and will yield different results. Unfortunately, other researchers observed that learning gains related to serious games are not too motivating compared with passive teaching to improve learning.

2.5.1.3 Limited results.

Inconclusive results are some of the major challenges of research conducted in the area of games and learning; limited empirical evidence is also part of the main other criticisms and few research works to support outcomes. Some researchers after review concluded that there exists insufficient empirical research in the current knowledge base when comparing video game knowledge to different modes of instruction. It was also concluded that there is little evidence to support video games to increase student achievement in K-12 education. Some studies revealed that measured performance gains have no statistical significance.

2.5.1.4 Barriers to implementation.

Critics of games-based learning also identified certain issues related to gaming integration in formal school environments, including costs, role of the teacher, logistics and program alignment. Firstly, the costs of licensing, game equipment, software products and video are usually taken into account and thus represent a serious barrier to implementation. Secondly, teachers' role is complicated, and most students are not conversant with game playing in learning environment. Therefore, teachers must constantly ensure that children stay on track to achieve their educational goals. Thirdly, the constraints of school days do not give players sufficient time to engage themselves in games to derive maximum benefit. Finally, teachers and administrators are still concerned that games may not fit their program goals.

2.5.1.5 Games in education

This subsection aims to highlight the literature on the role of games in learning. The purpose is just to introduce the subject and give a taste of the available studies. This subsection is partially based on the work by Straight (2015).

One of the main additions to the repository of tools used by educators is games. Following the digitization of modern life, digital games are now the main form of games for all kinds of students, as well as other aspects of education that is rapidly taking a digital form (Deng & Tavares, 2013; Dew, 2010). Many studies have explored the role of games in education, either surveying games or the literature. For example, Kebritchi and Hirumi (2008) found twenty four video games that were launched in the period from 2000 to 2007 for educational purposes. They found that the most effective games are those that are less dependent on traditional way of memorization and more student-centred, creative and based on the theory of Constructivism. Another finding of this study is that many games lack groundings in educational theories.

Other studies exploring the future of games in education include the meta-study by (Girard, Ecalle, & Magnan, 2013), which covered thirty articles, and another study that surveyed 300 articles (Young et al., 2012). This takes a more reserved approach, although the future of games and learning is at the heart of their concerns. Another notable work on educational games is (Annetta, 2008), in which several recommendations have been highlighted. The author argued that the design of game can include the sense of touch beside vision and sound, which is very similar to the idea of forced feedback used by video games since 1976 (Wolf, 2008). Other recommendations by the study include distance education, virtual/home schools and employing the concept of gamification.

Apart from surveys, other studies have observed students themselves to detect the impact of games on their learning skills. One important skill that received the attention of

Adachi and Willoughby (2013) is problem-solving. Their 4-year study on high-school students showed positive effects of strategic games and games in which student s play roles on problem-solving skills in teenagers.

The use of games for learning is not restricted to the academic setup, and is not exclusive on educators, as many games have also been used in other settings and different environments. One common form of games used in learning is *serious games*. This type of games is used to teach actual skills for tackling real tasks or learning serious subjects with no specific purpose of entertainment. Hess and Gunter (2013) investigated serious games and found that learners enjoyed the lessons when playing games and engaged in the learning process. It was also found that learners take more time learning the course via serious gaming than it would take otherwise. This increase in learning time has been attributed to the level of depth that is associated with learning using serious games. The study suggested that more research is needed to confirm not only positive impacts of serious games but also when this type of games may be better for the learning process.

Serious games gave also been used for the purpose of raising the young's awareness of the dangers of drugs and alcohol Rodriguez, Teesson, and Newton (2014). Review of some serious games designed for this purpose shows moderately positive result and aid to increase students' knowledge. Even though only one case of decreased frequency of drug abuse has been reported.

Another approach for using games in education is to add qualities of games, or what is called as game components, in to the learning process rather than teaching subjects using games. This approach is known as gamification, and is being widely applied in very different context, including marketing, behaviour change and health. An example of using gamification in universities is the project of Velius at the University of Alabama Libraries, which uses gamification to assist the use of library and provide instruction to

utilize the library resources (Battles, Glenn, & Shedd, 2011). Fitocracy (http://www.fitocracy.com) is another example, which is an online fun fitness tracker where badges are used to motivate participants for enhancing their performance and tackle more difficult exercises.

Southerton (2014) examined the gamification for fitness, in particular Zombies, Run! (Six to Start & Alderman, 2012). The author suggested that gamification should take into account immersion or flow (Faiola, Newlon, Pfaff, & Smyslova, 2013). This is important when there is a tendency to focus too much on the characters' narrative and the user who runs the game enters an automatic mode in which they need to pay little attention even if they didn't look at the screen. Based on research findings, gamification can motivate users and engage them in learning and improve learning outcomes, though some learners may get bored of the game after some time (Cheng, She, & Annetta, 2015).

Games can also be used in commercial settings. For instance, Berger and McDougall (2013) gave an example of a game played by police officers. This game is called L. A. Noire (Team Bondi, 2011), and was played in L. A. during the end of 1940s by police officers. The game was used in Britain in classes of English literature at the level of undergraduate students to study their pedagogical method of games reading. The study emphasized on the strong believe that teachers' engagement is essential in games play in classrooms and the teacher must be familiar and comfortable with the game. For example, illusion of free choice is predominate in most video games, where storylines may take another path based on the decisions of the players, but may fail at the end as well (Cassidy, 2011). This concept of branching in game playing based on player choices is not familiar in conventional fiction literature. Consequently, educators can have a very tough time trying to comprehend and utilize a multitude of branches for the same game story, such as the case in the Mass Effect line of games (BioWare, 2010). Other games, however, can

be much easier to understand and control such as the Skyrim game in the Elder Scrolls series (Bethesda Game Studios, 2011).

Serious games, commercial games and gamifications are the most famous games used. However, after this brief review (based on Straight (2015) study), it seems that all the approaches have some limitations. The inherent advantages that led to the prevalent use of mobile technology make mobile games learners to inquire based about their curriculum and react based on their performance which result to a viable solution to the current educational crisis.

2.5.2 Mobile Game Applications

Increase in the availability of feature phones has risen accessibility to hardware powered devices. Several incorporated features such as coloured screen, multi-channel and capability to run applications have paved way for mobile game publishing (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012). In the 21st century, the popularity of mobile games grew extensively globally which consequently led to the mobile culture. The use of the extensive variety of game applications range from mystery games to computer-generated titles. This development has led to increased human-computer interactive (HCI) media that utilized 3D games and extraordinary quality visuals. Recently, mobile gaming has emerged as one of the world's leading virtual industry by revenue.

Given that mobile gaming applications have become available in the mainstream of public. The added features and purposes such as social benefits of apps have driven computer scientists to create games with educational, lifestyle and health improvement objectives (Girard et al., 2013). *Outloud* Apps (Speech-language), Finnish start-up *Rehaboo* (children's rehabilitation in hospitals), *Habitica* (acquiring new healthy habits), *Memrise* (memorizing things and learning languages) are some of the instances of game applications that can be used for social benefits. Subsequently, use of motivational power

and wide household gaming applications have added value to the system. Computer scientist have developed variety of applications with added attributes to address the wide range of socio-psychological issues in the society (Felicia, 2011).

Despite the growing number of game applications, scholars such as Raybourn and Bos (2005) indicated that game application can be supportive in serving another social purpose other than entertainment such as m-learning. Based on game applications ability to serve educational purposes, the serious games emerged as an important tool that can be used for obvious and well-thought-out academic purposes such as (1) learning pathways (Falloon, 2013), (2) language learning (Viberg & Grönlund, 2013) and (3) vocabulary learning (Yang, 2012). The use of such digital technology such as game applications for the purpose education or learning has been validated in past research (Wouters, Nimwegen, Oostendorp, & Spek, 2013). For example, Girard et al. (2013) noted that the serious game applications have effective and positive learning outcomes.

Similarly, Sefton-Green (2004) stated that the challenges faced by learners in education can be addressed by introducing informal means of learning (game applications). This implies that incorporation of digital technologies in school curriculums can impact positively learning and improve digital competence of learners (Mitchell & Savill-Smith, 2004). Therefore, game applications designed with educational or learning purposes can support learning outcomes such as vocabulary or language learning. Furthermore, the current environment of digital age in which new generation is raised with great familiarity and advanced technologies such as gaming apps or tablets can also supplement the effectiveness of the GBL.

Hence, games can be a valuable tool for learning, as they can influence human attitudes (Garris et al., 2002). Therefore, GBL is used to aid learners with their learning/studies, and help to enhance their motivation (Schwabe & Göth, 2005). In comparison with the

earlier, vocabulary-based applications and games offer added value. For example, a new application called "MEL enhanced" proved to be more enjoyable, engaging and interactive compared with the earlier versions ("MEL original") (Sandberg et al., 2014). Similarly, other investigations based on the use of the mobile game for learners' engagement and motivation lead to improved student outcomes (Kondo et al., 2012; Liu & Chu, 2010). However, some limitations do exist (Asabere, 2013). For example, (1) learners could cheat more easily if they are not suitably supervised, observed or monitored (Wiafe & Nakata, 2012), (2) learners who become very familiar and proficient with the technology could experience undue advantages in relation to their peers, (3) the technology and the affiliated tools may lead to isolation at a personal level for the learner, or not fitting in with general society and other people without technological proficiencies, (4) frequent changes could result in some content becoming outdated, (5) learners without a background in technology will require additional support, and (6) the technology may not be appropriate for laboratory based experiments in educational departments.

GBL with mobile devices has grown over the last decade (Straight, 2015). Furió, GonzáLez-Gancedo, Juan, Seguí, and Rando (2013) demonstrated the results of learning using an iPhone game by comparing its use to the use of a conventional game. Although the study did not reveal any significant difference between the groups, children in the study said they would continue to play mobile gaming and 9 out of a total of 10 participant children liked the iPhone game more than the conventional game. Conventional mobile gaming needs to be strengthened technologically by enabling learners to continue to play and learn through motivation. This can be done using compelling technology and principles that can motivate users. Mobile-based learning has been used successfully in-place of the traditional book-based method to encourage learners (Chang, Chang, & Shih, 2016). Chang et al. (2016) inferred that lack of motivation affects students' learning. Therefore, motivation should be considered when developing applications meant for

mobile learning (Ma et al., 2012). However, educational institutions and educators often attempt to design and apply motivational methods and materials at par with their students' expectations (Prensky, 2003).

An earlier study demonstrated that Mobile Game Applications (MGA) provide sufficient motivation to learners and transform behaviours and attitudes of users positively (Fogg, 2002). However, due to these limitations, other research works are reconsidering the use of mobile game application. Because it is believed that m-learning cannot motivate learners for a long period of time (Ciampa, 2014), hence, the game design is being challenged. The next section reviews the existing mobile frameworks to find the most effective one that can aid in design and development of m-learning system in proper way and help to improve it toward system acceptance.

2.6 The Mobile Game Framework

Despite the numerous forms of m-learning available, it is still not yet considered as a renowned system due to its confinement to technologies and pedagogical considerations. Though some scholars offer guideline to present outline for theories regarding m-learning with activity and conversation theories. Teachers and instructional designers need to consider solid theoretical foundation for m-learning. Background information of distance education and more direction regarding deployment of evolving mobile technology for integration with teaching in a more effective way (Park, 2011).

In this study, the most related existing framework(s) would be selected due to the fact that different cases require different framework (Berking et al., 2012; Sarrab et al., 2016). Thereafter, the most related framework would be chosen in order to find out if it is suitable for this study or require enhancement. The selection based on Hsu and Ching (2015) was reviewed which shows there is only 6 educational mobile learning frameworks. Furthermore, Rikala (2015) study indicated that there is 17 mobile learning frameworks.

The main reason for the selection of these two studies is because they used two different criteria and methods to select the most existing mobile learning frameworks. So, these two studies will lead to the selection of the most existing mobile learning frameworks. The criteria used to select the most related framework is; select the framework that is used for language learning proposes, then review and determine which one is used for game and motivation propose. Section 2.6.1 has listed the four mobile frameworks used for language learning proposes.

2.6.1 Components and Objectives of language learning Frameworks

Comparison between four mobile learning frameworks.

2.6.1.1 Schmitz, Klemke, and Specht (2012)'s framework

The aim of this framework is to categorise and evaluate mobile games and identify mechanism that would support the design decisions for future m-learning games (Figure 2.4). The framework focuses on two aspects; motivation and knowledge acquisition. Secondly, it presents a set of models that have been identified in literature and have positive influence on these two aspects.

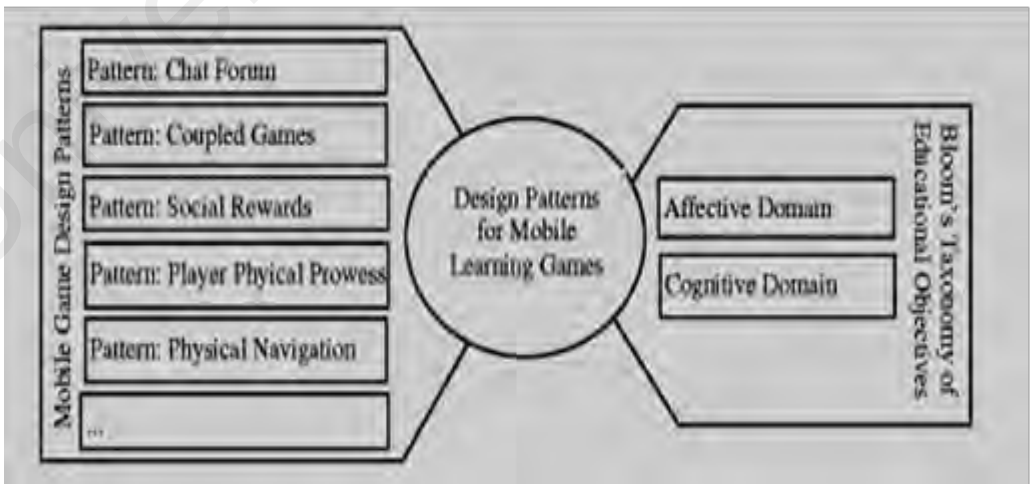

Figure 2.4: Schmitz et al. (2012)'s Framework

The results of this study corroborate with the general hypothesis that mobile learning games have the potential to improve motivation. It reveals that gaming mechanisms such as collaborative actions or augmented reality encourage engagement in learning and / or a particular topic. As far as the acquisition of knowledge is concerned, the results are less complete.

2.6.1.2 Abdullah, Hussin, Asra, and Zakaria (2013)'s framework

The aim of this framework is to improve learners' language performance (Figure 2.5). Abdullah et al. (2013) presented a model that aims to endorse m-learning by inferring the outcomes based on changes identified and comparison of the activities of learners. This was deduced from framework of Gilly Salmon model and recommended five-stages. The first stage includes participation and encouragement of learners by providing technical support. The second stage displays the learners' interaction to familiarise themselves with the learning administration system. The third stage aims to intensify the interaction with the usage of learning management software. This would result improve understanding of the network system. For the fourth stage, participants (i.e., learners) are expected to conduct group deliberations which results in improved teamwork among others. This stage helps to address individuals' learning needs based on their negotiations about the existing knowledge and solution. Lastly the fifth stage is proposed to know the individuals' insight about what have been learned and accomplished along with the vital rational to design of the subsequent learning objectives. In a nut shell, this framework aimed to explore how e-learning could be made easier through m-learning.

This model was established principally for e-learning and aligned with m-learning. Furthermore, Abdullah et al. (2013) based their framework on the assumption of eloquent interactions from social learning theory. In developing their framework, it was considered that online learning ability does not only dependent on technical support but on learners'

social interaction and environment. Furthermore, the backing and direction of moderator also play a vital role in learning. In doing so, the role of moderator was reconceptualised whereby the moderator steadily shifts the obligation of learner's development to the learning community guidance and recommend inclusion of informal learning.

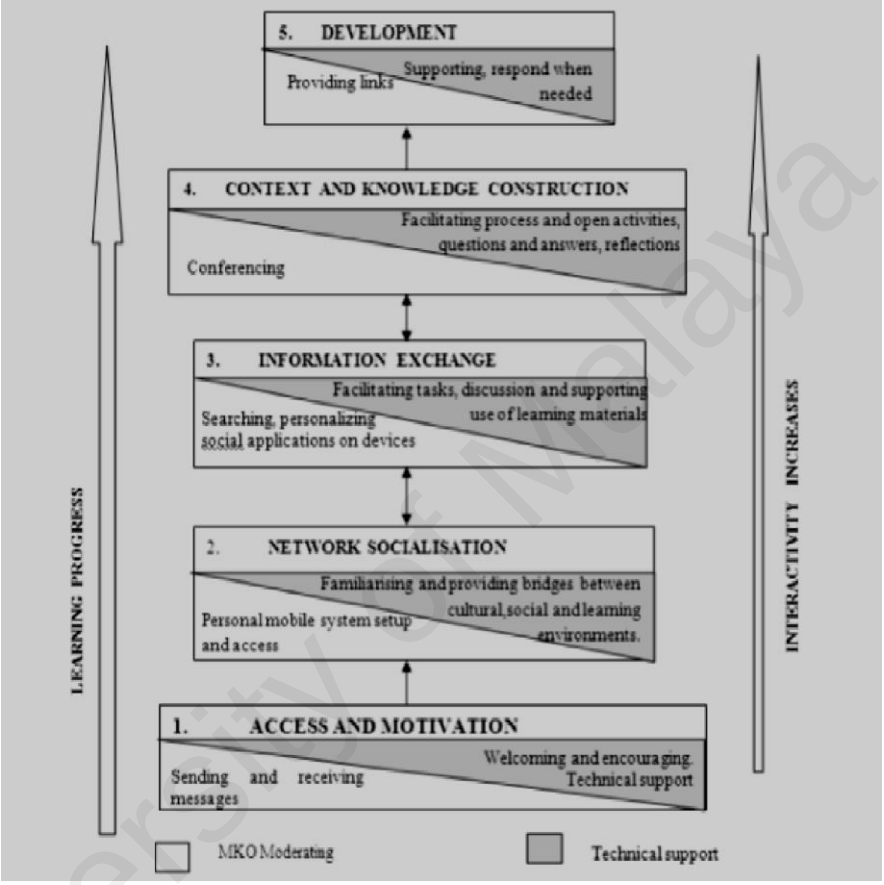

Figure 2.5: Abdullah et al. (2013)'s Framework Model to Enhance M-learning

2.6.1.3 Wei and So (2012)'s framework

The aim of this framework is to evaluate previous empirical research works by conducting systematic review and build holistic evaluation framework on contextual m-learning as shown in Figure 2.6. The framework has three levels: (1) the external level of social, cultural and technical aspects; (2) the intermediate level including the content, context and device; and (3) the internal level by emphasizing the attitude and experience of learners. This framework provides a systematic structure for evaluating mobile learning strategies at the organizational level, for designing mobile learning activities at

the educational level, and for studying the experiences and attitudes of learners at the user level. In general, a continuous reflective evaluation with this framework would allow researchers and practitioners to better understand the design, implementation and evaluation of contextual mobile learning.

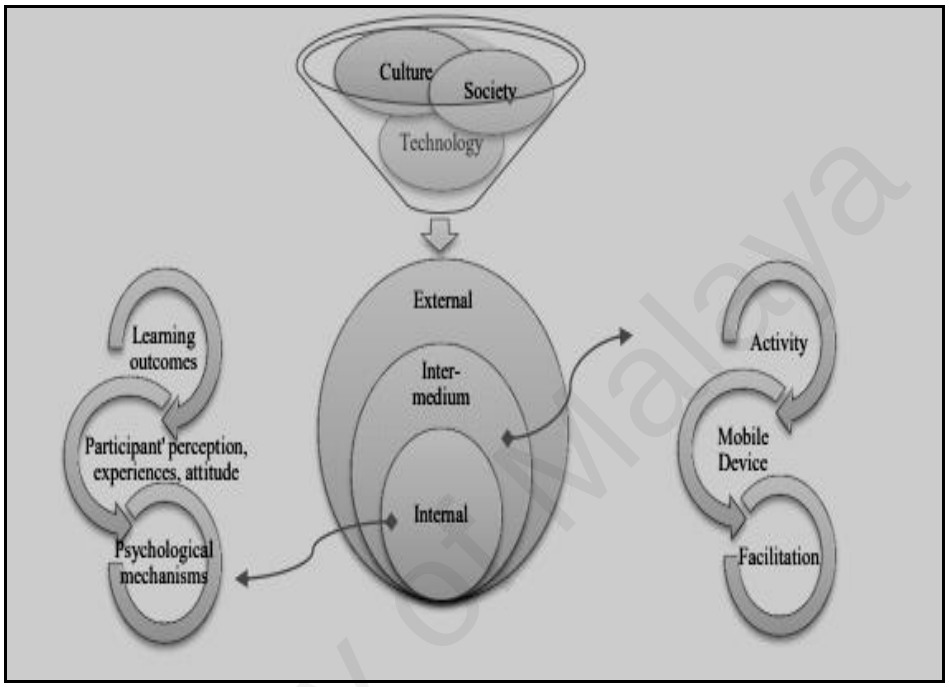

Figure 2.6: Wei and So (2012)'s Framework

2.6.1.4 Scanlon et al. (2014)'s framework

The aim of this framework is to support language learning and social inclusion and to enable software developers to analyse and design comprehensive games that would aid learning. In doing so, Scanlon et al. (2014) assumed that portability of tech-devices such as cell phone provide learners flexibility to learn anywhere and anytime. But, the learning provision also requires consideration of the contextual factors such as learning condition. To this point, Scanlon et al. (2014)'s framework focuses on factors such as places or tools and how these factors affect m-learning. Furthermore, it also offers an interactive instrument for approaching designers such that learners can communicate effectively with feedbacks. Overall, this framework attempt to improve the contextual awareness in relation to competencies of mobile devices as shown in Figure 2.7.

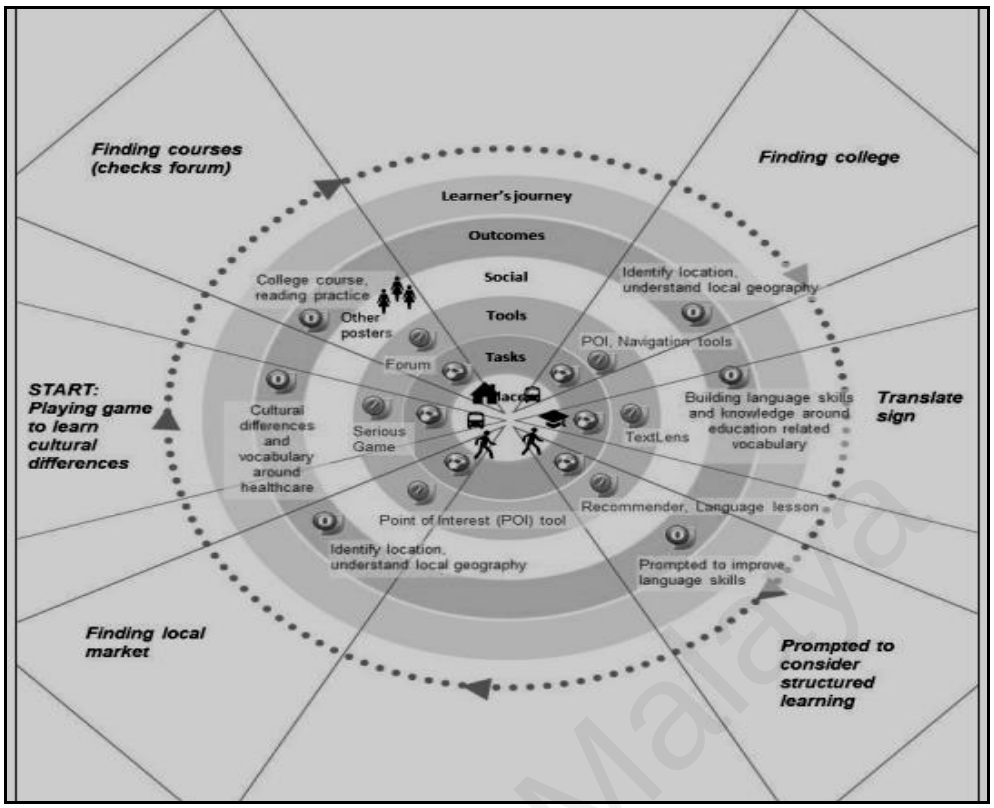

Figure 2.7: Scanlon et al. (2014) Framework to Support Language Learning and Social Inclusion

2.6.2 Framework Comparison

This section presents comparison between studies conducted on language learning frameworks as shown in Table 2.8. The table lists frameworks proposed models and components, while Table 2.9 lists the advantages of the frameworks and the theories used. This classification and information was deduced from Hsu and Ching (2015) and Rikala (2015).

Table 2.8: Educational M-learning Frameworks

Authors/year	Proposed Framework/Model	Components	Weaknesses
Schmitz et al. (2012)	Analysis of game patterns	Game design patterns Davidsson, Peitz, and Björk (2004) and Bloom (1956) taxonomy of learning outcome (cognitive and	The framework focuses on two factors cognitive domain and affective domain and the game patterns get many limitations

Authors/year	Proposed Framework/Model	Components	Weaknesses
		affective domains).	
Abdullah et al. (2013)	M-learning scaffolding five-stage model	access and motivation, network socialization, information exchange, context and knowledge construction, and development	This framework is focused on the generic aspect which is information exchange and do not see the other important factors can contribute to better use of mobile technologies.
Wei and So (2012)	Evaluation tool	External level (social, technical factors and cultural), inter-medium level (devices, context, and content), internal level (experiences and learner attitude)	This model comprises both internal and external factors but can be extrapolated and improved
Scanlon et al. (2014)	Analysis tool	Tasks, social support, learning journey, places, tools, and time	A good analysis tool but too much orientation on the time factor and learning aspect related time.

Table 2.9: Mobile Language Learning Framework (Advantage, Theory)

Authors/year	Advantage	Theory
Schmitz et al. (2012)	Can be used for analysing mobile games to help inform design decision regarding the design patterns aligned with desired cognitive or/and affective learning outcome	Davidsson et al. (2004) and Bloom (1956) taxonomy
Abdullah et al. (2013)	The more capable others (peers or adults) could provide scaffolding to learners by taking advantage of these unique features of m-learning	Vygotsky's Zone of proximal Theory Gilly Salmon's five-stage model
Wei and So (2012)	Evaluating contextual m-learning with the introspective method in general.	Situated learning and contextual learning
Scanlon et al. (2014)	Allowing researchers to analysis mobile incidental learning by considering key elements of learning (tasks, places, tools,	Incidental learning

Authors/year	Advantage	Theory
	etc.,) and how they come into play in different learning journeys. It also provides a tool for communicating with designers of the tools and services	

The most related framework to this study is the Schmitz et al. (2012)'s framework due to its principal focus on motivation and game. However, this framework focus on using game patterns for m-learning established by Davidsson et al. (2004). Some of its limitations are listed in Section 4.3.1. Thus, this study discovered a technology that could better, ease and improve motivation. The approach could also make the application design entertaining and meet learning requirements. This technology is persuasive technology that has the capability to make the game much active and encourage good interaction between the learners and the application due to its powerful interface design. Additionally, this technology can improve motivation due to its influence on learners' attitudes and behaviour coupled with its less propensity to conflicts in principles of game patterns. This technology is further reviewed in-depth in Section 2.7. The second part of the framework uses Bloom (1956) taxonomy of learning outcomes. This taxonomy would also be adopted in this study. However, affective domain of Bloom's taxonomy is only used on proposed framework because it is focused on motivation. Educational components are also important in the development of mobile framework. Therefore, the study has added educational theory (Socio-cultural theory) to provide educational base and model (Bloom's taxonomy) to support the persuasive guideline. All the educational theories and models are discussed in detail in Section 2.8.

2.7 Persuasive Behaviour or Technology

Analysing persuasion framework requires detailed understanding of happenings during information processing session. According to Oinas-Kukkonen and Harjumaa (2008), this involves understanding the role of the sender, receiver, message, and the

channel in a psychological context. On receiving the persuasive content, receiver's mind encounters with the multifaceted psychological event. Fundamentally, the individual being persuaded through the information is a human information processor (Oinas-Kukkonen & Harjumaa, 2009). However, to understand the persuasion process in the perspective of information processing requires inevitable elements such as attention and comprehension.

In order to persuade a person, the basic requirement is the dissemination of information. However, the level of persuasion is likely to be dependent on the level of attention paid by the person in question to the given information (Brinol, Petty, & Belding, 2017). In this standard, information must have attributes in other to get the attention of the person. In fact, the level of attention is dependent on the quality of the information provided to the person who is likely to be determined by the message content such as argument or image presented (Lin, Hwang, & Lai, 2017). Persuasion is not limited to attention and elaboration, the success of persuasion is further reliant on the retention (i.e., attitude) of the yielded position and acts (i.e., behaviour) to conform with the new position resulted after the exposure of information (Chang, Yu, & Lu, 2015).

Previous research works on persuasion considers persuasion in explaining the complex information processing phenomena (Sundar & Kim, 2005), health communication (Lin et al., 2017), computer-mediated communication (Chang et al., 2015) and human-computer interaction (Oinas-Kukkonen & Harjumaa, 2008). These studies found that persuasion has a positive effect on individual's motivation and behaviour in question. However, literature has also suggested that notwithstanding of the message content's, the source of the information is invariably importance. Individual motivation is also amongst the determining factors of persuasion. The information processing also involves evaluation

of factors associated with the source of information and individual motivation which drive human behaviour or attitude such as user utility, credibility or perception about the source.

The perspective of human-computer interaction and the concept of persuasive technologies is highly imperative to consider where interactive devices are involved in changing attitude (Wright & Bogost, 2007). After the emergence of the human interaction devices, scholars debated about it role in addressing social psychological phenomena such as learning attitude (Lindgren, Tscholl, Wang, & Johnson, 2016), health informatics (Alahäivälä & Oinas-Kukkonen, 2016), childhood education (Yilmaz, 2016) and persuasive stimuli (Hamari, Koivisto, & Pakkanen, 2014). The primary challenge that emerged is for the development of interactive devices to successfully interact with computing system. However, this is possible with the adoption of persuasive principles.

The importance of persuasive principles calls for the need for many interactive systems to be developed for persuasive determinations such as change in user's attitude and behaviour. Therefore, persuasive principles derived from social psychology have been widely used in the development of interactive systems aimed at changing the users' attitude. Use of such principles with the aforementioned purposes is widely known as persuasive technology. The interactive systems design such as learning apps and healthcare computing are some of the instances of the persuasive technology. Computer scientists have frequently used these user interface design drawing in persuasive principles.

The use of persuasive technology makes it easier in initiating persons to get involved in doing some sequences of activities by providing incremental recommendations rather than one-time combined recommendation (Mathew, 2005). This suggests that persuasive technology should also have attributes to permit making incremental phases to achieve the targeted attitude. For instance, an application for language learning could primarily

inspire its users to at least use the app, whereas the app could later encourage users to learn the language. Moreover, Fogg (2009) indicated another crucial factor that describe when persuasive technology is clearly functional to a user-defined purpose. This can in turm increase motivation of users.

Persuasive technology can be defined as any interactive computing system designed to influence peoples' attitudes and behaviours. Moreover, it can change their response depending on user inputs, requirements, and states. The interactive program collects information about users' actions to help achieve their goals (Fogg, 2002). This research is built on the attitude change concepts to develop a system that will use its knowledge about users' activity to provide suggestions and guide through some activities or give the appropriate encouragement to let the user achieve their goals.

2.7.1 Persuasive Technology and Educational Theories

Most research works in the area of persuasive technology focused on computational and interactive technologies including computers, Internet services, video games and mobile devices (Oinas-Kukkonen & Harjumaa, 2008). However, this aspect is based on theories, , rhetoric, results, human-computer interaction (Wright & Bogost, 2007) and experimental psychology. According to Mintz and Aagaard (2010), introduction of this technology in classroom provide new opportunities for educationist. Persuasive technology provides avenue for effective assimilation in classrooms. It is necessary to consider its relationship with the existing educational paradigms and it is innovative contribution to teachers.

Additionally, there is a relatively limited discussion in literature on the relationship between typical paradigms of teaching and learning and the model of learning represented in the use of persuasive technology. This is partly due to the "fuzzy boundaries" of persuasive technology. That is, it is basic in a number of different theoretical positions

drawn from aspects of social psychology. Alexander, Fives, Buehl, and Mulhern (2002) considered persuasion in relation to socio-cultural (explanation in Section 2.8) or Vygotskian theories of learning. Even though, no points of conflict were identified, difference in emphasis was observed. It was inferred that despite the emphasis on social process of learning, socio-cultural methods do not give sufficient weight to the credibility and quality of the evidence, texts or tools employed. It was argued further that in Vygotskian theory, emphasis on group social processes of learning underestimates the contribution of cognitive preferences and individual emotions in ascertaining the result of the learning process. Credible considerations related to the alternative paradigms have not been revealed. Development of credibility should be an integral part of the overall pedagogical strategy. Credibility refers to the ability to influence and technology does not have that property by nature.

2.7.2 General Persuasive Models to Design System

In general, there are two main studies on this field as listed below: -

2.7.2.1 Oinas-Kukkonen and Harjumaa (2009)'s model

Figure 2.8 shows Oinas-Kukkonen and Harjumaa (2009) who explained the development of persuasive systematic steps. Firstly, it is highly imperative to understand the main issue behind persuasive system before implementation. Therefore, the following hypothesis need to be addressed: people want their views and opinions about the world to be consistent and organize, open, unobtrusive, and easy.

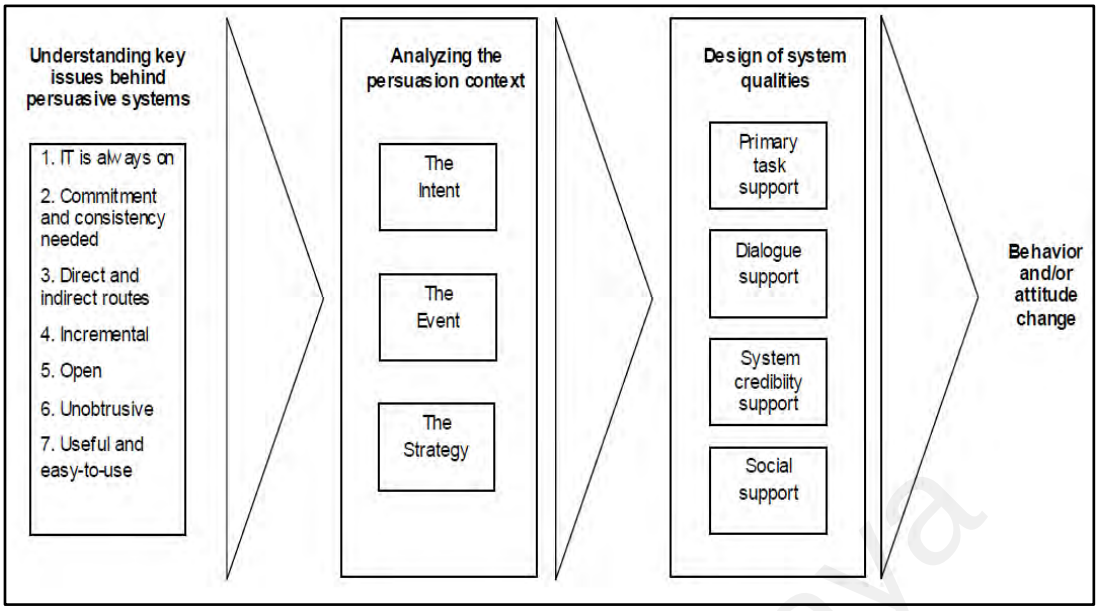

Figure 2.8: Persuasive System Development *(Oinas-Kukkonen and Harjumaa, 2009)*

Secondly, analyse persuasive systems contexts and identify the intent, events, and strategies. Based on intent, people are divided into: the persuasive technology creator, who allows others to access the persuasive technology or distribute it, and those who use or adopt the technology. The importance of intent is to determine which type of behaviour and/or attitude will be changed and consideration of events is the context in which it is applied by a user.

Thirdly, a system could be designed with features of new information system or for evaluation of an existing one. The principles have been classified into four categories and is discussed in the subsequent subsections.

2.7.2.2 Fogg (2009)'s model

Fogg (2009) listed eight steps in the early stage of persuasive technology design as shown in Figure 2.9.

Step 1: Choose a simple behaviour to target: by reducing big goals to a smaller target.

Step 2: Choose a receptive audience: Select the right users who have the desire to engage with emerging technologies.

Step 3: Identify the reasons behind the learners' low performance due to lack of motivation and ability.

Step 4: Choose a familiar technology channel: Provide technology through familiar channels for users such as web, mobile phones, popular gaming platforms etc, or provide introductory training to the users to familiarise them with the use of the channels. These four steps can be re-ordered in some cases based on the domain they applied.

Step 5: Find applicable examples of persuasive technology: Finding successful examples of persuasive technology that are relevant to the team objectives.

Step 6: Imitate successful examples: Imitating the successful examples obtained in the previous steps.

Step 7: Test and iterate quickly: Carry out a quick series of small tests using persuasive technology.

Step 8: Expand on success: Expand the work by targeting behaviour.

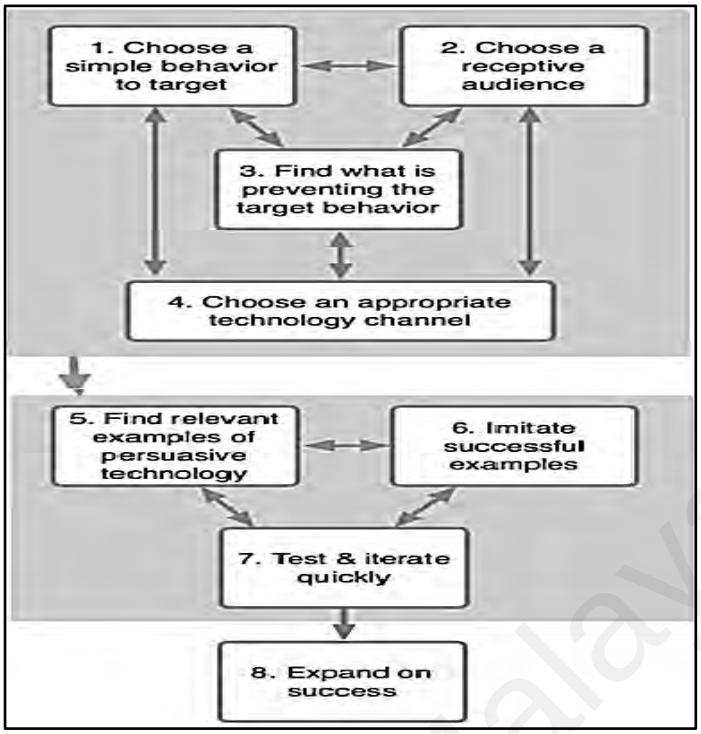

Figure 2.9: Eight Steps in Early-Stage Persuasive Design *(Fogg, 2009)*

2.7.3 Persuasive Technology's Principles

In term of principles, two categories of principles are listed below:

2.7.3.1 Oinas-Kukkonen and Harjumaa's principles classification

These principles are designed based on Fogg's works in 2002 as presented in Section 2.7.3.2. However, there exist some differences such as surveillance and conditioning that are not used due to unacceptability. In general, the numbers of principles reduced from 43 to 28 in this classification. In general, from the point of view of Oinas-Kukkonen and Harjumaa's the main difference between Fogg's and their principles is that the key benefit of suggestion is meaningful for the user rather than providing support for carrying out a process or making a task simpler.

Firstly, the principles of primary task category support carrying out user's primary task as shown in Table 2.10.

Table 2.10: Primary Task's Principles

Principles	Description
Reduction:	Makes the system simpler.
Tunneling:	Guides users.
Tailoring:	Design depends on needs, interests, personality, the use of context or any aspect belongs to users group.
Personalization:	Offers personalized services or content.
Simulation:	Provides simulation (before and after).
Rehearsal:	Provides training systems to cope with a reality problem.
Self-monitoring	Allow users to track their performance and status.

Secondly, Table 2.11 shows the principles of dialogue support based on several design principles related to implementing computer-human dialogue support in a manner that help users to keep moving towards their goals or target behaviours.

Table 2.11: Dialogue's Principles

Principles	Description
Praise:	Offers praise.
Rewards:	Rewards depend on target behaviour.
Reminders:	Reminders depend on target behaviour.
Suggestion:	Offers fitting suggestion.
Similarity:	Offers things reminding the users of themselves
Liking:	Offers visual attraction.
Social role:	Adopts social role.

Thirdly, Table 2.12 shows the principles of system credibility support category which describe how to design a system so that it is more credible and persuasive.

Table 2.12: Credibility's Principles

Principles	Description
Trustworthiness:	Views as trustworthy.
Expertise:	Views as incorporating expertise.
Surface credibility:	Has a competent feel and look.
Real world feel	Provides information about the people or organization behind its content and service.
Authority:	Leverages roles of authority.
Third party endorsements:	Authorization from a respected source.
Verifiability:	Easy verifies the accuracy of content via outside sources.

Fourthly, Table 2.13 presents the principles of social support category adopted from Fogg's principles on mobility and connectivity (but not all).

Table 2.13: Social support's Principles

Principles	Description
Social learning:	Allow users to observe others performance.
Social comparison:	Allow comparison
Normative influence:	Gather people together who have the same target.
Social facilitation:	Shows user others performing the same behaviour.
Cooperation:	Provides cooperation.
Competition:	Provides competition.
Recognition:	Offers public recognition.

2.7.3.2 Fogg's principles classification

About 43 principles were counted and classified based on use of computer, website, and mobile. However, some other classifications are shown below. Some principles have been explained already under Oinas-Kukkonen and Harjumaa's principles classification. Therefore, no description would be provided but the listed unless if a new one is found.

Firstly, the principles of Computers Persuasive Tools have been defined as an interactive product designed to change attitudes or behaviours or both by making a desired outcome easier to achieve. They are: Tunneling, Reduction, Self-Monitoring, and Suggestions. In addition, the remaining are listed in Table 2.14.

Table 2.14: Computers as Persuasive Tools' Principles

Principles:	Description
Surveillance:	Observation others' behaviour could increase the outcome.
Conditioning:	Can use positive reinforcement to transform existing behaviours into habits or shape complex behaviour.

Secondly, the principles of Computers as Persuasive Media Simulation are: Virtual Rewards, Virtual Rehearsal and Simulation in Real World Contexts. In addition, the rest

are listed in Table 2.15. When computers are used as persuasive media, they are used essentially to create simulations. They can have a powerful influence on shaping attitudes and behaviours in the real world.

Table 2.15: Computers as Persuasive Media: Simulation's Principles

Principles:	Description
Cause and Effect:	Observe immediately the link between causes and effects.

Thirdly, the principles of Computers as Persuasive Social Actors are: Similarity, Praise, and Authority. In additional, some other ones are listed in Table 2.16. When perceived as social actors, computer products can leverage these principles of social influence to motivate and persuade users.

Table 2.16: Computers as Persuasive Social Actors' Principles

Principles	Description
Attractiveness:	Target user is likely to be more persuasive as well
Reciprocity:	Reciprocate when computing technology has done a favour for them

Fourthly, the principles of Credibility and Computers can be defined as believability like: Trustworthiness, Expertise and Surface Credibility. Additional information in this regard are listed in Table 2.17.

Table 2.17: Credibility and Computers' Principles

Principles	Description
Presumed Credibility:	People approach computing technology with a preconceived notion about credibility, based on general assumptions about what is and is not believable.
Reputed Credibility:	Third-party endorsements, especially from respected source, boost perceptions of credibility of computing technology.
Earned Credibility:	Credibility could be strengthened over time if computing technology performs consistently in accordance with the user's expectations.

Principles	Description
Perfection:	Computing technology will be more persuasive if it never/rarely commits what users perceive as errors.

Fifthly, the principles of Credibility and the World Wide Web is to convince users that visiting their site is the best way to get what they need and are: Real World Feel, Easy Verifiability and Personalization. Additional information are listed in Table 2.18.

Table 2.18: Credibility and the World Wide Web's Principles

Principles	Description
Fulfilment:	A web site will have increased credibility when it fulfils users' positive expectations.
Ease of Use:	A web site wins' credibility points by being easy to use.
Responsiveness:	The more responsive to users, the greater the perceived credibility of a website.

Sixthly, the principles of Mobility and Connectivity are: Normative Influence, Social Comparison, Social Learning, Social Facilitation, Cooperation, Competition, and Recognition and the rest of them are listed in Table 2.19. New computing capabilities such as networking and mobile technologies create additional potential for persuading people at optimal time and place.

Table 2.19: Mobility and Connectivity's Principles

Principles	Description
Kairos	Gives suggestion at the right moment.
Convenience	Easy to access
Mobile Simplicity	Easy to use
Mobile Loyalty	Serves its own user needs and wishes
Mobile Marriage	Makes a positive bond between users and product
Information Quality	Delivers current, pertinent, and well-arranged information

2.7.3.3 Other persuasive principles classification

There is different classification of persuasive principles which the principles have been classified into some related categories (educational and game principles). These classifications used Fogg terminologies and description of principles, so it considered as Fogg classification but with different way of classifying. The principles are:

(a) ***Educational principles***

Mintz and Aagaard (2012) classified persuasive principle into educational category which can use them to develop educational application. The educational principles are: Reduction, Tunneling, Personalization, Self-monitoring, Credibility, and Kairos. They claim that these principles can be used to develop different type of educational application, but this claim is too strong because there are different educational areas and subjects which each one of them need to specific application design. Thus, this study focuses only on English language learning then it should extraction persuasive principles for that type as done in Section 4.2.12.7.4.1(b).

(b) ***Game principles***

According to Musa, Shaffiei, and Mokhsin (2010), game application should have some specific persuasive principles which they are: Conditioning rewarding, Self-monitoring, and Tunneling.

After listing out the persuasive technology's models and principles, the study is going focused on Fogg's model under system development and principles terminology and description (including principles in Section 2.7.3.3) rather than others. Because Fogg's principle includes Oinas-Kukkonen and Harjumaa's one and the principles are classified based on tools (mobility principles which are going to be used on this study). Moreover, Fogg's model is much clearer and simpler. The next step in this study is addressing reviews related to educational and medical fields. The proposed review is to investigate

whether there is an existing guideline to be used to develop mobile game application for learning languages or not. If not, the study needs to figure out how to develop such guideline and its components.

2.7.4 Adopting/Usage of Persuasive Technology in Domain

In this section, four different language learning-based applications were identified, and are deployed in persuasive principles to enhance language learning. These applications have been selected after series of search activities on Google, Google Scholar, and the University Library Website by using keywords: Language learning and persuasive principle and by tracking down references in the bibliographies of various articles (Jalali & Wohlin, 2012). However, despite a comprehensive and detailed search, the study has failed to find more research studies on persuasive principles for the development of applications within the field of language learning.

Based on the few literature available in the area of persuasive technology in education, wide use of persuasive systems has been observed in medical field or health care sector, (Hamari et al., 2014; Wiafe & Nakata, 2012).

2.7.4.1 Adopting persuasive technologies in language learning

Four applications were found after the completion of the search process. These applications used persuasive principles to motivated learners to learn language. Moreover, their interfaces are developed based on these persuasive descriptions as the authors claimed. However, these studies have not shown any evidence or prove as to how these principles reflect on the application development.

The applications that adopted persuasive principles for English language learning are: (1) the Euro PLOT Project ("EPLOT") (EuroPLOT, 2013, December 31), (2) Reading & Writing Application ("RWA") (Lucero, Zuloaga, Mota, & Muñoz, 2006), (3) Malay

language for disabled learners ("DML") (Sun & Chang, 2016), and (4) "ENGLISCH–Die Sofort Grammatik auf CD-ROM ("EA") (Trân, 2008) (see Table 2.20).

Table 2.20: Educational Studies

App's Name	Application's Details	Persuasive Principles	Model / Theories Underlying
EPLOT	- This group addressed the use of persuasive technologies. This project designed and developed two of the tools (PLOT-Learner and PLOT-Maker) that used persuasive principles. **Outcomes -** Benefits were experienced from the use of persuasive principles within the applications of education learning.	1. Social Signals 2. Self-Monitoring 3. Suggestions 4. Tunneling 5. Reduction	-
RWA	- This study attempted to improve motivation for reading through the employment of persuasive technologies. Participants were between the 8 and 11 years old. **Outcomes-** Improvements were noted across both writing and reading habits.	1. Credibility 2. Tailoring 3. Similarity	Theory of multiple intelligence by Gardner
EA	- This EA study investigated the theories and techniques across several e-learning tools/ applications for motivating learners. This study examined three different applications that used persuasive technologies. **Outcomes-** Both older and newer models increase motivation.	1. Self-monitoring 2. Tailoring 3. Tunneling 4. Reduction	Expectancy-value theory, goal theory, and attribution theory

App's Name	Application's Details	Persuasive Principles	Model / Theories Underlying
DML	- DML makes use of mobile applications to enhance the performance of learners with disabilities. The specific persuasive principles underlying DML were selected randomly.	1. Rewards 2. Praise 3. Tailoring 4. Self-monitoring 5. Personaliza--tion 6. Tunneling 7. Reduction	Fogg behaviour model ("FBM") as well as the persuasive system design ("PSD")

Upon completion of the search process, the educational studies that use applications are listed above and four application were found after the search process. The applications used persuasive principles to motivate learners to learn language. More so, their interfaces were developed based on persuasive description. However, there is no evident so far to prove the claims that the principles reflect in the development of the applications.

(a) ***Techniques / Methodology***

Several techniques, models, and theories have been used to enhance performance of learner. Gardner (Lucero et al., 2006) proposed a theory based on multiple intelligences. Also, The models, as well as techniques of motivation, have in addition been studied, reviewed and suitably applied in (Trân, 2008) studies and received a technique of motivation to develop a model. The Fogg behaviour model ("FBM") and the persuasive systems design ("PSD") were also utilized for application design. None of these approaches are utilized in the predominant models.

Researchers have focused on how to select a principle that improve and enhance learners' outcomes. Many educational theories were studied and applied in several models or randomly selected principles. However, the fact that all these principles can motivate learners and encourage to learning to be involved in teaching and learning has

been overlooked. Additionally, studying the tools and techniques before applying suitable principles was not observed among these studies.

Critical examination and evaluation of these four studies have shown that with the exception of EPLOT, the various theories of education used to reinforce applications are adopted. In addition, the DML studies focused on the persuasive FBM and PSD study which claimed that all the 28 different principles under PSD could be randomly selected for developing applications for language learning.

(b) ***Persuasive principles for language learning studies***

The four different kinds of language learning applications can be categorized in the following manner, (1) website-based applications: EA, RWA, and EPLOT, (2) mobile based application: DML, (3) game-based application: RWA, and (4) non-game-based application: EA, RWA and EPLOT.

These four categories of applications applied the principles of education and further aggregated with other principles as illustrated in Table 2.21. Importantly, the rationale behind the combining with other principles. However, the reasons for non-selection of some specific principles of education was not indicated. The study has selected the common principles to be language learning principles. These principles are selected once they appear at least three times. However, three principles have been selected from the principles of education (Reduction, Tunneling, and Self-monitoring) and only one principle came out of education principles (Tailoring).

Table 2.21: Comparison for the Application Principles

		EPLOT	RWA	EA	DML
Principles of Education	Reduction	X		x	X
	Tunneling	X		x	X
	Personalization				X
	Self-monitoring	X		x	X
	Credibility		x		

		EPLOT	RWA	EA	DML
Other Principles	Kairos Tailoring	X	x	X	X
	Suggestion	X			
	Conditioning	X			
	Simulation	X			
	Social Signals	X			
	Similarity		x		
	Praise				x
	Rewards				x

2.7.4.2 Adopting persuasive technologies in the healthcare/medical domain

The utilization of mobile-based applications across public health as well as medical practices is made possible through Mobile Health ("m-Health") applications. Free et al. (2013) suggested that any mobile device can be utilized in a variety of ways within the field. Persuasive technologies have been used in healthcare and medical domain for a long time. Wiafe and Nakata (2012) carried out a comprehensive review and analysis of persuasive systems in healthcare applications.

Many studies like Osman, Zam, and Ibrahim (2016) proposed guidelines for use in persuasive systems in healthcare domain. These studies applied different persuasive principles and failed to consider a website or mobile tools. Thus, this study investigated several MGAs within the healthcare domain to determine if the principles of underlying mobile games can be generalized across learning areas and used to identify strengths and weaknesses in the system.

(a) ***Techniques / Methodology***

Table 2.22 shows that studies in the healthcare and medical fields outnumber those in other domains, yet the overall selection of principles appears to be similar. In previous educational applications, research works only focused on studying the effects of principles on the target problem without considering the tools and techniques used for the technology. Investigators only select principles without any academic study or review.

Table 2.22: Medical Studies

Categorization	Propose	Study Reference	Underlying Principles	Model / Theory
Obesity	To encourage physically active lifestyles	Arteaga, Kudeki, and Woodworth (2009)	behavioural intentions, attitudes, subjective norms, perceived controls, praise and rewards	Theory of Big 5 personality, theory of the meaningful behaviour, theory of the planned behaviour, and model of technology acceptance
	To propose a framework	Almonani, Husain, San, Almomani, and Al-Betar (2014)	information quality, marriage and kairos	-
		Ping, Poh, Meng, Husain, and Adnan (2012)	Competition, rewards, feedback, rewards, competition, social learning	Theory of planned behaviour
	To motivate children to practice healthy eating habits	Pollak et al. (2010)	information quality, reminder, tailoring, rewards, competition, cooperation and tunneling	-
Smoking harms	To campaign on the dangers of smoking	Ismail, Ahmad, Rosmani, and Shuib (2012)	information quality, convenience, cause and effects, praise, mobile simplicity and attractiveness	theory of social learning from Bandura, and the Fogg behaviour model
Consumption of water	To determine the amount and regularity of water consumption	Chiu et al. (2009)	Feedback, environment and surveillance for discovery (a positive form of rewards that are offered towards good behaviour), simulated experiences, virtual groups (competition or cooperation)	Theory of social conformity

Categorization	Propose	Study Reference	Underlying Principles	Model / Theory
Dental	To raise oral health and dental hygiene awareness of adolescents	Soler, Zacarías, and Lucero (2009)	attractiveness, suggestion and cause and effect simulations	-
Physical exercise	To examine the effectiveness of a game in many physical aspects	Wylie and Coulton (2009)	Feedback, competition, simulation	-
Medication Compliance	To persuade patients to be adhere to their medication prescription	De Oliveira, Cherubini, and Oliver (2010)	competition, reminders, social competition, simplicity, and convenience	-
Bipolar disorder	To address the challenges of self-management of mental illnesses	Bardram et al. (2013)	information quality, tailoring, praise, tunnelling	-

Table 2.22 indicates that majority of these studies did not adopt any specific technique, model or theory for supporting application development or design. Many other studies adopted theories used in education. However, most of them had used it to develop applications for solving health care-related problems.

(b) ***Persuasive principles for medical studies***

Many articles in the field of medicine did not clearly list persuasive principles but, specified that they utilized technology and provided evidence. While many others only mentioned that they used technology without any evidence of such usage. This finding is in line those of (i.e. Osman et al., 2016) who mentioned that many guidelines are available; some other principles listed to be used by other studies that do not deal with

principles. Clearly, applications in the medical field failed to consider the use of tools and techniques during the design stage as the study believes that these factors are too importance to develop such guideline. Therefore, they should be considered when developing mobile game guidelines such factors are tools, domain, and techniques.

2.7.4.3 Research gap

(a) ***No guidelines to develop language learning applications based on persuasive technology***

Unlike medical field, there are no guidelines for the development of applications for language learning in educational sector. Even though, the medical guidelines have not yet demonstrated any advantage in the development of medical applications. The existing guidelines could be reviewed to determine their usefulness and applicability to language learning.

In 2009, Oinas-Kukkonen and Harjumaa developed a persuasive system design ("PSD") model. Essentially, PSD classifies the persuasive principles as social support, system credibility, dialogue, and primary task. The classifications consisted of 28 different persuasive principles. Unfortunately, the authors failed to use a suitable set of principles with respect to mobility as was done by Fogg previously. In addition, the process the developer used identify the principles is still unclear.

Guidelines aid in saving designers valuable time as due to its ability help designers to select suitable set of principles for their targeted systems. All the persuasive principles could be utilized to improve motivation and engagement of users. However, each of the principles can individually improve motivation. In addition, the guidelines offer a suitable range of principles relevant to each proposal.

(b) ***Non-consideration of tools and techniques when principles were selected by researchers***

An application should be designed to achieve an optimal design. Tools such as computers and mobile devices have different functions and features as considered by Fogg and other researchers. These researchers classified several principles.

The techniques used to develop the applications (e.g. game or non-game) are important, because each of them is designed in different ways. Most studies, especially those used for mobile game applications disregarded mobility and game design and considered only the research problems. There are some limitations and missing that should have been included in the previous persuasive technology studies. Hence, some of them are listed below:

i. Some studies do not list the persuasive principles employed in their works.
ii. Most of the studies do not mention their principles description and definition.
iii. All the studies do not give any evidence on how the principles refract in their applications.

The performance of foreign English language student using mobile game applications to aid their learning was investigated. Additionally, motivation theory was considered as an approach to propose an empirical study. The theory provides the basic principle on how extrinsic and intrinsic motivation theories are used in the area of foreign language studies (Noels, Pelletier, Clément, & Vallerand, 2000). Extrinsic motivation refers to an act towards achieving targeted goals through earning rewards or avoidance of punishment. On other hand, intrinsic motivation means to engage in any enjoyable and fulfilling activity. According to Aarts and McMahon (2006), motivation result to hard work and better performance of student. More so, the studies inferred that motivation of

students and mental status in learning have not been taken in to consideration in many research works in the area of mobile learning. Most research works tend to focus on interactions between the student and system and its influence on learning performance (Alavi & Leidner, 2001). Palmer and Goetz (1988) stated that motivation is a fundamental factor that aid students to achieve high level of responsibility during learning and an enhancer of self-learning.

According to Sun and Chang (2016), courseware designed based on persuasive technology can impact positively on learning performance of children with learning difficulties compared to the traditional teaching systems. Also, courseware based on multimedia are integrated with persuasive technology showed significant improvement in students' syllable by achieving better scores in the questionnaire-based test. Mobile technology can engage students much better and improve their learning process. Students can easily change from passive learners and truly engage learners who are behaviourally, intellectually and emotionally involved in their learning task (Wang, Shen, Novak, & Pan, 2009). For the purposes of developing mobile game applications with respect to language learning, it is essential to develop guideline that provides developers with suitable principles. These principles should enhance the motivation of the learner. Furthermore, the guideline needs to consider the specific tool used (mobile) and technique (game) as well as domain (language learning) with regard to selection of relevant principles. So, this guideline would be included in the proposed framework.

2.8 Educational Theories and Models

This study relies on the use of Socio-cultural educational theory and the Bloom's taxonomy educational model.

2.8.1 Socio-cultural Theory based on Scott and Palincsar (2013)

Sociocultural theory, in the context of persuasive technology is an education curriculum, assessment and instruction that are widely used. Socio-cultural theory in terms of notion of proximal development zones, suggests that educational goals assessment should:

i. Identify abilities which are in the process of developing.
ii. Attempt to forecast what the learners will do individually in the future.

A line of inquiries consistent with these goals is a dynamic assessment use to characterize a number of distinct methods that are guided by learning for the purpose of determining a learners' potential for change. Additionally, dynamic assessment is concerned with the diverse ways learner who earned the same scores achieved it. Moreover, dynamic measures are concern with performance of learners when provided assistance rather than disclose only those abilities that are completely developed as traditional measures.

It is worthy to note that design are used for dynamic assessment in general types domain to solve problems and tasks (Brown, 1985). It was observed that dynamic assessment measures disclose a different competency rather than static measures, that decrease children's ability to learn in an area they initially performed poorly.

2.8.2 Bloom's (1956) Taxonomy of Learning (Krathwohl, Bloom, & Masia, 1964)

According to Wilson (n.d.), domain of learning is divided into three and teachers should be aware and use to develop lesson plans. These three domains are cognitive (thinking), affective (feeling or emotion) and psychomotor (kinaesthetic or physical). There is a different taxonomy (classifications) for each domain. These taxonomies have been arranged from simplest to complex level.

This study is going to focus on affective domain that can be classified in a hierarchy (Krathwohl et al., 1964). This area focuses on emotions and feelings (motivation). The taxonomy of this domain is divided into five parts as shown below:

- Receiving

Refers to the learners' sensitivity to the existence of stimuli-awareness, willingness to receive and selected attention.

- Responding

Responding refers to the learners' active attention to stimuli, motivation to learn, feelings of satisfaction or willing responses.

- Valuing

Valuing refers to the learners' attitudes of worthy acceptance, beliefs and commitment, or preference. Normally, in acceptance, a commitment, or a preference is given to a value.

- Organization

Refers to the learners' beliefs involving and internalization of values; (1) conceptualization of values. (2) organization of value system. As beliefs or values become internalized, the learners organize them in accordance with priority.

- Characterization

Characterisation refers to the learners' highest internalization and behaviour that reflects (1) a generalized set of values. (2) a philosophy or characterization about life. So, learners are capable of acting and practicing on their beliefs or values.

For language learning, socio-culture theory and affective domain of Bloom's taxonomy are reflected in the propose framework in the form of persuasive technology principles and concept. This technology integrated key aspects from these models. It is worthy to emphasize that social setup is the best avenue for language learning. Therefore, in this research, socio-cultural theory was adopted as a social tool for language learning coupled with persuasive technology.

2.9 Summary

In this chapter, literature review related to e-learning and m-learning are studied to have understanding of the application of m-learning in English language learning. It also investigates the contributions of e-learning and m-learning to this field. Moreover, studies that used one or both of these technologies have been described. The study also focused on game application, and the effect of motivation to learners. In addition, the project investigated the persuasive behaviour to find out suitable principles that can be employed to develop mobile game applications that impact on vocabulary and make learning more enjoyable and increase motivation.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The main goal of this study is to develop a framework for mobile game that include a persuasive principles in the development of the guideline. The framework would be applied on a gaming application and its effectiveness would also be evaluated. This chapter discusses the research method used in this study. To achieve these goals, six-step research guidelines based on Design Science Research (DSR) is adopted. This chapter provide details of the research guidelines with detailed discussion of each step. The method adopted are: Identification of the problem and motivation, definition of the objectives of solution, design and development, demonstration and communication.

3.2 Identifying a Suitable Research Method

Maddison et al. (1984) defined methodology as *"a recommended collection of philosophies, phases, procedures, rules, techniques, tools, documentation, management and training for developers of information systems".* Gasson (1995) addressed elements of methodology as shown in Figure 3.1. These elements allow researchers and academic communities to structure their understanding and find appropriate solutions for the problems.

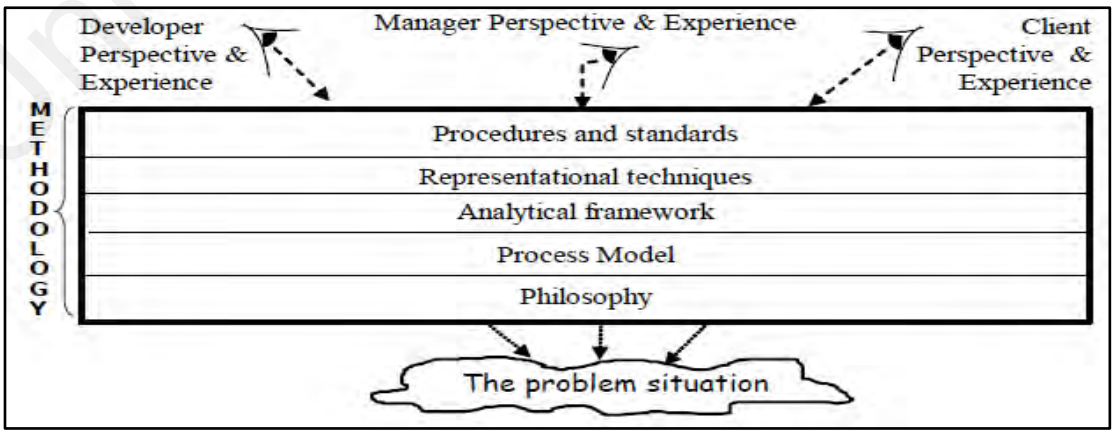

Figure 3.1: Methodology's Elements (*Gasson, 1995*)

Due to the difference in background and experiences of this sort of methodology among individuals, difference views, perspectives and opinion to understand methodology are recorded. In the context of this scope of meaning, the use of the term methodology in the wide sense by development practitioners does not seem inappropriate, especially in academic research. The main objective is to improve information systems development practice (Gasson, 1995).

Saarinen (1990) classified methodology based on four variables:

i. Development strategy of the system: prototyping, liner (waterfall model), or mixed methodology.
ii. Software development tools: application generator (4GL or 3GL), or software package.
iii. The formality of system method development.
iv. Level of management control and planning in the project.

According to Isaias and Issa (2015), the concept of methodology in information system society is to develop a framework that contains actions, methods, and processes used together to provide information system. In this context, the search would list the most renowned methodology in information systems field. Therefore, the various techniques pertaining the system development methodology is presented.

3.2.1 Information System Development Methodology

Information Systems Development Methodologies (ISDMs) have been recognized in the existing literature as shown in Table 3.1.

Table 3.1: Information System Methodologies

System Development Strategy	Methodology	Authors and year
Design-oriented	Agile	Martin (2002)

System Development Strategy	Methodology	Authors and year
Structured	Structured Systems Analysis and Design Method (SSADM),	Ashworth (1988)
	Soft Systems Methodology (SSM),	Checkland (2000)
	Instructional Systems Design (ISD),	Campbell (1987)
	Structured Analysis, Design and Implementation of Information Systems (STRADIS)	Avison and Fitzgerald (2003)
User-oriented	Information Engineering (IE)	Finkelstein (1998)
Hybrid	Multiview	Rundensteiner (1992)
Constructive research	Design Science Research Method (DSRM)	Peffers, Tuunanen, Rothenberger, and Chatterjee (2007)

Adaptation of organization to a new Information System (IS) should not be a one-way thing: IS needs to be designed based on the situation and context by putting the end users into consideration. This adaptation could be easier when adopting one of the existing methodologies within the purpose of the IS. There is no single methodology or framework that is applicable globally to measure success of IS. In general, IS researchers agreed that IS success could not be assessed with accuracy precision due to its multiple variables in which some are endogenous, and others are external to the system. Even though, there is a great difference between variables from study to study, some have been repeatedly used such as user satisfaction and usage. However, different processes or cycles can use these factors in different investigations. IS success measurement research being a fundamental and necessary aspect of modern organizational management in a technologically driven world. IS is evolving and continuously growing toward a more sustainable information technology and information systems.

Therefore, Gasson (1995) and Geambaşu, Jianu, Jianu, and Gavrilă (2011) indicated that there is no study or research that declared clear consensus as regarding use of methodology. Based on the review carried out so far on methodology, Design Science

Research (DSR) received more attention and is discussed its details in the following section.

3.2.2 Adopting Design Science Research

Peffers et al. (2017) posited that Design Science Research (DSR) methodology is crucial in a discipline-oriented research approach to the generation of successful artifacts. Therefore, DSR method provides a suitable methodology for this research as it studies artificial phenomena produced by human beings instead of nature (Hevner, March, Park, & Ram, 2008; Hevner & Chatterjee, 2010). As natural science understands the natural world, however the design science expands the frontiers of human and organizational abilities by creating novel advanced artifacts. Anderson, Anderson, Reder, and Simon (1996) explained that design science model stems from the sciences and engineering of artificial. In addition, DSR is fundamentally a problem-solving model aimed at creating novelties. It defines ideas, apply practical capabilities, and build products over analysis, design and implementation. Therefore, the use of information systems could be professionally accomplished as noted by Hevner et al. (2008). DSR addressed organizational problems in advanced and unique way and solve them in a more effective and organized manner (Hevner & March, 2003).

This concept was chosen due to its focus on development and performance of (designed) artifacts with the goal of improving its functional performance in artifact. It is also typically applied to categories of artifacts, including human-machine interfaces, and languages. Its application is particularly notable in the engineering and computer science disciplines (Kuechler & Vaishnavi, 2008; Vaishnavi & Kuechler, 2004). Research in these disciplines can be seen as a quest for understanding and improving human performance (Van Aken, 2005). Based on these merits, DSRM is deemed as a suitable methodology to implement this study over the alternatives.

3.2.3 DSR Contributions

According to Gregor and Hevner (2013), there are three categories of DSR contributions which stand out in DSR output. These categories vary in type from the limited as well as specific variety to more abstract, mature and complete knowledge of the subject matter. The first category is the creation of artifact such as the implementation process or software products. The second category is the knowledge of operational principles which is called the nascent design theory. It represents an instance of more limited, less mature knowledge but yet more specific. In this research, the implementation of this kind of system while using game falls under the second category of contribution. The third category is a well-developed theory on embedded phenomena. An example of this type of mid-range theories and grand theories is presented.

3.2.4 DSR Method

Building and evaluation are the primary loop activities of DSR. The building is designed to address a specific problem by constructing artefact. While evaluation is to determine how well the artifact perform according to the intended information theory. According to (Hevner et al., 2008), the artefact varies from a model, construct, instantiation, method, to principles, rules, design, technologies (Gregor & Hevner, 2013) as well as through social innovations (Aken, 2004) or novel characteristics of informational, technical, or social resources (Järvinen, 2007).

The artifact acts as the main part of the DSR, however, the main contribution for this research is the knowledge derived from the process of constructing and assessing this artifact representing a key difference between research and design. The contribution is to obtain suitable fundamentals of knowledge base and methodologies. In this research, the primary artifact is built and evaluated based on mobile game guideline. Hevner et al. (2008) confirm that information system research contributes and link to both knowledge

and environment. Contribution to the base of knowledge are two new fundamentals and methodologies that could be used in upcoming works and the contribution to the environment is to address the organizational needs.

Hevner (2007) proposed three cycles of view for DSR to assist in building and evaluation of DSR results. Relevance, design and rigor are the three cycles. The first cycle which is the relevance cycle joins the DSR to the environment according to the requirement identification and testing. The second cycle represents the Design cycle which loops between the building and the evaluation of the activities that are occurring within the development of the DSR artifact. The last cycle but not the least one is rigor which provides additional knowledge base and grounds the research in terms of base for knowledge. The DSRM which stands for the Design Science Research Methodology technique process model is applied to ease and start DSR research (Peffers et al., 2007). The DSRM helps in product and present DSR for IS research's area. Figure 3.2 shows the DSRM research stage which are broken into six stages.

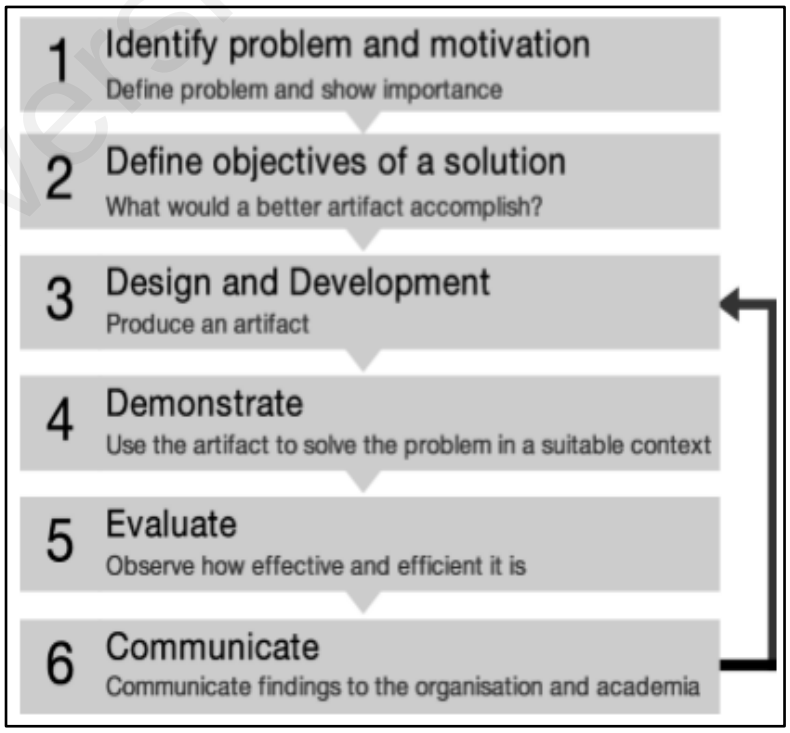

Figure 3.2: DSRM Research Stages *(Adapted from Peffers et al., 2007)*

The DSRM matches all the three-cycles view of the DSR's activities and each step is connected to at least one of these cycles by Hevner (2007). The approach DSRM as shown in Figure 3.2 provides structured and detailed guidance to undertake DSR important for this research.

3.3 Research Methodology

Design Science Research Method (DSRM) was adopted from the work of Peffers et al. (2007) as shown in Figure 3.3. A mobile game framework that include persuasive guideline is proposed as artifact. The framework and guideline are developed using two steps build and evaluate approach of Design Science Research (DSR). The framework and guideline are evaluated by experts using artifact to design mobile game application for English language learning.

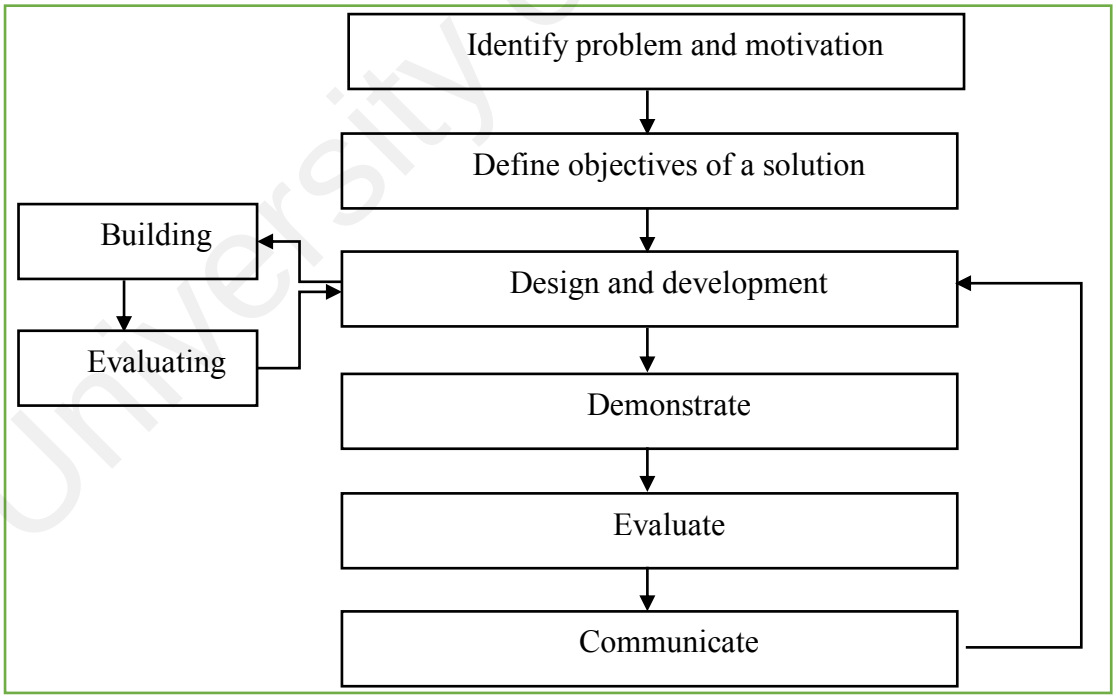

Figure 3.3: The Study's Methodology

Regarding to experts validation of framework and guideline and quasi- experimental design that is used for motivation and performance evaluation, quantitative research designs would be applied. According to Creswell and Creswell (2017), quantitative

research is defined as *"is one in which the investigator primarily uses post positivist claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data"* (p. 18).

The experimental design was used in this study to determine the suitability of mobile vocabulary applications to improved comprehension and learners' vocabulary. At the same time to ensure that the application enhanced learners' motivation and improved their learning outcomes (Creswell & Creswell, 2017). Quasi-experiment is an empirical interventional study used to estimate the causal impact of an intervention on a target population without random assignment. Quasi-experimental research shares similarities with the traditional experimental design or randomized controlled trial, but it specifically deficient of the element of random assignment for treatment or control. Instead, quasi-experimental designs typically allow researchers to control the assignment for the treatment condition, and use some criterion other than random assignment as an eligibility cut-off mark (DiNardo, 2016).

The quasi-experiment with repeated measure design has enabled the approach to identify the causal effect of learning outcomes. For instance, the pre-test scores identified the existing knowledge of English language among learners. Whereas, the post-test scores of the student in both groups (control and experimental) has enabled the researchers to compare the results and determine the actual effect of the manipulation (English learning app) intended. This method has been used based on the previous literature which suggested that the quasi-experimental design is a rigorous way of determining the effect of the manipulation (Grabbe, 2015). The investigation began with an exploratory stage to justify the context and moved on to build evaluation. It focused on building and evaluating

the artifact, numerous DSRM activities that are aligned with each stage of this proposed guidelines.

3.3.1 Identify the Problem and Motivation

The first step was an investigative step which justified the research and identified the existing problem related to m-learning in English language learning and applied persuasive technology. This step reviews the field to find the most persistent problem in learning English vocabulary. It also seeks for the most suitable technology that can be applied to resolve the problem and increase learners' performance. This was clarified through literature review. Previous studies have shown that lack of motivation is the main problem learners encounter when learning English language.

The computer science community has tried to solve this problem for many years (Lee, Yeung, & Ip, 2016). So far, there is no evidence that suggests improvement in this area. Also, this study has discovered the gaps in m-learning and are listed as a way forward to solve problems. To reinforce m-learning and make sure this technology improves the learners' performance, this research focuses on persuasive technology due to its ability to influence technology and behaviour. The study attempted to use persuasive principles to take care of learners' motivational issues and difficulties. However, there is no specific guideline applicable to develop mobile game applications in this area as explained in Section 2.7.4.3(a). This can be a major hurdle for any researcher who wants to develop such an application.

3.3.2 Define Objectives of a Solution

To address the lack of persuasive principles guidelines for English language learning by using mobile applications, an operationalized and evaluated mobile game framework that include guideline is presented to aid the design of an effective mobile game application. This step answers the first research question which says – "What are the

suitable persuasive principles required in developing a guideline for primary school students". A guideline should consider the device, technique, and domain and it should also solve motivational problems. In addition, the key objective of providing a mobile game framework is to assist in designing an effective mobile game application. An effective mobile game application in this study is a system that leads to a suitable behavioural change and provides enjoyable playing experience. It does not affect the tool usage. Also, this guideline should offer guidance on how to:

i. Identify a fit and suitable goal for a mobile game design.
ii. Choose mobile game persuasive principles that line up to the goals.
iii. Implement the mobile game persuasive principles using the obtainable technology.

3.3.3 Design and Development

This step answers the second research question which says – "What are the important components required while designing a mobile game framework for primary school students". Moreover, the framework was developed, and its guideline has been applied in DSR primary tasks (building and evaluating). It is used to develop and ensure its usability and reliability. DSR primary tasks have been used to develop frameworks as well.

The framework includes persuasive principles guideline developed based on steps below: -

3.3.3.1 Building the guideline

The guideline was built by comparing existing language learning applications and combining their common principles with mobility and game principles as listed by researchers in Section 4.2.1.

3.3.3.2 Evaluating the guideline

The first evaluation was done by ten experts who have experience in related fields (experts details are shown in Appendix A). The experts were asked to fill up an online survey. The survey was designed and analysed based on Khowaja and Salim (2015) study. The survey was carried out online using Google Form.

3.3.3.3 Building the framework

The framework was built after reviewing the existing mobile language learning frameworks that are listed in Hsu and Ching (2015) and Rikala (2015). However, it was inspired by Schmitz et al. (2012) work. The framework was developed to test game patterns of some mobile game applications. The game patterns were replaced by the persuasive guideline due to their limitations and provide theoretically ground to the framework. Therefore, learning and learning environment have been added to the framework design.

3.3.3.4 Evaluating the framework

Once mobile game application has been developed based on framework, real users are used to measure the effect on motivation and performance. Formerly, it is validated using experts who asked to complete the questionnaire submitted via email (experts details are shown in Appendix C). The questionnaire has two parts; the first part explains all the steps and stage of developing the framework and its components. The second part describes the survey prepared to answer three factors; usability, applicability, and motivation. Experts validation of the framework is considered as the second guideline for testing

3.3.4 Demonstrate

DSRM suggests that the artifact is used to solve one or more instances of the problem that include its use in a case study, experiment, or other appropriate activities (Peffers et

al., 2007). In this case, an experimental study was undertaken for primary school learners. This step answers the third research question which says – "How to develop a mobile game application using the proposed framework". Then the framework was used to design a mobile game application experience for current students at IMAS. The mobile game application was aimed at enhancing students' performance. The main set of vocabularies was identified by a teacher. Subsequently, the requirement for analysis for the prototype was gathered and designed.

3.3.4.1 Developing the prototype

Multimedia Mobile Content Development (only the first two steps) framework reinforced by Fogg's steps (only the first six steps) of Persuasive Technology Design has been used to develop application (Figure 3.4).

(a) Multimedia Mobile Content Development (MMCD)

According to Saifudin, Salam, and Abdullah (2012), MMCD framework and methodology has shown that it can minimize the time used for development solve problems during system reconstruct and redevelopment.

i. Planning: Type of application, target device, target users, FPS and application settings, GUI, images, video, audio, and application synopsis.
ii. Analysis: Objects and navigation used in the application, and content structure checklist (layers design, frame design, menu and navigation, number of main GUI, sub-GUI images, placing audio, placing video, ActionScript draft, storyboard).
iii. Design develop and test: as shown in Figure 3.4 Fogg's steps model has adopted to design and develop the application. So, these steps have been replacement by the first six steps only.

(b) Adopting six step of Fogg's Eight Steps of Persuasive Technology Design (FESPTD) these six steps can be used to design persuasive technology in its early stage.

i. Choose a simple behaviour to target: - The study aims to improve learners' performance and outcome.
ii. Choose a receptive audience: - Primary school learners are selected to be the audience of the search.
iii. Find what prevents the target behaviour: - Lack of motivation was found to be the main reason for decreased learner performance.
iv. Choose a familiar technology channel: - Mobile devices are our chosen medium in this study.
v. Model the appropriate persuasive technology for the target system (Find relevant examples of persuasive technology): - This step is a guideline which is designed to isolate persuasive principles, which can be used in developing a Persuasive Mobile Game Application for Language Learning (PMGALL).
vi. Imitate successful examples: - The study has used word match and trivia to be the target application and imitated its success in improving learning among commercial games.

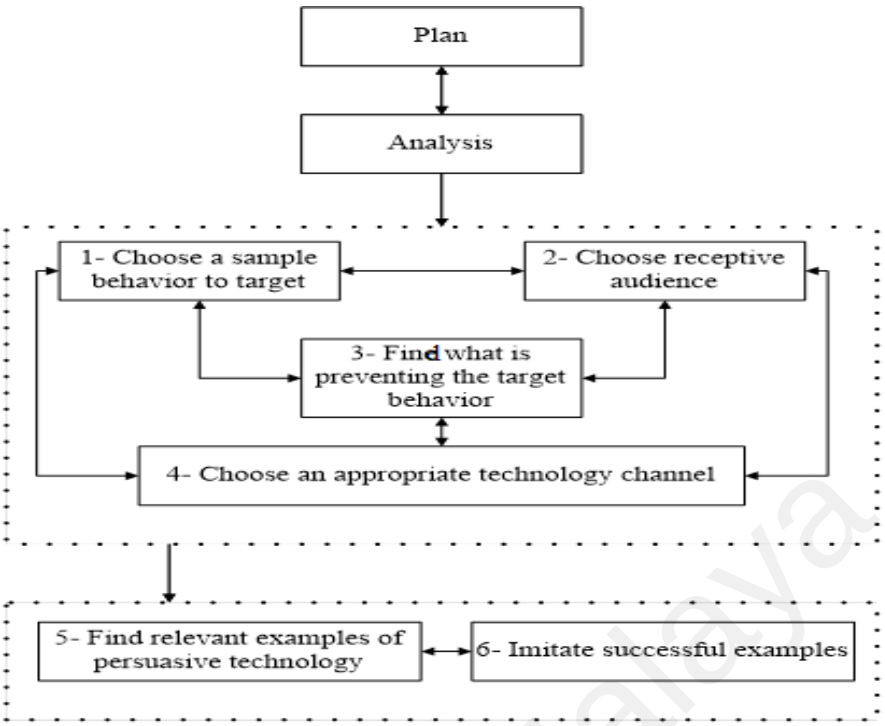

Figure 3.4: The Mobile Game Application Development

3.3.5 Evaluate

In this part, the last research question which says – "How to evaluate the mobile game application in order to validate the proposed framework" would be answered. The framework was evaluated two times, first by experts and secondly after developing the prototype. The prototype was evaluated using quasi-experimental design (Huizenga et al., 2009; Hwang, Chen, Shadiev, Huang, & Chen, 2014; Sánchez & Olivares, 2011) to evaluate the framework which is considered as the third guideline for testing. The evaluation is done by the targeted users who are the primary school's students. Additionally, according to Rezaei et al. (2013), pre-test users are those users before the application tested and post-test users are those after usage. This kind of testing (t-test) figures out the effects on the learners' vocabulary. Besides that, the study includes another pre-test group among the students who collected data regarding English language performance.

Many investigations have been carried out in respect of mobile applications, however, most of the studies either presented unclear or incomplete experimental design. For instance, in some research works, none of these important parameters such as period of training, group size of participants or assessment method are mention. Example, Ashiyan and Salehi (2016) used WhatsApp to improve motivation among Iranian student in learning English language vocabulary. However, the study did not indicate the duration of the study. Also, Ma et al. (2012) did not specify the groups size and the study duration in their investigations. Scurtu, Dai Ho, Preda, and Dang (2011) also did not clarify on the category of learners who took part in their study. Furthermore, the research presented insufficient details regarding the study duration or period. For instance, Alkhezzi and Al-Dousari (2016) outlined detail experimental design procedure followed during their investigation. The experiment, t-test was used in conjunction with questionnaire to measure the university students' performance and motivation in learning vocabulary. However, the research paper did not specify the particular duration for each step within the 12 weeks of training. Lastly, most studies often fail to use appropriate assessment tool for their investigation. However, majority of studies deploy questionnaire to measure motivation and believe is the right assessment method (Bustillo, Rivera, Guzmán, & Acosta, 2017; Sung, Chang, & Liu, 2016). But, Rahimi and Miri (2014) did not use questionnaire to measure motivation for learners in their study. Therefore, in other to cope with all the limitations aforementioned, this study declared the experimental design in depth and in detail.

Vocabulary Test: Pre and post-test were developed based on school textbooks and exercises. The resources were checked by an English teacher of 3rd grade (see Appendix F). The main essence of this test is to determine the students' performance. The input data was collected at the beginning and end of the experiment. The vocabulary test was reviewed by English language teachers who have more than five years' work experience

in teaching English language subject in order to ensure its validity. The test includes 10 words and 10 pictures, so the student looks for word that matches a given picture. The final mark of this test is 10 and the students marks are listed in Table 6.1 in Section 6.2.

Motivation Questionnaire: The questionnaire is divided into two sections with the first part containing participants information such as age, gender and class, while the other section is adapted from Sung, Hwang, and Yen (2015) and modified to meet the requirement of MSLQ (Motivated Strategies for Learning Questionnaire) which includes questionnaire of learning motivation. The questionnaire is equipped with of 7 concrete questions that tend to acquire knowledge about participants' motivation to learning English vocabulary. The questions are rated on a 5-point Likert scale (ranging from 1, strongly disagree to 5, strongly agree). The student scores in learning English language was collected both at the beginning and end of the exercise. The questionnaire questions are list in Appendix E.

The students from four (5) classes were separated into two groups based on the classes they attended. The various groups were subjected to the same pre-test and pre-questionnaire exercise. The students who scored lower marks than the control group were assigned to the experimental group. Two English language teachers are allocated to each group. Both groups used the traditional materials available in the school. So, the same environment is provided for the two groups except the experimental group that used mobile application as additional material. Therefore, reliability analysis was carried out and seven (7) questions were outlined for the respondents. The respondents consist of traditional and mobile group. In the traditional group, seven (7) questions structured to measure the motivation and the result indicated that these questions are reliable with Cronbach's Alpha of 0.792. Similarly, for the mobile group, the measurement of motivation is reliable with Cronbach's Alpha of 0.825.

There are two reasons for pre-test, firstly, it provided data for comparison with the post-test results which show if students have made any progress or not. The results can divide the students into two groups based on their language ability (Chang et al., 2011; Chen & Chang, 2011; Shen, 2014; Thajakan & Sucaromana, 2014). The students in group which perform poorly in the pre-test are the test targets. The study assumes that good English students' do not need help to learn English language and their good performance would affect the accuracy of the results if we simply divided the students into two groups without giving attention to their prior performance. Moreover, the good group have studied English language through traditional educational style.

Next, the study applied the second exam (post-test) to the two groups, and then a comparison is made to find out if the targeted system has improved performance of the bad group. Furthermore, the final results of the two groups are compared to find out if the technology can bring the poor students' performance at par with the good students' performance and enhance their motivation.

A variety of statistical analyses were conducted to analyse the data in order to answer research questions four (4) which says – "How to evaluate the mobile game application in order to validate the proposed framework". The statistical analyses included: t-tests, ANCOVA, and repeated ANOVA. The analytical procedures were conducted using the Statistical Package for the Social Sciences (SPSS) software. This range of statistical models allows researchers to analyse data in depth and control variations of variables. T-test was conducted to measure performance and ANCOVA was conducted to measure the motivation. These tests were especially utilised to assess statistical differences in terms of mean differences (t-tests) between the two groups, in terms of more than two groups or subgroup differences (Analysis of variance ANOVA) and co-variances between the various variables (performance and motivation). Analysis of covariance was used to test

the main interaction effects of categorical variables on a continuous dependent variable controlling the effects of other continuous variables which co-vary with the dependent variable. Next, the study describes the quasi-experimental measures/instrumentation.

To evaluate the impact of education and training, attempt have been made adapt some models from healthcare, business and marketing sectors (Arthur Jr, Tubré, Paul, & Edens, 2003). Kirkpatrick (1996) is one of these models that provides detailed guidelines for effectiveness evaluation of trainings. In academic institutions, the four levels of the model attempt to assess students' responses to the program (Level 1), their learning (Level 2), their behavioural change (Level 3), and the result. Final for institutions (level 4). While levels 1 and 2 are relatively simple to assess (Praslova, 2010), levels 3 and 4 have proved extremely difficult to examine in educational studies. This is because level 1 and level 2 measures can be applied as long as students have not yet left the program, but levels 3 and 4 require post-hoc studies and monitoring student performance in the field. More worryingly, level 4 requires a systematic review of the effect of the educational program on the "growth" and "success" of educational departments, to determine which ESL literature has articulated / reported no framework. Therefore, it would be more efficient to study the levels individually (Praslova, 2010).

The Kirkpatrick model is a very influential framework for the evaluation of training programs. Although the model was developed primarily to evaluate enterprise training, and its application to education programs has been an acceptable success (Paull, Whitsed, & Girardi, 2016). In addition, the challenges associated with transfer of evaluation models in different disciplines and institutions need to be taken into consideration. However, it is plausible that the model facilitates assessment of traits and skills that play a key role in academic environments and contributes to providing feedback to students, teachers and higher education institutions (Paull et al., 2016).

The model includes four levels: Reaction, Learning, Behaviour, Results, and are presented in Table 3.2.

Table 3.2: Kirkpatrick Four Levels Model (Paull et al., 2016)

Level	Description
Reaction	Sometimes referred to as happiness or smile sheets, this level of assessment determines whether participants responded favourably to training or intervention
Learning	In relation to learning outcomes of training or intervention, this level determines whether participants have acquired the desired knowledge, skills or attitudes based on their participation in training or intervention
Behaviour	Sometimes referred to as "transfer", this level determines the extent to which participants changed their subsequent behaviour in other contexts (e.g. in the workplace) after participating in training or intervention
Results	Sometimes referred to as an organizational level assessment and linked to longer term expected outcomes, this level determines whether overall objectives have been achieved as a result of interventions and subsequent strengthening. Rather than return on investment (ROI), the fourth level refers to return on expectations (ROE).

3.3.6 Communicate

The evaluation result was transmitted to research community and university which represents an important component of DSR as explained by Hevner et al. (2008). This include reports on the importance of the research, the artifact coupled with its novelty and utility, design rigor and its effectiveness (Peffers et al., 2007). A number of academic articles were written and published in this regard.

3.4 Summary of Research Flow

Figure 3.5 illustrates the research procedure that began by extracting mobile game framework from recent studies that reviewed and analysed current mobile learning frameworks that was supported by incorporation of persuasive guideline.

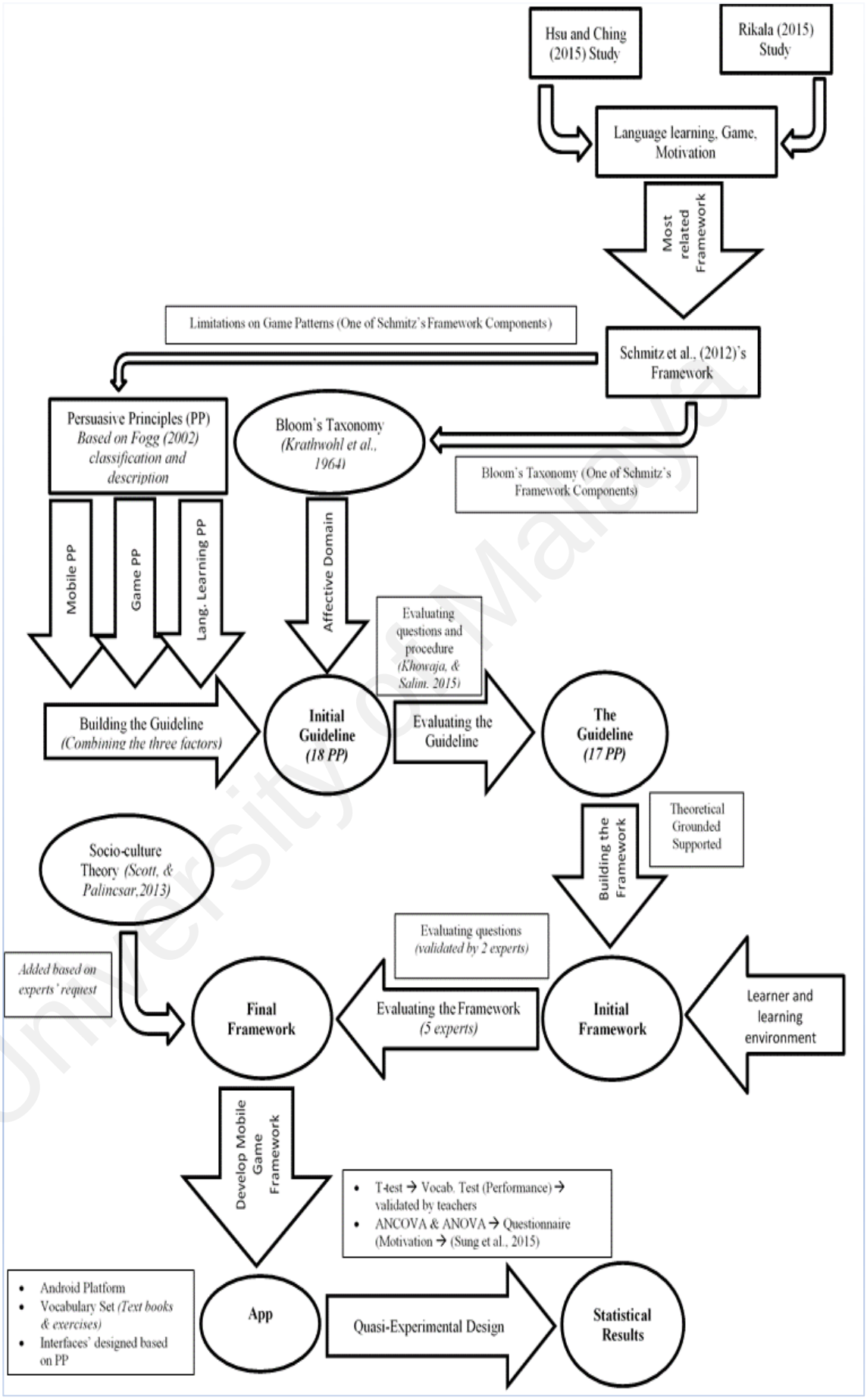

Figure 3.5: Summary of Research Flow

The prototype was developed based on framework and its guideline and evaluated by using quantitative method (quasi-experimental design). The aim of this summary of research flow is to provide a full picture of how the study derived all parameters from the scratch to evaluated by real users.

3.5 Summary

This chapter identified DSRM as the main research methodology based on its advantages which is related to this research. The stages of the research methodology are explained in steps. Additionally, it explains how, where, which, and when the persuasive technologies are applied in the game. It also describes the various statistical tests that are used to analyse the data obtained for validation of the proposed framework. The framework would be used in mobile game application. Moreover, the steps are being used to develop the prototype and are based on Multimedia Mobile Content Development guideline that is supported by Fogg's steps who employed persuasive technology concepts.

CHAPTER 4: MOBILE GAME APPLICATION FRAMEWORK DEVELOPMENT

4.1 Introduction

This chapter explains why and how mobile game framework and its persuasive guideline is proposed. Mobile Game Framework (MGF) has been developed to improve the challenges and limitations in the existing m-learning frameworks. The framework components are persuasive technology principles which have been used in English language m-learning applications to motivate primary school students to learn vocabulary and improve their performance. The Persuasive Mobile Game Application for Language Learning (PMGALL) is used as a guideline to develop such applications. Below is the guideline developed and evaluated after integration with the framework environment.

MGF was developed to provide roadmap to develop a mobile game application for educational propose. This framework combined educational content within persuasive guideline. Moreover, one of the major obstacles to success is the none inclusion of theoretical instructional design guidelines to support mobile learning in the previous mobile learning frameworks (Herrington & Herrington, 2007; Park, 2011). The design strategies require a high-level interactivity and persuasion. Therefore, this research used persuasive technology to resolve such challenges. Indeed, effectiveness of the existing instructional design approaches are still challenged and which inferred that new approaches are absolutely necessary (Berking et al., 2012; Koszalka & Ntloedibe-Kuswani, 2010). The guideline would also be used to develop the application interfaces.

The study explains how the guideline is developed and validated by experts and explains the steps in mobile game framework development. In both cases, DSR has been used for development due to its usability and reliability.

4.2 The Guideline

The guideline was developed based on DSR building and evaluated. It was built through review of literature related to persuasive technology. The challenges and open issues are then outlined. The evaluation was done using distributed questionnaire among experts to evaluate the guideline principles.

4.2.1 PMGALL Guideline Building

According to the Oxford English Dictionary, "persuasive" is *"to make someone do or believe something through reasoning or the use of temptation"*. Fogg (2002); Mintz and Aagaard (2012); Musa et al. (2010) analysed the use of persuasive principles to encourage the use of application. Each of these authors listed persuasive principles based on their domain (educational principle) (Mintz & Aagaard, 2012), a tool (mobility principle) (Fogg, 2002), and technique (game principle) (Musa et al., 2010).

The guideline of Educational Mobile Game Application for Language Learning (EMGALL) in this study is a set of persuasive principles that are extracted based on the three factors (mobile, game, language learning). Mobile principles have been adopted from Fogg (2002), and game principles have been adopted from Musa et al. (2010). However, there is no existing language learning principles, so the study derived from comparison between the existing studies in persuasive language learning applications. This aspect is described in Section 2.7.4.1. By combing these persuasive principles (18 principles) the guideline could be used to develop mobile game application interfaces, features and functions to enhance motivation and improve performance to learn English vocabulary among primary school students. Due to the limitation of motivation, the guideline has been built based on affective domain of Bloom's taxonomy only.

Table 2.21 in Section 2.7.4.1(b) shows the persuasive principles extraction in this study for English language learning persuasive principles (ELLPP). The principles of ELLPP are as follows.

i. Reduction
ii. Tunneling
iii. Self-monitoring
iv. Tailoring

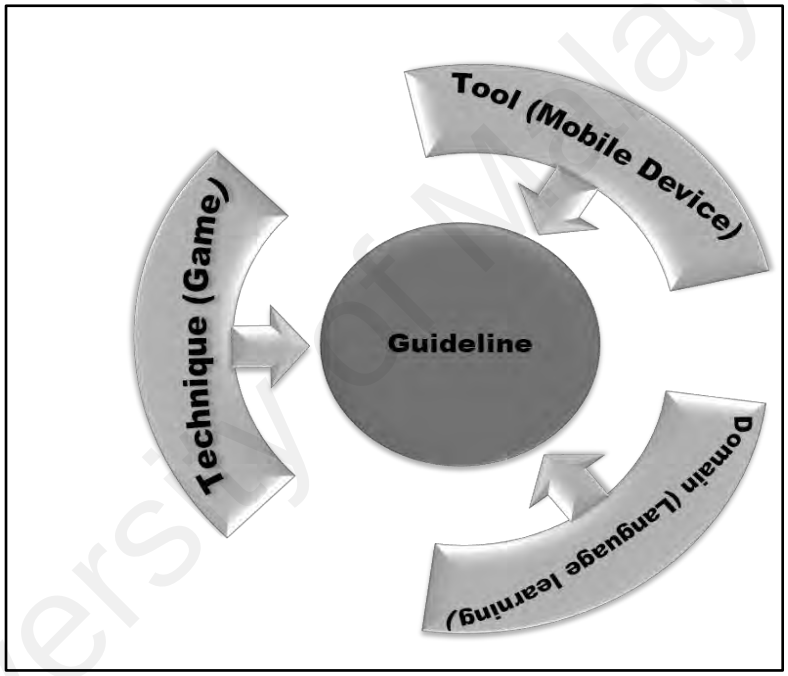

Figure 4.1: The Guideline

Then ELLPP is combined with mobility and game principles as shown in Figure 4.1Figure 4.1 to build the guideline principles. All the PMGALL guideline principles (Language learning, game, mobile) are explained in Section 2.7.3.2. Moreover, these principles encourage users to use Educational MGA (EMGA). The continued use of the application requires designing visual aspects and reward systems for EMGA. The principles of mobile and game are as follow:

v. Karios

vi. Convenience

vii. Mobile simplicity

viii. Mobile loyalty

ix. Normative influence

x. Mobile marriage

xi. Mobile quality

xii. Social facilitation

xiii. Social comparison

xiv. Social learning

xv. Competition

xvi. Recognition

xvii. Rewards

xviii. Cooperation

4.2.2 PMGALL Guideline Evaluating

As mentioned in Section 3.3.3.2, all the guideline validation steps begins from survey question until the results presentation which is based on Khowaja and Salim (2015) study. The guideline is evaluated as shown in the following subsection.

4.2.2.1 Survey's participants

After the building of the guideline, evaluation was carried out by distribution of the survey online among experts. Experts selected for this survey program have requisite knowledge about mobileHCI, persuasive technology, HCI, m-learning and have conducted similar researches. The search for these experts was performed in Google search engine and Google Scholar. Based on this search, a lot (around 50) of the experts were selected for this survey. The reason for this selection of the experts is familiarity with application domains. Email invitations were then sent to these experts and ten of

them in the affirmative confirm their participation in this survey. The experts' recommendations were taken into consideration. The experts' profiles are shown in Appendix A.

4.2.2.2 Instrument used

The main instrument used in the survey is a questionnaire which has two parts; the first part explains all the steps and stage of developing the guideline and the guideline's components. It also clearly stated that the primary school students are the experimental study participant. The second part contains seven questions. In questions Q1 to Q4, the experts were asked to validate the relevance, clarity, relation of each principle, and whether the principles required any additional information to be added, the experts are asked to provide their opinions within one of three options (agree, disagree, or not sure). Information on the need to combine two or more principles together was obtained through Q5. Information about missing principles was obtained in Q6. Question Q7 asks the experts to give remarks, further clarification, and explanation for each principle. This kind of feedback provides a good chance to understand the experts' views and opinions. The survey questions are shown in Appendix B.

4.2.2.3 Survey analysis

The data provided by the experts was analysed using frequency of responses in relation to the four questions (Q1 to Q4). The frequency was calculated as a sum of responses for (agree, disagree, and not sure) among the four questions and the average was determined. The experts' comments for Q5-Q7 was studied to see if the experts gave out similar answers. The procedure to check if the principle is valid (principle gets 50% or more of experts' confirmation) or invalid (principle gets less than 50% of experts' confirmation) is shown in Figure 4.2.

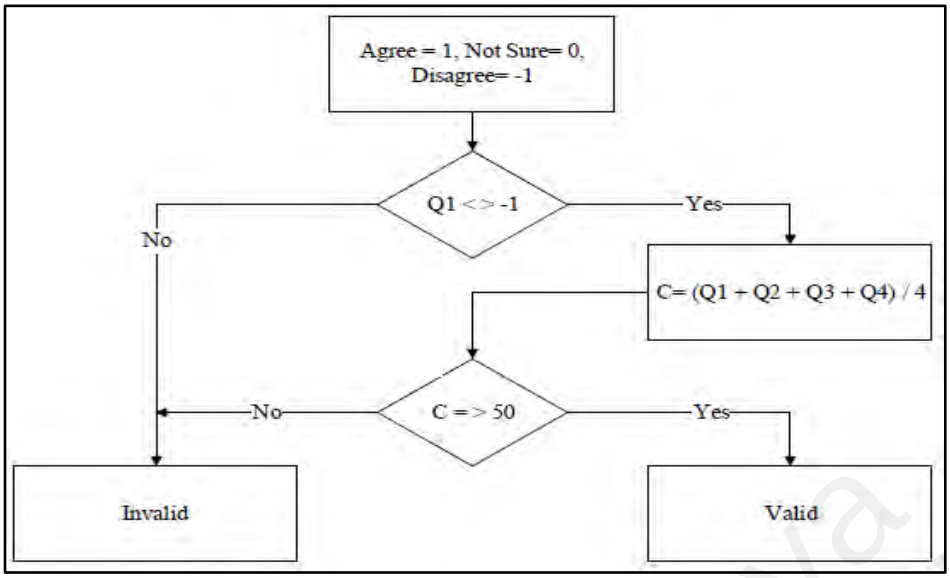

Figure 4.2: Processing of Analysis

Each respondent answers to the four questions related to the guideline principles and answers were coded in numbers 1, 0, -1 which represent agree, not sure, disagree, respective. These answers have been analysed and shown in the survey result section and the answers are discussed to determine whether the experts agreed about the guideline or not.

4.2.2.4 Survey result

In this section, all the experts' answers are calculated as shown in Table 4.1 to show if the principle are accepted or not.

Table 4.1: Guideline's Principles Evaluation

Principles	Acceptance Rate (%)	Principles	Acceptance Rate (%)
Kairos	70	Mobile marriage*	40
Convenience	70	Mobile quality	100
Mobile simplicity	80	Social facilitation	80
Mobile loyalty	90	Social comparison	100
Normative influence	60	Social learning	90
Completion	90	Recognition	90
Self-monitoring	100	Rewards	90
Cooperation	90	Tunneling	70
Tailoring	100	Reduction	90

*Principle has been omitted based on experts' opinions

The experts have confirmed that all the guideline principles are suitable for development of mobile game application for language learning except Mobile Marriage principle. So, it has been omitted leaving only about 17 principles in the final version of the guideline. Figure 4.3 shows that the guideline is 83% valid (it is a total number of experts agrees about the whole principles) to be used for this kind of application.

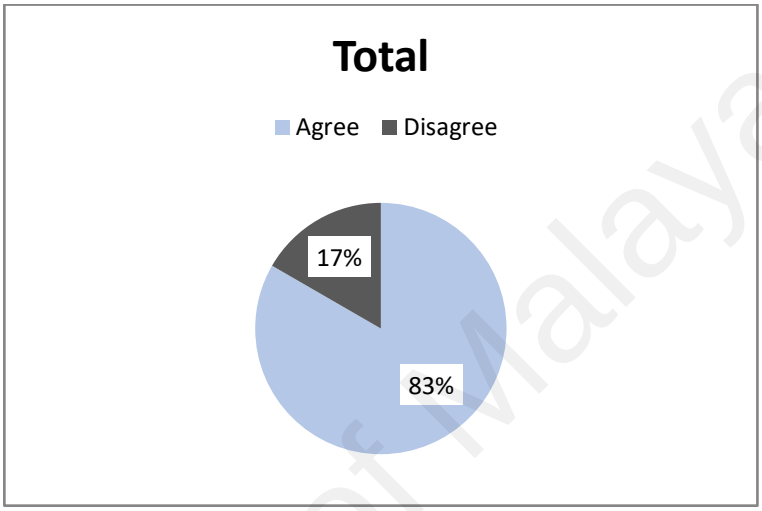

Figure 4.3: Guideline Validation Percentage

Experts' comments do not add anything new to the guideline because they do not agree with the same answers and about half of them did not filled up Q5-Q7. The questions were left unattended to because they believe that the guideline does not need any combination of its principles together or there were any necessary principles missing or need to be added.

After validation of the guideline by the experts and confirmation of its principles to be used on mobile game application development, the guideline would be used to develop framework in next section.

4.3 The Mobile Game Framework

Mobile game framework was developed based on building and evaluation of DSR steps.

4.3.1 Mobile Game Framework Building

Two different review papers explained in Section 2.6.2 were used as the basis for building the propose framework. The two papers have different mechanism and criteria for use in the selection process of the frameworks. Hsu and Ching (2015) conducted a search of article titles in databases including WorldCat, ERIC (Education Resources Information Centre), and Google Scholar, using keyword combinations including: (1) ti: mobile learning and ti: model (where ti stands for title); (2) ti: mlearning ti: model; (3) ti: m-learning ti: model; (4) ti: mobile learning ti: framework; (5) ti: mlearning ti: framework; (6) ti: m-learning ti: framework. WorldCat is the World's largest online catalogue and bibliographic database built and maintained by 72,000 participating libraries in 170 countries and territories, ERIC, sponsored by Institute of Educational Sciences and the United States Department of Education. They provide online access to 1.5 million bibliographic records of journal articles and other educational materials. Google Scholar is a web-based search engine that indexes open-access academic publications and also provides access to most peer-reviewed journals published by the largest publishers in Europe and the U.S.A search in these three databases allows the data collection to be comprehensive and inclusive.

In the other hand, Rikala (2015) searched and selected mobile learning frameworks mainly using the snowballing technique. This means that the data was searched by tracking down references in bibliographies of various articles. The data search was obtained from Jyväskylä University library's Nelli portal. The library provides access to relevant databases, e-journals and other electronic resources. Google search engine and Google Scholar were also used to conducted keywords search such as mobile learning and mobile learning frameworks. The objective of the information retrieval was to find diverse mobile learning frameworks from archives of early years of mobile learning (2005 to 2015). So, these two studies cover most of the mobile learning framework due to the

different databased, keywords, and criteria of selection and filtration between them. Therefore, this research is based on these two studies due to the importance and value of their findings.

Furthermore, the two tables in Section 2.6.2 compared frameworks used to proposed mobile language learning frameworks. Each framework has a different objective and aims. Furthermore, Table 4.2 shows comparison between these frameworks based on the following mechanism: Mobile, Language Learning, Game Focus, Motivation Solved, Learning and Learning Environment. These factors are selected due to their importance in selecting the most related framework to this study.

4.3.1.1 Selected based on mechanism

The reason for this mechanism is that mobile, language learning and games focused on the components of the proposed framework. Motivation is the reason for developing this framework and learning and learning environment because Teall et al. (2011), stated m-learning designed based on this framework must consider both learning and learning environment.

Table 4.2: **Comparison of M-learning Frameworks**

Authors/year	Mobile	Language Learning	Game focus	Motivation solved	Learner and learning
Schmitz et al. (2012)	Yes	Yes	Yes	Yes	No
Wei and So (2012)	Yes	Yes	No	Yes	Yes
Abdullah et al. (2013)	Yes	Yes	No	Yes	Yes
Scanlon et al. (2014)	Yes	Yes	Partly	No	Yes

4.3.1.2 Schmitz et al. (2012) framework

Based on the information assembled in Table 4.2, Schmitz et al. (2012) seems relevant to this study due to its highly diverse gaming features. Gradually, problematic educational practitioners would take decision regarding the selection of games; that is, the game that is suitable for learning. Sharing and re-using a game is problematic without a clear and thorough explanation of the targeted benefits, learning consequences and possible impact. Many attempts have been made to discover a shared language structure of game in other to better comprehend this complicated issue (Schmitz et al., 2012). In addition, there is inadequate technology to assess m-learning games. Consequently, it is essential to define a conceptual framework that supports, assess and categorize m-learning games. It is also worthy to recognize mechanisms that support design decision of future m-learning games. The framework components are based on Davidsson et al. (2004) and the taxonomy of learning outcomes by Bloom (1956). However, (Schmitz et al., 2012) study has indicated many limitations and makes the following recommendations: -

(a) ***The patterns limitation***

According to Schmitz et al. (2012), game patterns provide a common language for industry and academia and help describe the rapidly developed areas of mobile games. Each pattern is identified by a core definition, a general definition, example(s), descriptions of how to use the pattern (by listing related patterns or patterns that can be linked to it), the description of its consequences, relations with regard to instantiation (patterns causing each other's presence) and modulation (patterns influencing each other), as well as references. The game patterns limitations are:

i. It is difficult to determine the impact of individual patterns on learning (this makes it hard to know which pattern should be used). Most at times, using one pattern requires the presence of another game design patterns. From

this, other complexities derive: Does a pattern on its own have the same effect or does it require interplay with other?

ii. The effects occurred with a given condition of the patterns such as given level, given time, etc. To what extent does varying the conditions of the various patterns influence the effect? Such as, the provision of imperfect information was identified to motivate learners to finish the game, what amount of information is necessary to bore and discourage the learner?

Based on the above, the impact of individual patterns on learning is difficult to determine. The number of patterns is too high (73) and there exist some conflict among the patterns. Thus, it is very clear that there are complexities in the game patterns used to design games.

(b) ***The study recommendations***

There are some setting that has to be included:

i. An experimental variation of patterns such as game settings that disable or enable individual's patterns.

ii. An in-disparity of patterns such as game settings that offers various instances for the same pattern.

This way, practicable and measurable outcomes can be achieved that are appropriate as a basis for design guidelines such as:

i. Game design patterns that supports achievement of the desired learning outcomes.

ii. Applying the patterns' ways.

Game design requires adaptation to diverse target contexts, groups, etc. This particularly applies in the educational games' context. There is a vital requirement for tailoring learning offers (educational games) to the needs of learners. According to learning targets, and capabilities, intelligent adaptive game mechanisms generally reflect this need.

To certain extent, this can be applied to the patterns score or level. Hence, the pattern approach reflects varying contexts or target groups. The extent to which individual patterns reflect learners' capabilities or needs for more specific analysis. Further research is needed to verify the efficiency of mobile games and validate their educational value to motivate teachers to use it for teaching.

Based on the review and extraction of above, the study has replaced game design patterns with persuasive technology principles. Similar to the 73 games design patterns which have been selected to enhance motivation by Schmitz et al. (2012), 17 (persuasive guideline) principles of persuasive technology can improve motivation. Furthermore, these persuasive principles in guideline form can cope with the missing theoretically grounded on existing mobile game frameworks. Additionally, the persuasive guideline classified the principles based on tool, technique, and domain and that could potentially improve the learners' performances and engagement. These principles are used to design and develop the prototype interfaces that would make them more attractive and enjoyable in a way to improve students' motivation.

To build the framework, a persuasive guideline is combined with the educational content such as are vocabulary set (textbook and exercises vocabulary words). By so doing, English teachers of the target school (primary school) can used the words in mobile game applications. This part of framework building is required to develop mobile learning framework based on the assumption of Teall et al. (2011).

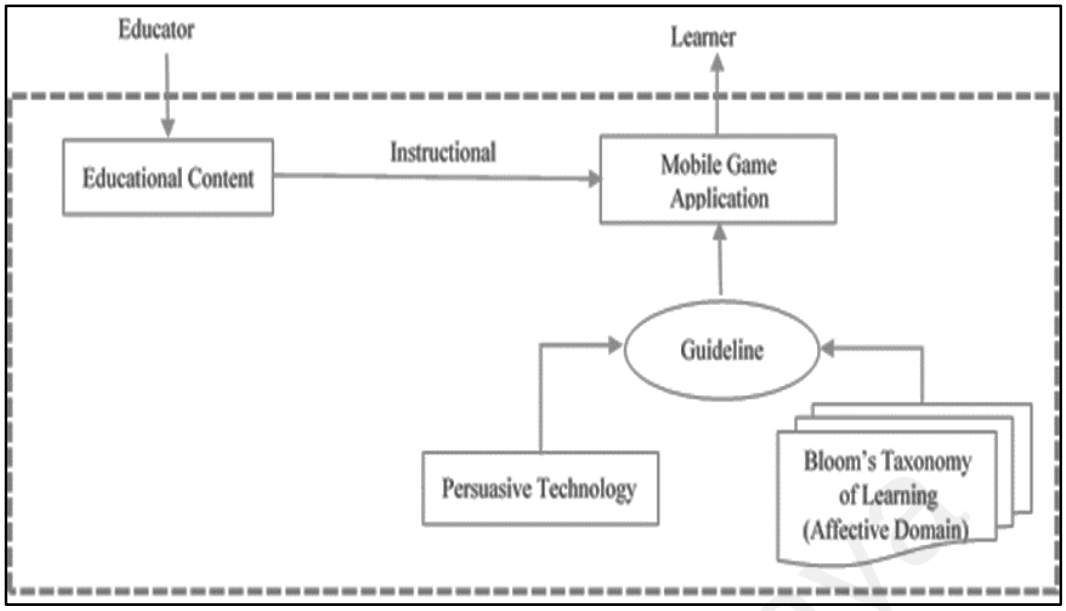

Figure 4.4: The Initial Mobile Game Framework (MGF)

The proposed mobile game framework (MGF) focused on motivation which is the problem statement in this research instead of motivation and knowledge gain as the original one as shown in Figure 4.4. The advantage of this MGF is that it is easy to use in any domain, simply by replacing learning principles with other principles such as fitness principles.

4.3.2 Mobile Game Framework Evaluating

The mobile game framework has been evaluated as shown in the following subsections.

4.3.2.1 Survey's participants

After building the framework, the investigation was followed by evaluation of the framework using a distributed survey among experts by emails. The experts selected for this survey have requisite knowledge about instructional and graphic designs, multimedia studies, visual communication, artificial intelligence, and digital entertainment, information technology, computing and education. They are also conversant with software development on mobile and web platforms such as mobile security, computer

and communications engineering. The search for these experts was performed in Google search engine and Google Scholar. Based on this search, a lot of experts were selected for this survey. Email invitations were sent to more than thirteen experts and five of them in the affirmative, confirmed their participation in this survey. The experts' recommendations were taken into consideration. The experts' profiles are shown in Appendix C.

4.3.2.2 Instrument used

The main instrument used in the survey is a questionnaire which has two parts; the first part explains all the steps and stage of developing the framework and the framework's components. It also clearly stated that the primary school students are the experimental study participant. The second part contains nine questions that are validated by two experts. Questions Q1-Q7 were listed to ask the experts to evaluate the framework based on three factors: applicability, motivation, and usability. By these questions the study would be able to know if the framework can be applied in mobile game applications. It can motivate the targeted students and determine if the application can be used by the students. Questions Q8 and Q9 are list in Appendix F. The questions are found out if the framework needs to be modified, edited, revised or requires some additional components. The survey questions are shown in Appendix D.

4.3.2.3 Survey analysis

The data provided by the experts was analysed using frequency of responses in relation to the nine questions (Q1 to Q9). All the questions were answered by the five experts.

4.3.2.4 Survey result

Tables 4.3- 4.11 show the result of each question. As a result, the five experts were satisfied with the mobile game framework. However, two experts queried the educational theories, because it is believed that frameworks should include educational theories. For

language learning, socio-culture theory was included into the framework. This is done to strengthen the philosophy of using social setup to influence language learning. Therefore, major ingredient of socio-cultural theory is applied in the persuasive technology as a tool to influence language learning (Figure 4.5).

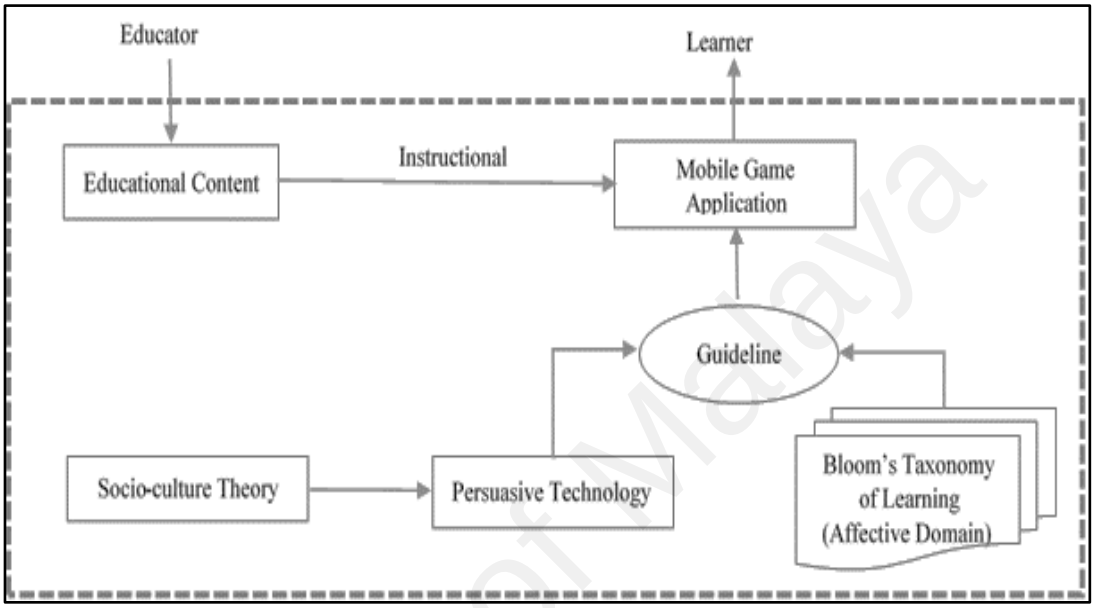

Figure 4.5: The Final Mobile Game Framework (MGF)

The survey questions have been analysed to make sure that the MGF is validated. Furthermore, each question is listed based on the experts answers to the 5 choices (Q1-Q7) which started from strongly agree to strongly disagree. The study considers the "Strongly disagree" and the "Disagree" as unacceptable levels of responses and "Not sure", "Agree" and "Strongly agree" acceptable response levels. The questionnaire questions (Q1-Q7) were developed based on three factors: Extraction, Applicable, and Motivation. Furthermore, Q8 and Q9 demanded to know from the experts if there is any need for addition, editing or modification to the framework components. The answers to these two questions are “Yes” or “No” then the experts are given space to express their opinion if their answers were “Yes”. These questions have been validated using two experts who have a good experience in related studies. The questions and the experts’ opinions have been listed in the tables below.

- Do you think the way the framework was extracted is correct? This question is to validate whether the framework extraction is correct or not. All of the experts agreed that the framework was properly derived (see Table 4.3).

Table 4.3: Question 1 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	5	100.0	100.0	100.0

- Do you think the framework's components suitable are for this kind of study? This question is to validate whether the framework components extraction is correct and if it can be used to solve learners' motivation and performance. Most of the experts are agreed that the framework components are suitable for this study (see Table 4.4).

Table 4.4: Question 2 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	3	60	60	60
	Strongly Agree	1	20	20	20
	Disagree	1	20	20	20

- Do you think the framework can motivate primary school students? The question is to validate whether the framework can motivate the targeted students or not. Most of the experts agreed that the framework can enhance the targeted student motivation to learn English vocabulary (see Table 4.5).

Table 4.5: Question 3 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	4	80	80	80

		Frequency	Percent	Valid Percent	Cumulative Percent
	Disagree	1	20	20	20

- Do you think the framework can be used to develop mobile game application? This question is to validate whether the framework is applicable to develop mobile game application or not. 3 of 5 experts agreed that this framework is applicable to develop such application (see Table 4.6).

Table 4.6: Question 4 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	3	60	60	60
	Disagree	2	40	40	40

- Do you think the framework is applicable for primary school students to solve their motivation problem? This question is to validate whether the framework can be used to enhance primary school student motivation or not. About 3 of 5 experts believe this framework can enhance students motivation (see Table 4.7).

Table 4.7: Question 5 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	3	60	60	60
	Disagree	2	40	40	40

- Do you think the application based on this framework can easily use by primary school students? This question to figure out whether the application can be used by students easily or not. Most of the experts believe that the application can be easily used (see Table 4.8).

Table 4.8: Question 6 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	4	80	80	80
	Disagree	1	20	20	20

- Do you think the application based on this framework can help students to improve their vocabulary performance? This question to find out that vocabulary performance can be improved by using the application which has been developed based on the framework. Most of the experts confirmed that the application can help students to enhance their vocabulary level which will help them to improve their performance (see Table 4.9).

Table 4.9: Question 7 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	4	80	80	80
	Disagree	1	20	20	20

- Do you think the framework components need revision/modification/editing? This is to ensure that the framework was developed correctly and has the right component. This question is somehow similar to Q2, but it allows the experts to express their opinion about framework revision. About 2 of 5 experts have inquired about the educational theory included in the section of this study (see Table 4.10).

Table 4.10: Question 8 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	40	40	40
	No	3	60	60	60
	Total	5	100.0	100.0	

- Do you think this framework require additional components? This question provides the opportunity to the experts to add whatever they think is missing in this framework. All the experts confirmed that this framework have not missed out any necessary components in the proposed design (see Table 4.11).

Table 4.11: Question 9 Result

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	5	100	100	100
	Total	5	100.0	100.0	

An agreement is reached in the final iteration in each of the soughed items in the numbers in tables of each question above showing that the numbers agreed with each of the tables. Two experts queried that educational theory should have being included in the framework. Socio-culture theory has been included to the framework meant for language learning. This way, language learnt in a social setup would impact more positively. Therefore, the tenets from the socio-cultural theory are implemented in the persuasive technology as a tool for language learning. In this framework, therefore, persuasive reflects the socio-culture theory and views in learning, development and motivation as social in nature (McInerney, Liem, & Walker, 2011), and emphasizes the interdependence of social and cultural interactions in the construction of knowledge (John-Steiner & Mahn, 1996). Most of the experts have favourable view of the framework and strongly believe it could be used to improve primary students' motivation and performance in English language learning.

4.4 Summary

This study identifies the vital factors (mobile, game, language learning) that can be used to improve adoption of MGAs by students who want to learn the English language. Previous and current studies on MGAs and related subjects were reviewed. The findings

revealed that some factors should be considered. PMGALL and mobile game framework were developed and validated using experts to motivate learners to learn the English language. Then the study developed a Mobile Game Framework (MGF) in order to use technology to improve the students' performance. Further research was conducted to apply the framework, including the guideline in real-life scenarios and to ascertain the functionality of the findings and enable improvements.

CHAPTER 5: GAME PROTOTYPE FOR ENGLISH VOCABULARY LEARNING

5.1 Introduction

A mobile application is proposed for use as a learning resource for primary students' school. A prototype was developed for English Vocabulary Game (EVG) based on the proposed mobile game framework and its persuasive guideline to motivate the students. Therefore, Android platform was used to develop the application. In this chapter, the implementation of the prototype developed in mobile application is presented in brief. This includes the platform in which the "app" was developed, the development process and the application contents.

5.2 The Implementation Platform: Android

The developed prototype consists of only one part, which is an application installed on a mobile device. The application was built for the Android operating system and is written using Java programming language and Android studio IDE 2.0. According to Skogberg (2010), *"Android was built from the ground up with the explicit goal to be the first open, complete, and free platform created specifically for mobile devices."* (p. 8). So, Android is an open source mobile operating system, it is a software environment that includes an OS built on Linux kernel and Dalvik virtual machine. The Dalvik virtual machine was recently replaced by Android Runtime ART which runs the Android applications as instances of the virtual machine.

Android is mainly maintained by Google and contains rich set of user interfaces, application frameworks, Java class libraries and multimedia support. Android also comes with built-in applications containing features such as short message service functionality, phone capacities and address book. For developers, Google provides a powerful software development kit (Android SDK) that includes rich set of API libraries, software emulators

of real devices and images of the operating system to use with the emulator during development. Moreover, the SQLite database engine is built- on Android and was used in the implementation of prototype as a persistent database to store the different details of the vocabulary lists and user performances.

Java on Android makes use of XML for variables such as strings and integers. XML is also used to control the layout and style of applications. This convention of separating the function layer from the layout layer is similar to the concept of using Hypertext Mark-up Language (HTML) for content and Cascading Style Sheet (CSS) for the style. For example, as far as practical aspects are concerned, Java defines the button's functionality on the interface of an app, while XML defines the buttons' text, colour, font-weight, and size (Skogberg, 2010).

5.3 Application Development

The EVG prototype is specially proposed to aid beginner's individual learning activities based on course goals. The application is designed to support learning activities and complements other tools available for students use. It is important to note that the main purpose of the prototype in this research is to feature the implementation of the proposed framework. This includes the principles of persuasive technology and evaluation using sample of actual primary school students.

The EVG application has taken more than six months to be developed. By following the MMCD and Fogg's steps, the EVG was designed from the planning until testing. In line with software development protocol, it begins with the requirement specification in alignment with the intended purpose to serve as a tool for evaluation of the persuasive principles. Analysis of the requirement was carried out followed by interface design of the software proposed in line with the guideline of the proposed framework. Socio-cultural theory was implicitly applied using persuasive principles of the guideline. Lastly,

Android platform (SDK) was used to implement (coding) the application. The developed application was then tested to prepare for the actual experiment.

Also, review of similar commercial applications was carried out before commencement. This approach gives a fair idea on the way and manner such applications or games are design. Then, the most important common styles were chosen. The reference games were selected Google Play website for Android Apps after searching online. The search used "vocabulary games for kids" as keywords and filtered the results based on satisfaction level of 4 stars+, and thereafter filtered the result based on whether to use vocabulary game or not.

Table 5.1 shows the most of the commercial vocabulary games and persuasive technology used. There is no information about each game and most of the information are written for commercial announcement. The study classified the games principles based on game description. Credibility refers to principles as mentioned earlier. The most credibility principle used so far in most of the games are third-party endorsements. On the other hand, most principle used in games under social category are highly competitive.

Table 5.1: Commercial Games

Games' Type	Games' Name	Description	Free
Puzzle Game	Animals Puzzle for Kids	It's developed to develop matching, tactile and fine motor skills. It helps preschool, and toddlers for learning different types of animals' names. Using voice with picture to encourage the learners. It comes with different languages.	Yes
	21 Animal Puzzles for Kids	Using text and voice to learn preschool and toddles about animals. It comes with different levels.	Yes
	Vocabul Jumble (Word Jumble)	It increases the vocabulary for kids by encountering new word. It comes with different levels. Using earned coins to solve word jumble puzzles. It offers play through multi-users.	Yes, except pay coins if need to extra

Games' Type	Games' Name	Description	Free
	Word Search	It comes with different levels. It offers daily different puzzle and mission.	Yes
Flashcards	PreSchool Kids ABC Flash Cards	Learning ABC for preschool and toddlers.	Yes
	Flashcards for Children	Learning vocabulary for small kids from 3 months and forward by using flashcards for many things like animals, fruits, birds, etc.	Yes
	Picture Vocabulary	It helps preschool and toddles to learn vocabulary by going through the finger picture that come out.	Yes
	Learn Animals in Zoo for Kids	Learners learn vocabulary by exploring animals' images and sounds in the animal kingdom.	Yes
	Explodium: Space for Kids Free	Learning vocabulary and facts about space.	Yes
Match Game (card game)	Fun Match Vocabulary Kids	Learning letters, and fruits' and animals' names. It comes with different languages.	Yes
	Match Up Learn English Words	Learning English by matching the pictures.	Yes
Dot-to-Dot Game	Join the Dot Game	Using voice, pictures, videos, and facts about many types of animals to learn preschool and small child's words, letters, and numbers. It comes with different levels and languages.	Yes
Non-competitive Game	Kids Socks	Using matching to learn words and counting to learn the numbers for preschool and toddles. It comes with different languages.	Yes, for regular version
Word search	Word search	It is an auto-generated word search for (animals, countries, cities, American presidents, historical figures, kids). It comes with different levels and languages.	Yes
Quiz Game	English Vocabulary Quiz lvl 1	It uses basic and elementary English language to test kids and adult vocabulary knowledge. It comes with different levels.	Yes

5.4 Application Content

The application was concentrated on vocabulary which is a specific aspect of English language. The vocabulary game was deduced from existing course material and exercises. The basic principle behind the developed game is that student is allowed to practice the targeted vocabulary list through matching quizzes. This would familiarize the students

with the listed words. Thereafter, the student is expected to go through a set of quizzes to test their knowledge of the words, up to the level of their spelling. Therefore, the basic elements of persuasive principles are implemented in both two groups of the game. This is in addition to the welcome screen that enables user to select one of the two games. The parts are briefly presented along with their interfaces.

The ultimate objective of any application interface is user-friendly navigation. Such factors as variable screen size, processing speed, and interactivity are critical to the learners' experience of that application (Cheon, Lee, Crooks, & Song, 2012). The components of the interfaces are easy to use and are based on the guideline principles to motivate students. Learning vocabulary such as warm-up, quiz and dictionary are the only scenario in the game that makes it simple, focused, and easy to use. However, some of the principles are intangible as it does not show any object on the screen. However, it exists in the application. Some other principles are vividly visible in the application, thus categorised as tangible. Below are the application screens and components the sake of clarity. Conclusively, the application is commonly referred to as "app".

5.4.1 The Welcome Screen

The app is designed with a welcome screen where student/user can be welcomed and asked to select one out of the two main quiz games in the app. Figure 5.1 shows the main interface which consists of two buttons; *Guess the Word Quiz* and *Spell the Word Quiz*.

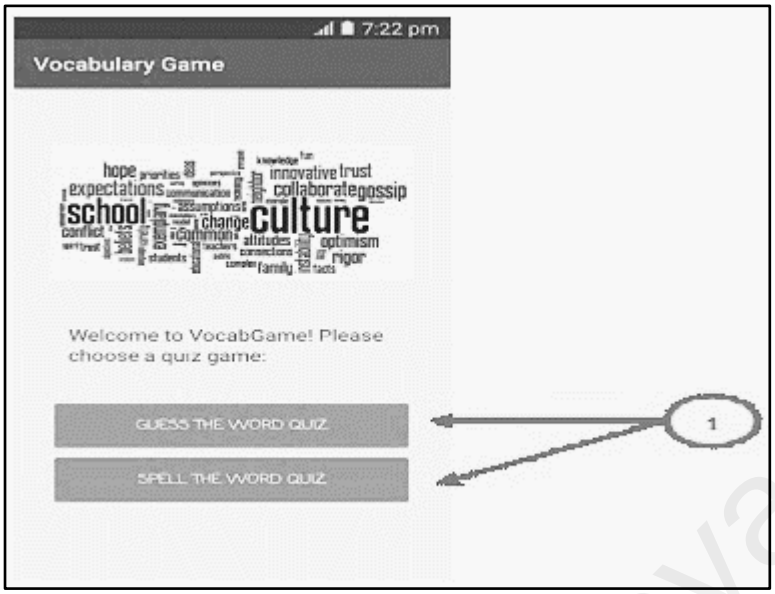

Figure 5.1: **Main Interface**

5.4.2 Guess-the-word Screen

If the *Guess the Word Quiz* button is selected, first quiz game in the app would be launched and show the interface as illustrated in Figure 5.2. The interface shows only one English word at a time with the image illustrated at the centre. Also, four optional Arabic words are suggested for selection of the correct meaning. It was designed in such a way that only one option is a correct translation to the given English word. The student needs to choose the correct word before moving to the next question. Upon the choice of a correct answer, a large green text would appear, declaring a correct attempt, and the screen will move after a short delay to the next question. On the other hand, wrong attempt would display a red text indicating an incorrect answer and the user screen wait for the next attempt after excluding the wrong option.

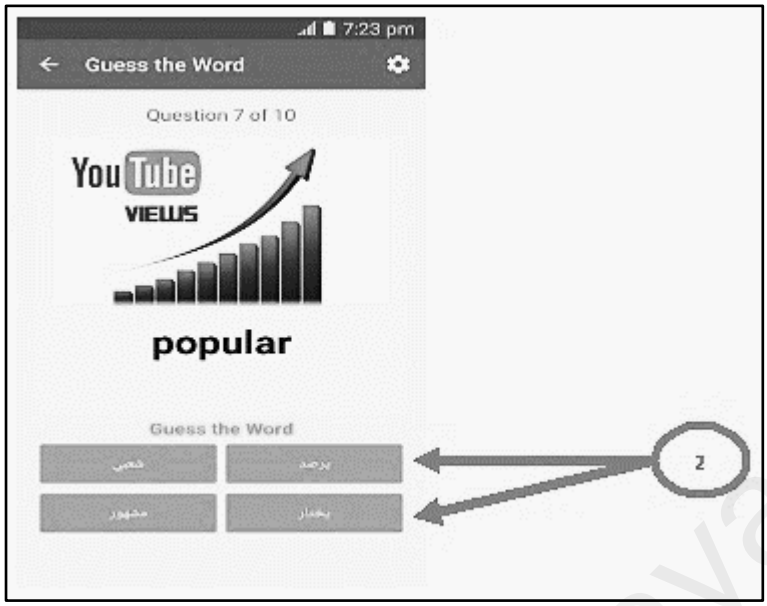

Figure 5.2: Guess the Word Interface

The main reason for designing this quiz is to improve student vocabulary with ease and prepare them for spelling challenge. The accompanying screen display makes it easier to guess words. Besides the fun in winning or losing, it enables users to get acquainted with the words and build vocabulary via visual aids. The whole list of words is divided into rounds of 10 words to make sets of targeted vocabulary. The quiz can be repeated indefinitely after reaching the end of a game. No scores are allocated at this level, and no performance evaluation of the student is considered at this point.

Aside the major interface of the guess game, settings screen also exist which can be displayed through the settings icon at the top right corner. These settings are introduced to customize the game and make it are easy to manipulate. In the settings screen, there are two icons as shown in Figure 5.3. The first icon is designed to change the number of choice options (number of guess buttons). The options are; 2, 4, 6 and 8 which also indicate increase level of difficulty with increase in the. The second icon of the setting provide users with the options to turn on or off the button sounds and the various events of pop-up sounds for wrong attempts.

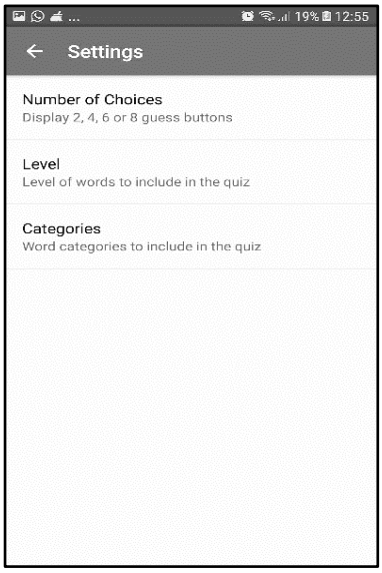

Figure 5.3: **Setting of Guess the Word Interface**

This game also contains embedded definitions of the correct words from an online dictionary (it works only when Internet connection is available). When appropriate guess is made, student can easily tap the word in green as appeared on the screen to open link to the definition of such word from www.dictionary.com. This can help the students to understand the meaning of the word and extended their vocabulary bank (because the definition of the word is in English). It also provides a sense of authority and quality to the chosen answer. Finally, Arabic language has been used in apps as mid-language to help the student in this stage to learn English. This method is often used in commercial software applications.

5.4.3 Spell-the-word Screen

The second and perhaps most important aspect of this game app is the quiz game that task the student to spell English words off-hand with the aid of necessary guides. Figure 5.4 shows the *Spell the Word* interface which displays one image (similar to the sets of images in the first game) and one Arabic word. Student are expected to spell the English version of a given word by completing the text boxes in the interface. The number of the

text boxes are equal in number to the word letters. So, the student is provided with a set of 12 letters (in small buttons) to select from, by tapping on these buttons.

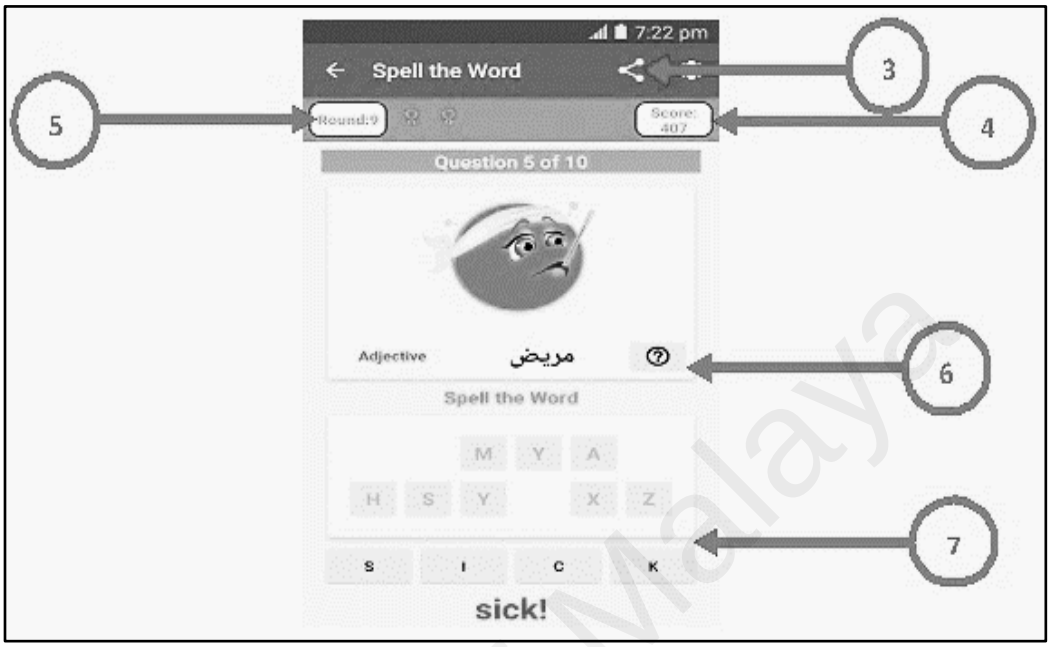

Figure 5.4: **Spell the Word Interface**

The interface also shows the score gain by the student each time the words are spell a correctly. A score of 5 points is allocated to every successful attempt. Each round comprises of 10 questions and the most recent round is displayed on the screen. Furthermore, the user is awarded a medal (badge) after winning four (4) rounds. Hints button are provided in case students could not guess the appropriate words (small button marked with question mark) to show one letter of the correct word. However, scores are reduced by two (2) points every time the hint button is used. In addition, this game has few other features:

i. The setting icon provide button to the turn on or off the sound.
ii. An icon is provided on top of the action menu that enable users to share summary of their performance (round, scores and badges) with other social networking channels such as Facebook, WhatsApp etc in addition to email

and chatting programs. However, this depends on the networking applications installed on the device.

iii. The kind of the word such as adjective, verb, noun etc are also shown to improve level of knowledge and ease the guess.

iv. Users can easily select letters from the available buttons and can also deselect any letter without having to erase all the letters and start over.

v. The most significant performance indicators are collected in the background in a local database for evaluation and analysis. The statistical record comprises the word, result, start and finish time, old and new scored for each attempt by a user.

5.5 The Persuasive Principles in the Application

To better understand the working principles of the guideline (whether tangible or intangible) as reflected in the app, some explanation regarding each principle is shown in Table 5.2. The numbers in the last column refer to the circled numbers in Figure 5.1, Figure 5.2, Figure 5.3, and Figure 5.4.

Table 5.2: Guideline Principles and Their Reflected on the Application

Principle	Game feature	Components (if tangible)
Reduction	1. The complex process of memorizing vocabulary is broken down into two-step game: • Warm-up game (to learn the vocabulary first). • Spelling quiz game (to test the learned vocabulary).	1
Tunneling	1. User should follow a specific sequence of: • Learning vocabulary, and then • Test his/her knowledge 2. User should finish a stage to unleash the next one.	7
Personalization	Personalized aspects: 1. Learning: • Target categories of vocabulary • Levels of difficulty • Preference to receive performance statistics 2. Appearance:	Settings screen

Principle	Game feature	Components (if tangible)
	• Colours • Font sizes	
Self-monitoring	1. Create a scoring system and show the score all the time. 2. Provide statistics on performance history. 3. Send the statistics and current score to the user, if desired.	4
Kairos	1. Provide a hints option. 2. Words are selected at random by default. However, it would be better to increase the probability of selecting words that were not guessed correctly in the last session, as a corrective and JiTT action.	2, 6, 7
Convenience	1. Interaction with the game is mostly through easy actions of clicks on buttons, swiping or typing few letters. 2. Minimum numbers of steps are emphasized for every task.	2
Mobile Simplicity	(overlapping with convenience) 1. The game is a mobile app in the first place. 2. No previous training or special IT literacy is required to use the game.	2
Mobile loyalty	1. This is an educational, research-produced game. 2. It is free of charge. 3. Its purpose is to serve the user. 4. No advertisements; user feels he/she is the only beneficiary.	Non-component
Information Quality	1. Use current and modern vocabulary, divided into few categories. 2. Provide definitions for (some) vocabulary words drawn from authentic dictionaries/resources. 3. Provide web links from words to interesting and relevant online resources.	Non-component
Social Facilitation	1. This feature is related to what is called the audience effect. 2. Keep track of the user performance in each session (e.g. time is taken to finish a stage, the achieved score, the number of errors made, and the number of used hints), and allow the user to selectively share those stats with others. In this way, the user knows that people will be looking at his/her performance, so it might motivate him/her to improve it, while there is no pressure that might hinder the learning process, as the user knows that he/she can exclude certain sessions from sharing.	3
Social Comparison	(overlapping with competition)	3

Principle	Game feature	Components (if tangible)
	1. Similar to social facilitation feature above, provide the ability to share selected performance metrics with other users via social networking. The shared information might be at session-level or general score info.	
Competition	1. Provide access to brief statistics on the top performers at each level of the game.	4, 5, badges
Social Learning	1. Add visual tutorials for how the game is played, and how one can learn through it. 2. Try to incorporate a feature where success stories of users can be shared with other users.	None
Recognition	Introduce a system of public recognition among the users of the game: 1. Divide the users' community into multiple levels based on achievements. 2. Use the notion of badges and titles to distinguish individuals.	5 and badges
Cooperation	1. Allow users to trade score for help and hints, through some social network.	None
Conditioning Rewarding	1. Increase the score gradually with every correct answer. 2. Provide bonus increase upon the completion of a stage or level. 3. Award badges and titles upon the completion of certain levels.	4, 5, badges
Normative Influence	1. Pressure the users to play the game. In this case, just ask the student to play it.	Non-component

Finally, Figure 5.5 provides a brief summary of the main features of the second quiz game showing their correspondence to the guideline principles. Each feature is linked with persuasive principles. Table 5.2 shows all the persuasive principles reflection on the app design which are listed as: "Hint" button reflected Kairos principle; because this button assists the students by showing up one letter from the word when they do not know the word spell, that meets the Kairos description and idea "gives suggestion at the right moment". "Template" is also reflected in the Kairos principle; because it provides text boxes similar to the number of letter words and help the students to know the number of letters to guess. All that meet the description of Kairos. "Template" is also reflected in Tunneling principle. Tunneling description is "guide users" this term gives a number of

letters similar to the word letter number so that students would have as many choices as possible.

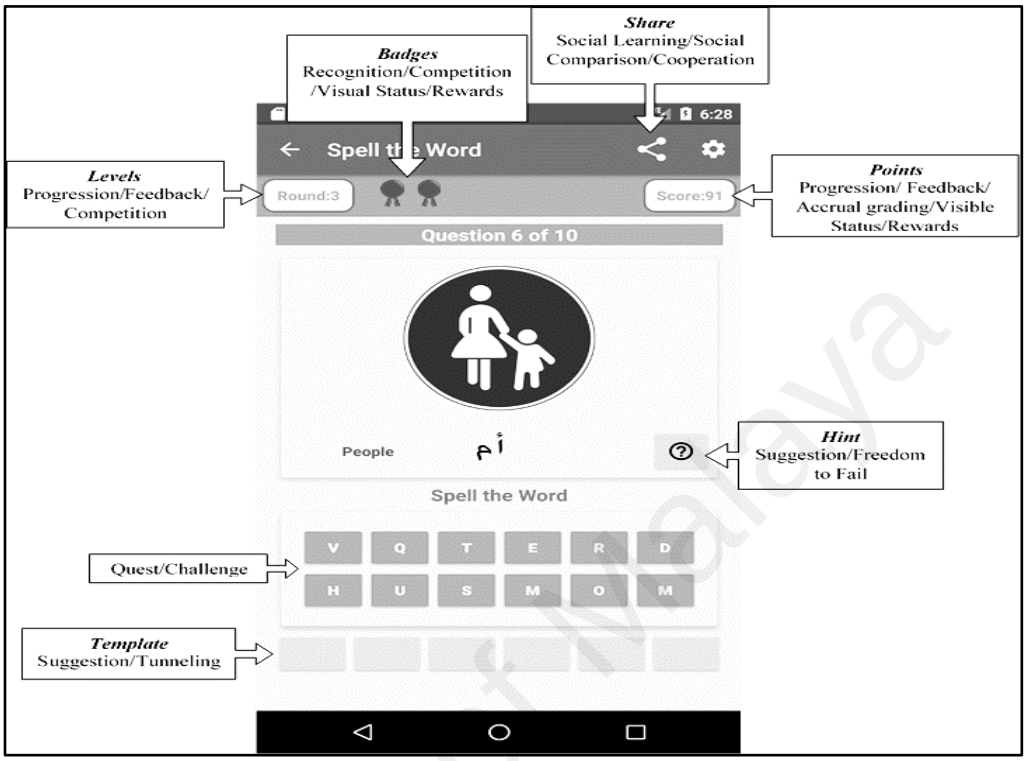

Figure 5.5: **Mapping Game Features to Guideline Principles**

"Share" is reflected in two persuasive principles which are Social Facilitation and Social Comparison principles. Social Facilitation is described as "showing users others performing the similar behaviour". So, by using Share feature, students can share his/her score with other students. Social Comparison is to "allow comparison". This enables students to compare their scores with others which encourage low performance one to enhance their performance. "Competition, Recognition, and Conditioning" principles that are shown on "Levels" feature. Competition is to "provide competition", Recognition is to "offers public recognition", and Conditioning is to "use positive reinforcement to transform existing behaviours into habits or shape complex behaviour". Thus, Levels can provide all these concepts because by Levels, students can know their achievement and provide access to brief statistics on the top performers at each level of the game. This would increase competition among the students which would subsequently increase

motivation and performance. This would also increase the score gradually with every correct answer and provide bonus and badges upon the completion of certain levels.

Competition and Conditioning principles can be seen as “Points” feature, because Points show the score of the achievements of each student. Similar to “Self-monitoring” principle is also reflected by Points feature. Because its description is “allow users to track their performance and status”. While points provide statistics on performance history. After listing some of the game features, it is clearly seen that it matches the persuasive principles. Also, there exist some similarity between persuasive principles and gamification terminology. However, there is a difference in some classification of elements (principles in persuasive case) and description of that elements.

5.6 Summary

This section presents summary of implementation of the mobile application used to evaluate the proposed framework. This include the implementation of the platform on Android, development process and the application content. All the main interfaces are presented and explained using actual screenshots. The application was developed based on mobile game framework (MGF), whose guideline principles and vocabulary set of IMAS are put together to produce English vocabulary game (EVG) (see next chapter). This game is used in the evaluation of the proposed framework through field experiments on a sample of IMAS students, which is detailed in the next chapter.

CHAPTER 6: RESULT AND DISCUSSION

6.1 Introduction

This chapter presents the experimental results and discussion of the findings. The results were achieved based on quasi-experimental study selected due to its suitability for use in this kind of study. Therefore, experimental results (test and questionnaire) are listed in the chapter. Participants, quasi-experimental measures/instrumentation, procedure, materials, comparison between the groups, results, and discussion are presented.

6.2 Participants

According to Chen and Chang (2011), researchers who carry out their research in the same school would improve internal validity of their studies. Because, it would eliminate some of the most important compounding variables. Therefore, the main participants in this study were 3rd grade English learners educated in a mainstream classroom in an international school located in the Putrajaya, Malaysia. Most of the student come from Arabic native language background. Most of International Modern Arabic School (IMAS) are Arabs who are born in Arab countries before going to Malaysia. The study was conducted on 68 students. However, the number of students has reduced due to absenteeism while some students have moved to other schools or countries. So, the final number of participants is 64 students and their ages ranged from 8-11 years. Institutional Review Board rules (Schrag, 2010) for research with children less than 18 years of age were followed according to the proper procedures. Also, anonymity was honoured. These students were divided into experimental (poor performance) and control (good performance) groups. The experimental group include students from first, second, and third classes and the control group include fourth and fifth classes. Firstly, there are two English teachers for 3rd grade and so the students were divided into two groups based on their teachers. The groups completed the same pre-test and pre-questionnaire (listed and described in Section 3.3.5). Thereafter, the students who got lower scores (Avg.) were

assigned to the experimental group and the remaining students became the control group as shown in Table 6.1.

Table 6.1: Students Marks for Vocabulary Test

Students number	Poor performance group	Students number	Good performance group
1	5	1	10
2	8	2	10
3	7	3	10
4	6	4	10
5	10	5	10
6	8	6	10
7	8	7	10
8	8	8	10
9	8	9	10
10	10	10	10
11	8	11	8
12	10	12	8
13	8	13	8
14	10	14	8
15	10	15	7
16	8	16	4
17	10	17	10
18	8	18	10
19	8	19	10
20	8	20	10
21	8	21	10
22	3	22	10
23	7	23	10
24	8	24	10
25	8	25	10
26	4	26	10
27	8	27	8
28	10	28	8
29	8	29	8
30	8	30	8
31	6	31	6
32	8	32	6
Sum of marks	252	Sum of marks	287
Avg.	7.875	Avg.	8.96875

6.3 Experiment Procedure

The targeted school are Certified Cambridge Registered International Schools with a well-structured curriculum tailored toward nurturing future leaders. The curriculum emphases on the four English language skills which comprises of Reading, Writing, Listening and Speaking. All the skills aforementioned are closely examined and assessed every half term. It also enables the intervention groups to further assist by ensuring that all the users' needs are satisfied. Also, emphasis on literacy was observed across the school, because it believes to raise educational standards. It is believed that the key to raising students' to develop high standards of literacy as this is essential to preparing the students for future education and careers.

The procedure adopted in the experiments is shown in Figure 6.1. Before the learning activity, the teacher introduced the researcher to the students and explained the necessary steps to the students (pre-test and pre-questionnaire). Sequel to that, the students took a post-test to evaluate their performance and the post-questionnaire of motivation.

During the learning activity, the experimental group students learned with the mobile game application on mobile devices. On the other hand, those in the control group learned the traditional way (textbooks, computers Lab., etc.). After the learning activity, all of the students took a post-test and post-questionnaire.

On the first week, all the students that sat for the pre-test and pre-questionnaire for 15 minutes. In the same week after categorizing the student into groups, the researcher met the experimental groups to explain the purpose of the study and to highlight the application features and functions. Also, screenshot of the application developed was distributed to the students to give a clearer picture of what they would expect. The meeting took place for about 20 minutes.

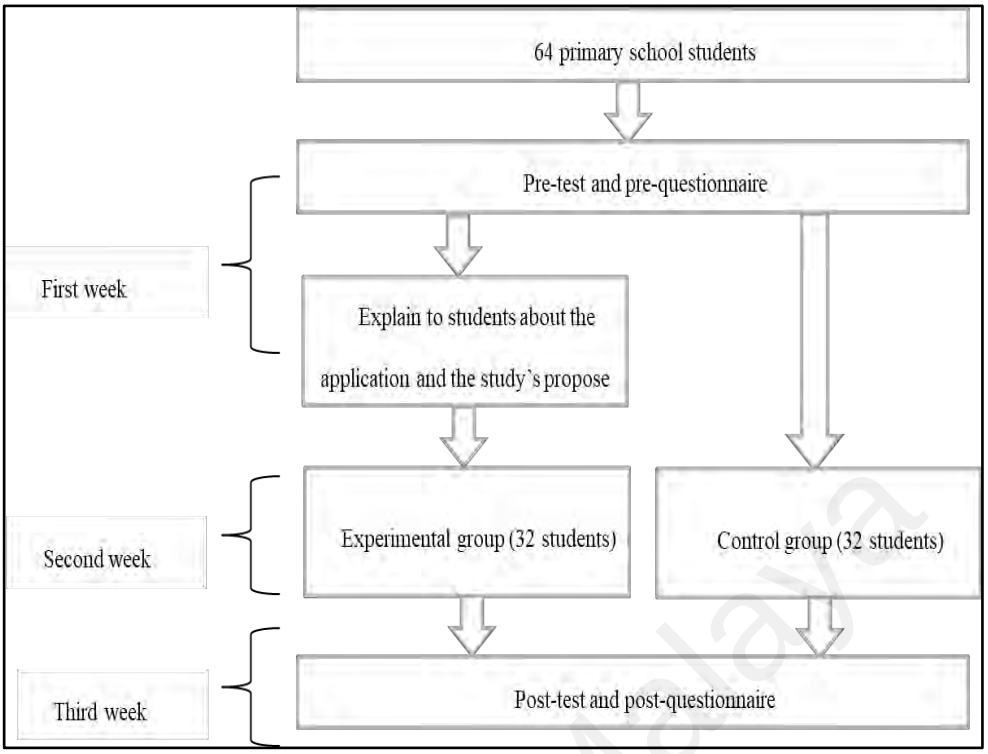

Figure 6.1: Experiment Procedure

The second week, eight mobile devices were provided to train the students. So, for that, the experimental students (32 students) were divided into subgroups each one of them include the eight numbers of students. Each student had been trained by the researcher for 20 minutes to learn the game. The application was uploaded into Google Store to enable the students to play even outside classes or school premises. This way, the mobility (anytime and anywhere) aspect is achieved. It also enabled the students to spend more time to practice using the app. However, the control group were not informed to download the application. They are engaged only through their traditional teaching method.

During the third week, the students were asked to sit again for the test and questionnaire (post) to collect data and find out if there are any improvement in performance and enhancement on motivation to learn English language.

6.4 Materials

Permission was obtained from the primary school administration to use mobile phones for learning for the sample group of students; however, students were not allowed to use their personal or family phones for this study. Independent mobile phones obtained for this research study was released the school at no cost.

Generally, students are permitted to carry mobile phones an around in the school, but not normally used in classrooms. Therefore, restriction on the use of mobile phones was established for the treatment group and agreed upon by the school administration. The following conditions were stipulated:

i. Mobile phones can be used only during the break time in the school day.
ii. Students used only mobile game application.

Parental information letter was passed to the students to give to their parents which explained how students were permitted to use mobile phones during the study. This would enable parent to support mobile game applications play for students for the purpose of training outside of the school community. A copy of the instructional manual for student how to play the game was included for the parents.

6.5 Comparing Experimental and Control Groups

The experimental and the control groups score for the vocabulary tests were compared. Based on the mean and standard deviations of each group, the measure of probability was determined.

Four t-tests were conducted to determine the difference between the groups at pre-test and post-test. T-test was conducted to measure the students' performance. Quantitative research instrumentation includes survey. The pre and post-survey were developed for

the study and administered face-to-face for the treatment group. ANCOVA and one-way repeated measures ANOVA were conducted to measure students' motivation.

6.6 Experiment Results

Pallant (2013) referred to independent sample t-test as a test researchers used to compare mean score on a continuous variable scale for two different participants. The author highlighted that the dependent variable must be continuous, while the independent must be categorical. In this study, an independent sample t-test was conducted to test the difference in performance of students before and after conducting the training courses. The performance was measured on ratio scale indicating that it is continuous while the mobile group and traditional group indicate that they are categorical variables.

According to Pallant (2013), two scenarios exist when conducting independent t-test. The first is assumed equal variance and the second is equal variance not assumed. Table 6.2 shows the descriptive information of the groups. Each group consists of 32 students with a mean score of 7.88 for the mobile group and 8.97 for traditional group. About 32 respondents are sufficient for conducting this analysis, because based on Sekaran and Bougie (2013), responses between 30 to 500 is sufficient for any scientific research.

Table 6.2: Descriptive Statistics of Group (Pre-Test)

Group Statistics					
	Group	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Pre-Test	Mobile	32	7.88	1.68	.30
	Traditional	32	8.97	1.56	.27

For the result of the independent sample t-test, Table 6.3 shows that the Levene's Test for equality of variance was not violated. The Sig (P-value) is more than .05 indicating that there are equal variances between the two groups. Accordingly, Pallant (2013) suggested that when equal variance is assumed, Sig (2-tailed) for the equal variance must

be considered. In Table 6.3, the Sig (2-tailed) is 0.009 indicating that there is a statistical difference between mobile group and traditional group. The mean difference between the groups is 1.09. The mean score of traditional groups is greater by 1.09 from the mobile group.

Table 6.3: Independent Sample t-test between Groups (Pre-Test)

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	.65	.42	-2.70	62	.009	-1.09
Equal variances not assumed			-2.70	61.63	.009	-1.09

6.6.1 Independent t-test for Post Test (Performance)

An independent sample t-test was conducted on post-test data to identify the differences between the two groups after training. Table 6.4 shows the descriptive information of the groups. It shows that each group has 32 students and the mean score of the mobile group is 8.34, while the traditional group is 8.87.

Table 6.4: Descriptive Statistics of Groups (Post-Test)

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Post-Test	Mobile	32	8.34	1.31	.23
	Traditional	32	8.87	1.36	.24

The independent sample t-test in Table 6.5 shows that the variance between the mean of the two groups are equal (Sig=.15), because the sig is greater than .05. The independent sample t-test result indicated that there is no statistical difference between the mean of the two groups, because the Sig (2-tailed) is greater than .05 (Sig=.12). The mean

difference between the two groups reduced from 1.09 (Pre-test) to .53 (Post-test). This indicates that there is improvement in the mobile group.

Table 6.5: Independent Sample t-test (Post-Test)

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	2.10	.15	-1.59	62	.12	-.53
Equal variances not assumed			-1.59	61.90	.12	-.53

To identify the difference in a mobile group alone, an independent sample t-test was conducted. The findings in Table 6.6 show that the mobile group mean in pre and post-performance. It shows that there is an improvement in the performance between pre (mean=7.88) and post (mean=8.34).

Table 6.6: Description of Mobile Group (Pre and Post)

Group Statistics					
	CODE	N	Mean	Std. Deviation	Std. Error Mean
Mobile	PRE	32	7.88	1.68	.30
	POST	32	8.34	1.31	.23

To identify the significance of this improvement, an independent sample t-test was conducted. Table 6.7 shows that Levene's Test for equality of variance is achieved due to the fact that Sig of p-value (.44) is greater than .05. Table 6.7 shows that there is no statistical difference between the mobile group in pre-test and post-test. This is because, the Sig (2-tailed) value (.22) is greater than .05. Despite this, there is an increase of .47 from pre to post-test, however, this increment is not statistically significant.

Table 6.7: Independent Sample t-test for Mobile Group (Pre and Post)

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	.61	.44	-1.24	62	.22	-.47
Equal variances not assumed			-1.24	58.52	.22	-.47

6.6.2 Analysis of the Covariate (ANCOVA)

Pallant (2013) pointed out that ANCOVA can be utilised when there are two-group pre-test and post-test design. The scores on the pre-test are treated as a covariate to 'control' for pre-existing differences between the groups. This makes ANCOVA very useful in situations where the sample size is small or medium. Under these circumstances, Stevens (2009) recommended two or three to be chosen carefully as covariates to reduce error variance and increase chances of detecting significant difference between the groups.

Table 6.8: Analysis for Pre and Post

Tests of Between-Subjects Effects						
Dependent Variable: Post_Result						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2.36a	2	1.18	5.28	.008	.14
Intercept	16.44	1	16.44	73.4	.00	.54

Tests of Between-Subjects Effects						
Dependent Variable: Post_Result						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Pre_result	1.88	1	1.88	8.39	.005	.12
Group	.08	1	.08	.35	.55	.006
Error	13.66	61	.22			
Total	1333.98	64				
Corrected Total	16.03	63				

a. R Squared = .148 (Adjusted R Squared = .120)

One-way between-group analysis of covariance was conducted to compare the effectiveness of the two different interventions designed to increase the motivation of student to learning. The independent variable was the type of groups (mobile group, traditional group), and the dependent variable consist of scores on the motivation administered after the intervention was completed. Participants' scores on the pre-intervention administration of the motivation were used as the covariate in this analysis.

Preliminary checks were conducted to ensure that there is no violation of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate. Table 6.8 shows that after adjustment of pre-test scores, there was no significant difference between the two groups on the post-

test scores on motivation to learn F= .35, Sig = .55, partial eta squared = .006. However, there is a strong relationship between the pre-test and post-test scores on motivation to learn as indicated by a partial eta squared value of .148.

The result indicated that for pre and post-test of motivation, the training courses did not make a significant change after conducting the training. However, this could be due to the length of training as one week was given for the student to train.

6.6.2.1 Repeated measure ANOVA

The repeated measures model has its origins in ANOVA. Thus, the term repeated measure ANOVA is often used to refer to the generic design. It also refers to as repeated measure General Liner Models (GLM). Repeated measures are used to increase statistical power or to learn something about the form of response over time or across situations (Pallant, 2013). According to Pallant (2013), in a one-way repeated measured ANOVA design, each subject is exposed to two or more different conditions or measured on the same continuous scale. Responses of two or more different questions can also be compared. However, similar scale must be used to measured use the questions (e.g. 1=strongly disagree, to 5=strongly agree).

Table 6.9: One-Way Repeated Measure ANOVA

Multivariate Tests							
	Effect	**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**	**Partial Eta Squared**
Time	Pillai's Trace	.12	8.82b	1.00	62.00	.004	.12
	Wilks' Lambda	.87	8.82b	1.00	62.00	.004	.12

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Time * Group	Hotelling's Trace	.142	8.82b	1.00	62.00	.004	.12
	Roy's Largest Root	.14	8.82b	1.00	62.00	.004	.12
	Pillai's Trace	.02	1.48b	1.00	62.00	.22	.02
	Wilks' Lambda	.97	1.48b	1.00	62.00	.22	.02
	Hotelling's Trace	.02	1.48b	1.00	62.00	.22	.02
	Roy's Largest Root	.02	1.48b	1.00	62.00	.22	.02

a. Design: Intercept + Group
Within Subjects Design: Time
b. Exact statistic

A one-way repeated measures ANOVA was conducted because ANCOVA did not show any statistically significance. Thus, ANOVA was used to compare scores on the motivation to learn at Time 1 (pre-test) and Time 2 (post-test). Table 6.9 shows the result of repeated measures ANOVA.

All of multivariate tests indicated similar result, but the most commonly reported statistic is Wilks' Lambda. In this study, the value for Wilks' Lambda is .87, with a probability value (sig) of .004. The p-value is less than .05; therefore, it can be concluded

that there is a statistically significant effect for time. This suggests that there was change in motivation to learn scores across the two different time periods.

6.7 Discussion of the Results

This part of the study answers research question "How to evaluate the mobile game application in order to prompt the framework?" Even though, it was mentioned earlier that improved motivation and enhance performance are parallels and go in single line. The study intends to confirm this claim.

Generally, review has shown that mobile game applications have been used mostly to motivate and improve performance of English language learners' skills. The outcome of the as review is described in Section 2.4.3.1. Also, many studies have shown that excellent results can be achieved when mobile game application is used to aid learning (Hsu, Chen, & Cao, 2017; Hwang, Shih, Ma, Shadiev, & Chen, 2016; Tao, Huang, & Tsai, 2016; Wu, 2018; Zarzycka-Piskorz, 2016). The mobile game proposed in this study is based on the framework and persuasive principles of guideline. Also, features/functions and their relationship to persuasive principles are studied. Statistical t-test was carried out to compare the performance between the control and the experiment groups. Furthermore, ANCOVA test, a statistical analysis tool was used to measure motivation. The result of the statistical t-test and ANCOVA did not show any significance. Even though exist a difference in average scores between the groups. SPSS couldn't detect small improvement, hence are ignored. However, there exist a strong relationship between the pre-test and post-test scores on motivation to learn based on high partial eta squared. From ANOVA (one-way repeated measures), time indicated statistical significance on learning process. This shows change in motivation during the learning process across the two different time periods (Time 1 for pre-test and Time 2 for post-test). These results are

consistent with the claim that strong correlation exist between motivation and performance (Crookes & Schmidt, 1991; Sewell, 2006).

Generally, investigation has shown that low motivation to learn English language vocabulary is prevalent among student. Therefore, the need to conduct test in order to evaluate student performance in English vocabulary is highly imperative. In this school, this is the first-time questionnaire is used to evaluate students' motivation to learn vocabulary. Some results showed that the student generally performed excellently with only few low scores recorded. Others indicated predictable results in that the students results with low motivation toward learning English language vocabulary. The pre-questionnaire results of the two groups reveals that students find English language study as unpleasant. However, some students performed well despite their low score in terms of motivation. The experimental group post-questionnaire showed improvement in the way they feel about English vocabulary learning. This has led to the conclusion that students could still perform well even if the task is not enjoyable. However, learning proved to be very difficult, despite the availability of numerous learning resources at the school under consideration such computer lab and other resources. Though, mobile game application can increase students' motivation in classes as discovered earlier by many researchers (Bachore, 2015; Godwin-Jones, 2018). The above results can be concisely summarized as in Table 6.10.

Table 6.10: Descriptive Statistics of Groups (Post-Test)

	Traditional Group (Not using the mobile game)	**Experimental Group (Using the mobile game)**
Improved Performance	Almost the same performance with a pre-test mean score of 8.97 (±1.56) and a post-test mean score of 8.87 (±1.36).	Measurable improvement from a pre-test mean score of 7.88 (±1.68) to a post-test mean score of 8.34 (±1.31). This difference is indicative of the potential of using a mobile game in improving student's learning performance although the difference in this particular case was not statistically significant, most probably

	Traditional Group (Not using the mobile game)	Experimental Group (Using the mobile game)
		due to the short period during which the mobile game was used by the students.
Improved Motivation	Using ANCOVA analysis, no statistically significant difference was measured between the times of pre and post-tests.	Using ANCOVA analysis, no statistically significant difference was measured between the times of pre and post-tests. However, using ANOVA analysis and adding the factor of time (allowing more time for the effects to take place), statistically significant difference was found, suggesting a motivation change across the two points of time. In addition, a very good relationship exists between the pre-test scores and post-test scores based on motivation to learn.

These findings are confirmed the findings of pervious similar works like (Ma et al., 2012; Sandberg, Maris, & Geus, 2011; Sandberg et al., 2014). These studies the only related works which developed/used mobile game application/environment to improve learners' motivation and performance to learn vocabulary (Systematic literature review on Section 2.4.3.1). However, Ma et al. (2012) designed a system framework/platform to learn vocabulary without developing a mobile game application but they have not provided any evidence to include any game characteristics to improve motivation. They had been working on the mobile game application on that time then they attend to test its effect on the real users once it will be completed. Even though Sandberg et al. (2014) have improved their application which they developed on 2011, they only focused on zoo animals and they have not developed the two application based on the school text books or materials. Thus, this study is added a mobile game framework which used a persuasive technology to improve motivation then developed application based on that framework which used a vocabulary set that extraction from school text books and materials.

Kirkpatrick's model deals with the styles of study of language learning and theory construction as well as it is concerned with the enhancement of existing of methodological

approaches. Level 1 and level 2 of the Kirkpatrick model is based on learner's attitudes and perceptions and they assistance in measuring their linguistic together with their cognitive development via growth models and psychometric measures (Aryadoust, 2017). According to latter, these two aforesaid levels of the Kirkpatrick model improve on the existing approaches to study the effectiveness of the educational programs. However, quasi-experimental studies are focussing primarily on the educational programmes learning outcomes and they do not examine changes in the attitudes of the students' towards such programs and they do not evaluate the students' own development. Although quasi-experimental studies are crucial, they are conducted rarely. On other hand, both level 1 and level 2 of the Kirkpatrick model is well-suited for this purpose.

Reaction: Most students responded positively to the mobile game application and they like to play and believe that the game enables them to be happy, effective and useful in their development. These reactions are due to the game design and its components. Although the game focuses primarily on vocabulary skills, one needs to spell the words. These sessions, along with other "fun" educational activities such as discussions, sharing of their results on public networks, and constant access to high speed Internet at school would make the learning environment more attractive to students. Nevertheless, students felt that the time spent at school would have been spent better. The questionnaire parts did not contain items based on students' feedback about how they spend their time but, on their reactions, while the researcher discusses their opinions about this game. As schools increasingly adopt multimodal and Internet-based teaching methods, students are expected to perform activities that recognize learner autonomy.

Learning: Perceptions of the questionnaires regarding their knowledge and skills were assessed using the vocabulary test and motivation questionnaire (MSLQ). Firstly, the result can be explained by the fact that, as the students' training progressed, the gradually

became aware of their knowledge and skills, which allow the correlation between their final scores with perceptions of their knowledge and skills. Secondly, knowledge and skills are in fact two distinguished concepts (Kirkpatrick, 1996). Knowledge in this study encompasses the students' training to improve the students' vocabulary level and their skills by applying their knowledge gained. The measurement of these two concepts is primordial in impact research since the students acquires both knowledge of the language mechanism as well as the vocabulary mechanism. Knowledge is need when students have discussion in the class as well as they consult their professors and to have feedbacks; it becomes the common means of communication in these contexts. On the contrary, skills represent the ability to apply knowledge and produce new vocabulary items. Students' self -assessment of these two concepts shows their awareness of their limitations and strengths.

In sum, this mobile game framework has the possibility to improve Arabic primary school students to learn the English language just they need to train on play the educational mobile game application longer than a week.

6.8 Summary

A mobile game framework was developed and evaluated using quasi-experimental study. This was achieved by dividing the students into experimental group and control group. T-test and questionnaire was used to evaluate the student's performance and motivation. The results show that there is no significant difference when students use mobile game application to support their English language learning. However, the study shows improvement if the students spend more time to use the application in their English language learning.

CHAPTER 7: CONCLUSION

7.1 Introduction

This research findings would go a long way assist educators, researchers, and developers to develop a suitable educational application that would improve Arabic students' motivation and performance to learn English language vocabulary. This chapter presents conclusion of the findings provides some recommendations toward better result for further works.

7.2 Summary of Findings

This research works demonstrated that there are many studies that applied m-learning to support learners in learning English language and most of them showed good results. These studies showed that students enjoyed and were fully engaged in using this mobile technology. However, m-learning has not yet been applied widely in schools around the world. Nevertheless, there are some studies that provided good evidence about the opportunity to use this technology to support students most especially when it is properly designed and applied in right way. Therefore, in this research, first step was to develop a suitable m-learning framework that provide roadmap for producing good design for this mobile application.

It is not an easy task to design a mobile application can motivate students especially young students. Most especially when it comes to young people have not known the importance of education talk less of educational materials. However, review has shown that persuasive technology can provide a good way to design interfaces that can guide learners through the application steps. This technology can offer theoretically grounded and good support to m-learning framework required to get the right mobile application design.

- To achieve the first research objective which is to identify suitable persuasive principles for mobile game framework and to answer the first research question which is determination of the suitable persuasive principles required in developing a framework for primary school students. Therefore, the guideline was developed based on three factors (mobile, game, language learning) to get the best interfaces design which covers all the application and tools used.
- To achieve the second research objective which is to develop a mobile game framework for English language vocabulary learning based on the persuasive principles identified in objective (i) and answer the second research question which is determination of the important components required while designing the mobile game framework for primary school students. Therefore, in this research, mobile game framework has been developed to improve Arabic students motivation and performance. Experts' opinion and feedback are important to know if the design of framework and guideline are really reliable to design the application. So, experts evaluated both the framework and the guideline and gave positive comments and feedbacks.
- This study focused on Arabic students attending IMAS school and measurement of their motivation and performance towards studying English vocabulary. The mobile game application was designed based on the mobile game framework and its persuasive guideline is to improve the students' motivation and performance. This is application was developed to achieve the third research objective which is to develop a prototype based on the proposed framework and to answer the third research question which is how to develop a mobile game application using the proposed framework.
- Test and questionnaire were used to investigate the students' motivation for learning English vocabulary in conjunction with students' performance. Also, to

achieve the fourth research objective which is to evaluate the framework by testing the effectiveness of the prototype among primary school students and answer the fourth research question which is how to evaluate the mobile game application in order to validate the proposed framework. Prior to the study, the researcher observed that students are not motivated to learn English vocabulary. So, the aim of this study is to improve their motivation and performance and determine if there exist any conjunction between them.

The test provided an opportunity to know the students' performance on vocabulary language learning without mixing with other English skills. The questionnaire provided an opportunity to know the students' motivation on vocabulary language learning which has never experimented on this school before. Overall, the results of this study were both surprising and expected. The results were surprising because students showed good performance in general, even though some of them score low in their results, but most of them have done well. The results were somewhat expected in that the students showed low motivation toward English vocabulary learning.

The results of pre-questionnaire to the two groups showed that students essentially see the study of English as necessity, but not necessarily an enjoyable one. However, few students got good performance result, but their motivation was low. Compared with post-questionnaire in the experimental group who got somehow improved outcome and showed good feeling toward English vocabulary learning. This led to the finding that, few students only do well on their studies, even though they did not enjoy it. This could be attributed to forcing them to do the study or just to make their family happy. However, another interesting finding can be noted, not all educational materials can be used to improve students' motivation. Because in IMAS school, there is a computers Lab, and many other materials used by teachers to support their students in English language

learning but has its own side effects. Nevertheless, the mobile game application could play a vital factor to improve students' motivation.

In this researcher, it was observed that students got enjoyable time when they play the mobile game application in class and some of them expressed their happiness to play at home. Because, they can download the app and play at their free time. More so, mobile game usage to support English language learning draw more attentions compare to other approaches.

7.3 Contribution of the Study

The output of this research can be summarized as follows:

- This research study utilised a mobile game framework for the design and development of the mobile application for studying English vocabulary based on experts' comments and feedbacks.
- This research study utilised persuasive guideline for the design and the development of the mobile application to study English vocabulary based on experts' comments and feedbacks.
- This research study has successfully designed and developed a mobile application using the proposed framework and guideline.
- The prototype mobile application's proposed framework was evaluated based on motivation and performance of students, while completing tasks in the mobile application based on English vocabulary.

This study contributed another tool to the arsenal of educators and developers who wish to leverage the power of mobile games in teaching English vocabulary. This tool is a guideline to develop effective mobile games, demonstrated with specific example to illustrate the use of the persuasive principles (guideline). Furthermore, this study

contributes to the literature of game-based m-learning from two perspectives: First, the study proposed a theoretical basis to combine the paradigm of persuasive technology with affective domain of the Blooms taxonomy in a single framework. It serves the applications of game-based m-learning, specifically for learning English vocabulary by primary school students. Secondly, the evaluation of the experimental results and the developed app provide supportive confirmation to the studies that prove potentiality of using mobile games to improve students' motivation. Even though, this confirmation is not decisive due to the limited time period during which the experiment was conducted.

7.4 Limitations

The limitations of this study can be divided into two parts. The first part comes from the study itself and the other part comes from the school. Firstly, the limitations from the study side is the number of available devices used for the research to train the students. Only 8 devices were available which led to dividing the students into four sub-groups. The process led to prolong training time.

Secondly, the students did not have sufficient time to play, thus they use the mobile game application even in their classes due to the numerous materials they have to study. So, the school allowed the researcher to train the students during their break time. This can affect the outcome of the results because of two things:

i. Mobile devices were not enough for each student because only 8 devices were provided by Faculty of Computer Science and Information Technology, University of Malaya.
ii. Time is not enough to train students, so the students could not play the game for a long time under the researcher observations. So, the research lost the opportunity to ensure the students spend sufficient time on the game or not.

iii. After a long day of study, the students were asked to play the game during their break, and this is not fair for the young people. Because they need to rest and have physical play as well. This may affect the results.

iv. Furthermore, non-randomization of the sample was another limitation of the study. The study divided the students into the control and experimental groups based on their performance. However, future studies can use more rigorous experimental designs to ensure randomization of the sample.

7.5 Recommendations

This part of the report is to help educator, developer, and researchers obtain a good result and avoid mistakes and limitation that occurred in this study. The recommendations are listed below:

i. There is no standard to the number of students in the groups and all the studies use different numbers. Some researches work based on statistical references which emphasized on minimum group of at least 30 participants. So, this study recommends that there is need to carry out a review to find out the best assessment and evaluation approach in this field.

ii. Due to the number of persuasive principles there is need to review all the persuasive principles and make sure that there is no reflect among them. This can be done by combining some of them together and then find a unique definition and explanation to each one. Moreover, it would make more sense if a catalogue is prepared that shows how each principle can be applied. This would close the gap between theoretical and practical understanding among the developers. also, the principles can be divided to reflect on component as tangible or without component reflection as intangible.

iii. The existing m-learning frameworks try to cover many fields and areas on framework. More attention should be given to the authors area of research. Therefore, it is recommended that each framework should cover and reflect their field and area.

7.6 Further Work

This study believes that the mobile game application should be enrolled on the students' curriculum and be one of the English language learning materials that can be used daily for learning. The use of this app should be on the whole semester and then measure its effectiveness at the end of the semesters. This can offer a good opportunity to researchers to know the real and most effective approach to be applied. However, this kind of study would cost a lot and take time to conclude.

REFERENCES

Aarts, B., & McMahon, A. (2006). *The handbook of English linguistics*: Wiley Online Library.

Abbad, A. T. (1988). *An analysis of communicative competence features in English language texts in Yemen Arab republic.* University of Illinois at Urbana-Champaign,

Abdullah, L. M., Hussin, Z., Asra, B., & Zakaria, A. R. (2013). MLearning scaffolding model for undergraduate English language learning: bridging formal and informal learning. *TOJET: The Turkish Online Journal of Educational Technology, 12*(2), 217-233.

Adachi, P. J., & Willoughby, T. (2013). More than just fun and games: The longitudinal relationships between strategic video games, self-reported problem solving skills, and academic grades. *Journal of Youth Adolescence, 42*(7), 1041-1052.

Ahmad, K. S., Armarego, J., & Sudweeks, F. (2013). *Literature review on the feasibility of mobile-assisted language learning (MALL) in developing vocabulary skills among non-English speaking migrant and refugee women.* Paper presented at the Research and Innovation in Information Systems (ICRIIS), 2013 International Conference on.

Ahmed, K., & Nasser, O. (2015). Incorporating iP ad Technology: Creating More Effective Language Classrooms. *TESOL Journal, 6*(4), 751-765.

Aken, J. E. v. (2004). Management research based on the paradigm of the design sciences: the quest for field-tested and grounded technological rules. *Journal of Management Studies, 41*(2), 219-246.

Al-Emran, M., Mezhuyev, V., Kamaludin, A., & ALSinani, M. (2018). *Development of M-learning application based on knowledge management processes.* Paper presented at the Proceedings of the 2018 7th International Conference on Software and Computer Applications.

AL-Mamri, M. J., & Hameed, S. (2019). Issues of English language learning in Yemen: A case study of secondary schools in Hajjah city. *IJELLH, 7*(1), 21-21.

Al-Nasser, A. S. (2015). Problems of English language acquisition in Saudi Arabia: An exploratory-cum-remedial study. *Theory and Practice in Language Studies, 5*(8), 1612-1619.

Al-Shamiry, R., & Alduais, A. M. (2013). EFL in-service Yemeni teachers' perceptions and perspectives on the importance of teaching stress and intonation as supra-segmental features of speech and sound attributes to the process of comprehension: A survey-study. *International Journal of Social Science Research, 1*(1), 39-56.

Alahäivälä, T., & Oinas-Kukkonen, H. (2016). Understanding persuasion contexts in health gamification: A systematic analysis of gamified health behavior change support systems literature. *International Journal of Medical Informatics, 96*, 62-70.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 107-136.

Alemi, M., Sarab, M. R. A., & Lari, Z. (2012). Successful learning of academic word list via MALL: Mobile Assisted Language Learning. *International Education Studies, 5*(6), 99-109.

Alexander, P. A., Fives, H., Buehl, M. M., & Mulhern, J. (2002). Teaching as persuasion. *Teaching and Teacher Education, 18*(7), 795-813.

Alkhezzi, F., & Al-Dousari, W. (2016). The impact of mobile learning on ESP learners' performance. *Journal of Educators Online, 13*(2), 73-101.

Almonani, E., Husain, W., San, O. Y., Almomani, A., & Al-Betar, M. (2014). *Mobile game approach to prevent childhood obesity using persuasive technology.* Paper presented at the Computer and Information Sciences (ICCOINS), 2014 International Conference on.

Alrabai, F. (2016). Factors underlying low achievement of Saudi EFL learners. *International Journal of English Linguistics, 6*(3), 21-37.

Alrashidi, O., & Phan, H. (2015). Education Context and English Teaching and Learning in the Kingdom of Saudi Arabia: An Overview. *English Language Teaching, 8*(5), 33-44.

Anderson, J. R., Reder, L. M., & Simon, H. A. (1996). Situated learning and education. *Educational Researcher, 25*(4), 5-11.

Annetta, L., & Cheng, M.-T. (2008). Why educational video games. In L. Annetta (Ed.), *Serious educational games: From theory to practice* (pp. 1-11). Rotterdam, The Netherlands: Sense Publishers.

Annetta, L. A. (2008). Video games in education: Why they should be used and how they are being used. *Theory Into Practice, 47*(3), 229-239.

Antimoon (n.d.). Why learn English. Retrieved from http://www.antimoon.com/other/whylearn.htm

Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, the advantages and disadvantages of its adoption in Higher Education. *International Journal of Instructional Technology and Distance Learning, 12*(1), 29-42.

Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., De Freitas, S., Louchart, S., . . . De Gloria, A. (2015). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology, 46*(2), 391-411.

Arteaga, S. M., Kudeki, M., & Woodworth, A. (2009). Combating obesity trends in teenagers through persuasive mobile technology. *ACM SIGACCESS Accessibility and Computing, 94*, 17-25.

Arthur Jr, W., Tubré, T., Paul, D. S., & Edens, P. S. (2003). Teaching effectiveness: The relationship between reaction and learning evaluation criteria. *Educational Psychology, 23*(3), 275-285.

Aryadoust, V. (2017). Adapting Levels 1 and 2 of Kirkpatrick's model of training evaluation to examine the effectiveness of a tertiary-level writing course. *Pedagogies: An International Journal, 12*(2), 151-179.

Asabere, N. Y. (2013). Benefits and challenges of mobile learning implementation: Story of developing nations. *International Journal of Computer Applications, 73*(1).

Ashiyan, Z., & Salehi, H. (2016). Impact of Whatsapp on learning and retention of collocation knowledge among Iranian EFL learners. *Advances in Language Literary Studies, 7*(5), 112-127.

Ashworth, C. M. (1988). Structured systems analysis and design method (SSADM). *Information Software Technology, 30*(3), 153-163.

Avison, D., & Fitzgerald, G. (2003). *Information systems development: methodologies, techniques and tools*: McGraw Hill.

Bachore, M. M. (2015). Language learning through mobile technologies: an opportunity for language learners and teachers. *Journal of Education Practice, 6*(31), 50-53.

Bardram, J. E., Frost, M., Szántó, K., Faurholt-Jepsen, M., Vinberg, M., & Kessing, L. V. (2013). *Designing mobile health technology for bipolar disorder: A field trial of the MONARCA system.* Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.

Battles, J., Glenn, V., & Shedd, L. (2011). Rethinking the library game: Creating an alternate reality with social media. *Journal of Web Librarianship, 5*(2), 114-131.

Berger, R., & McDougall, J. (2013). Reading videogames as (authorless) literature. *Literacy, 47*(3), 142-149.

Berking, P., Haag, J., Archibald, T., & Birtwhistle, M. (2012). *Mobile learning: Not just another delivery method.* Paper presented at the Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC).

Bethesda Game Studios. (2011). The Elder Scrolls V: Skyrim (computer program). Bethesda, MD: Bethesda Softworks.

Billings, E. S., & Mathison, C. (2012). I get to use an iPod in school? Using technology-based advance organizers to support the academic success of English learners. *Journal of Science Education and Technology, 21*(4), 494-503.

BioWare. (2010). Mass Effect 2. In: Electronic Arts Edmonton, Canada.

Bjoerner, T., & Hansen, C. B. (2011). Designing an educational game: Design principles from a holistic perspective. *International Journal of Learning, 17*(10).

Bloom, B. S. (1956). Taxonomy of educational objectives. Vol. 1: Cognitive domain. *New York: McKay*, 20-24.

Bohdanska, B. (2012). The level of knowledge of the cultural background of English-speaking countries among students of English language at a secondary school. In: Undergraduate thesis, Palackeho V Olomouci University Czech.

Boren, Z. D. (2014). There are officially more mobile devices than people in the world. *The Independent, 7*.

Boyinbode, O., Bagula, A., & Ng'ambi, D. (2012). *A mobile learning application for delivering educational resources to mobile devices.* Paper presented at the International Conference on Information Society (i-Society).

Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., . . . Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education, 94*, 178-192.

Bressler, D. M. (2014). *Is it all in the game? Flow experiences and scientific practices during an INPLACE mobile game.* (Unpublished Doctoral Dissertation), Lehigh University,

Briggs, N. (2015). Motivational value of mobile-based communicative tasks as coursebook supplements. *Multimedia-Assisted Language Learning, 18*(2), 11-36.

Brinol, P., Petty, R. E., & Belding, J. (2017). Objectification of people and thoughts: An attitude change perspective. *British Journal of Social Psychology, 56*(2), 233-249.

Briz-Ponce, L., Juanes-Méndez, J. A., García-Peñalvo, F. J., & Pereira, A. (2016). Effects of mobile learning in medical education: a counterfactual evaluation. *Journal of Medical Systems, 40*(6), 136.

Brown, A. L. (1985). Three faces of transfer: Implications for early competence, individual differences, and instruction. *Advances in Developmental Psychology, 3*, 143-192.

Brown, S. L. (2009). *Play: How it shapes the brain, opens the imagination, and invigorates the soul*. New York: Avery.

Burkhour, H. (1999). *The relationship between vocabulary and reading comprehension in junior high aged students with learning disabilities.* (Master's Thesis), Grand Valley State University, Allendale,Michigan, USA.

Bustillo, J., Rivera, C., Guzmán, J. G., & Acosta, L. R. (2017). Benefits of using a mobile application in learning a foreign language. *Sistemas Telemática, 15*(40), 55-68.

Campbell, C. P. (1987). Instructional Systems Development: A Methodology for Vocational-Technical Training. *Journal of European Industrial Training, 11*(5), 3-42.

Cardoso, W. (2011). Learning a foreign language with a learner response system: The students' perspective. *Computer assisted language learning, 24*(5), 393-417.

Carvalho, M. B. (2017). *Serious games for learning: a model and a reference architecture for efficient game development.* (PhD's Thesis), Eindohoven University of Technology,

Cassidy, S. B. (2011). The videogame as narrative. *Quarterly Review of Film and Video, 28*(4), 292-306.

Cenoz, J. (2002). Age differences in foreign language learning. *ITL-International Journal of Applied Linguistics, 135*(1), 125-142.

Chang, C.-C., Tseng, K.-H., & Tseng, J.-S. (2011). Is single or dual channel with different English proficiencies better for English listening comprehension, cognitive load and attitude in ubiquitous learning environment? *Computers & Education, 57*(4), 2313-2321.

Chang, C.-K., & Hsu, C.-K. (2011). A mobile-assisted synchronously collaborative translation–annotation system for English as a foreign language (EFL) reading comprehension. *Computer assisted language learning, 24*(2), 155-180.

Chang, C., Chang, C.-K., & Shih, J.-L. (2016). Motivational strategies in a mobile inquiry-based language learning setting. *System, 59*, 100-115.

Chang, S. E., & Tung, C.-H. (2010). *A Web-feed based service for enhancing asynchronous learning on personal computers and mobile devices.* Paper presented at the 24th International Conference on Advanced Information Networking and Applications Workshops (WAINA).

Chang, Y.-T., Yu, H., & Lu, H.-P. (2015). Persuasive messages, popularity cohesion, and message diffusion in social media marketing. *Journal of Business Research, 68*(4), 777-782.

Checkland, P. (2000). Soft systems methodology: a thirty year retrospective. *Systems Research Behavioral Science, 17*(S1), S11-S58.

Chen, C.-M., Wang, J.-Y., & Chen, Y.-C. (2014). Facilitating English-language reading performance by a digital reading annotation system with self-regulated learning mechanisms. *Journal of Educational Technology & Society, 17*(1), 102–114.

Chen, I.-J., & Chang, C.-C. (2011). Content presentation modes in mobile language listening tasks: English proficiency as a moderator. *Computer assisted language learning, 24*(5), 451-470.

Cheng, C.-M. (2013). Reflections of college English majors' cultural perceptions on learning English in Taiwan. *English Language Teaching, 6*(1), 79-91.

Cheng, M. T., She, H. C., & Annetta, L. A. (2015). Game immersion experience: its hierarchical structure and impact on game-based science learning. *Journal of Computer Assisted Learning, 31*(3), 232-253.

Cheng, S.-C., Hwang, W.-Y., Wu, S.-Y., Shadiev, R., & Xie, C.-H. (2010). A mobile device and online system with contextual familiarity and its effects on English learning on campus. *Journal of Educational Technology & Society, 13*(3), 93–109.

Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education, 59*(3), 1054-1064.

Chi, C.-C., Kuo, C.-H., & Lin, K.-Y. (2012). *A design of mobile application for English learning.* Paper presented at the Seventh International Conference on Wireless, Mobile and Ubiquitous Technology in Education (WMUTE).

Chiu, M.-C., Chang, S.-P., Chang, Y.-C., Chu, H.-H., Chen, C. C.-H., Hsiao, F.-H., & Ko, J.-C. (2009). *Playful bottle: a mobile social persuasion system to motivate healthy water intake.* Paper presented at the Proceedings of the 11th International Conference on Ubiquitous Computing.

Christensen, C., Johnson, C., & Horn, M. (2010). *Disrupting class, expanded edition: How disruptive innovation will change the way the world learns*. New York: McGraw-Hill.

Ciampa, K. (2014). Learning in a mobile age: an investigation of student motivation. *Journal of Computer Assisted Learning, 30*(1), 82-96.

Clark, R. (2002). Six principles of effective e-Learning: What works and why. *The e-Learning Developer's Journal, 6*(2), 1-10.

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education, 59*(2), 661-686.

Cook, V. (2001). 20 Linguistics and second language acquisition: One person with two languages. *The Handbook of Linguistics*, 488-511.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

Culp, K. M., Honey, M., & Mandinach, E. (2005). A retrospective on twenty years of education technology policy. *Journal of Educational Computing Research, 32*(3), 279-307.

Davidsson, O., Peitz, J., & Björk, S. (2004). Game design patterns for mobile games. *Project report to Nokia Research Center*.

De Oliveira, R., Cherubini, M., & Oliver, N. (2010). *MoviPill: Improving medication compliance for elders using a mobile persuasive social game.* Paper presented at

the Proceedings of the 12th ACM International Conference on Ubiquitous Computing.

Dekhane, S., Tsoi, M. Y., & Johnson, C. (2016). Mobile application development by students to support student learning. In *Mobile and blended learning innovations for improved learning outcomes* (pp. 223-246): IGI Global.

Deng, L., & Tavares, N. J. (2013). From Moodle to Facebook: Exploring students' motivation and experiences in online communities. *Computers & Education, 68*, 167-176.

Devincenzi, S., Kwecko, V., de Toledo, F. P., Mota, F. P., Casarin, J., & da Costa Botelho, S. S. (2017). *Persuasive technology: Applications in education.* Paper presented at the Frontiers in Education Conference (FIE).

Dew, J. (2010). Global, mobile, virtual, and social: The college campus of tomorrow. *The Futurist, 44*(2), 46.

Dhir, S. K., Verma, D., Batta, M., & Mishra, D. (2017). E-learning in medical education in India. *Indian pediatrics, 54*(10), 871-877.

Diaab, S. (2016). Role of Faulty Instructional Methods in Libyan EFL Learners' Speaking Difficulties. *Procedia-Social and Behavioral Sciences, 232*, 338-345.

DiNardo, J. (2016). Natural experiments and quasi-natural experiments. In Durlauf S.N. & B. L.E. (Eds.), *The new palgrave dictionary of economics* (pp. 1-12). London: Palgrave Macmillan.

Dmour, A. (2015). The Effect of Using Arabic Language for Teaching English as a Foreign Language at Elementary Stage Schools in Jordan. *Journal of Education and Practice, 6*(35), 93-97.

Dörnyei, Z., & Skehan, P. (2003). Individual differences in second language learning. In C. J. Doughty & M. H. Long (Eds.), *The handbook of second language acquisition* (pp. 589): Blackwell Publishing Ltd.

Edutopia. (2008). Mobile Learning. Retrieved from tp://www.edutopia.org/technology-integration-introduction

EuroPLOT. (2013, December 31). *EuroPLOT: Persuasive learning objects and technologies for lifelong learning in Europe*. Retrieved from https://www.up2europe.eu/european/projects/europlot-persuasive-learning-objects-and-technologies-for-lifelong-learning-in-europe_118361.html

Faiola, A., Newlon, C., Pfaff, M., & Smyslova, O. (2013). Correlating the effects of flow and telepresence in virtual worlds: Enhancing our understanding of user behavior in game-based learning. *Computers in Human Behavior, 29*(3), 1113-1121.

Falloon, G. (2013). Young students using iPads: App design and content influences on their learning pathways. *Computers & Education, 68*, 505-521.

Felicia, P. (2011). What evidence is there that digital games can be better than traditional methods to motivate and teach students. *Waterford Institute of Technology*.

Finkelstein, C. (1998). Information engineering methodology. In *Handbook on architectures of information systems* (pp. 459-483): Springer.

Fogg, B. J. (2002). Persuasive technology: Using computers to change what we think and do. *Ubiquity, 2002*(December), 5.

Fogg, B. J. (2009). *Creating persuasive technologies: An eight-step design process.* Paper presented at the Proceedings of the 4th International Conference on Persuasive Technology.

Fraga, B. (n.d.). The history of technology in education. Retrieved from https://study.com/academy/lesson/the-history-of-technology-in-education.html

Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., . . . Haines, A. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: A systematic review and meta-analysis. *PLoS Medicine, 10*(1), e1001363.

Fryer, L. K., Bovee, H. N., & Nakao, K. (2014). E-learning: Reasons students in language learning courses don't want to. *Computers & Education, 74*, 26-36.

Furió, D., GonzáLez-Gancedo, S., Juan, M.-C., Seguí, I., & Rando, N. (2013). Evaluation of learning outcomes using an educational iPhone game vs. traditional game. *Computers & Education, 64*, 1-23.

Gardner, H. E. (2000). *Intelligence reframed: Multiple intelligences for the 21st century*: Hachette UK.

Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation, and learning: A research and practice model. *Simulation & Gaming, 33*(4), 441-467.

Gasson, S. (1995). *The role of methodologies in it-related organisational change.* Paper presented at the Proceedings of BCS Specialist Group on IS Methodologies, 3rd Annual Conference, The Application of Methodologies in Industrial and Business Change, North East, Wrexham, UK.

Geambaşu, C. V., Jianu, I., Jianu, I., & Gavrilă, A. (2011). Influence factors for the choice of a software development methodology. *Accounting and Management Information Systems, 10*(4), 479-494.

Gheaus, A. (2018). Children's vulnerability and legitimate authority over children. *Journal of Applied Philosophy, 35*, 60-75.

Gheytasi, M., Azizifar, A., & Gowhary, H. (2015). The effect of smartphone on the reading comprehension proficiency of Iranian EFL learners. *Procedia-Social and Behavioral Sciences, 199*, 225-230.

Girard, C., Ecalle, J., & Magnan, A. (2013). Serious games as new educational tools: how effective are they? A meta-analysis of recent studies. *Journal of Computer Assisted Learning, 29*(3), 207-219.

Godwin-Jones, R. (2018). Using mobile devices in the language classroom: Part of the Cambridge papers in ELT series. In: Cambridge: Cambridge University Press.

Gopnik, A., Meltzoff, A. N., & Kuhl, P. K. (2001). *The scientist in the crib: What early learning tells us about the mind*. New York: HarperCollins Publishers.

Goundar, S. (2011). *What is the potential impact of using mobile devices in education.* Paper presented at the Proceedings of SIG GlobDev Fourth Annual Workshop.

Grabbe, J. W. (2015). Implications of experimental versus quasi-experimental designs. In *The palgrave handbook of research design in business and management* (pp. 141-152): Springer.

Green, P. I., Finkel, E. J., Fitzsimons, G. M., & Gino, F. (2017). The energizing nature of work engagement: Toward a new need-based theory of work motivation. *Research in Organizational Behavior, 37*. doi:10.1016/j.riob.2017.10.007

Gregor, S., & Hevner, A. R. (2013). Positioning and presenting design science research for maximum impact. *MIS Quarterly, 37*(2), 337-355.

Gromik, N. A. (2012). Cell phone video recording feature as a language learning tool: A case study. *Computers & Education, 58*(1), 223-230.

Halko, S., & Kientz, J. A. (2010). *Personality and persuasive technology: An exploratory study on health-promoting mobile applications.* Paper presented at the International Conference on Persuasive Technology, Berlin.

Hamari, J., Koivisto, J., & Pakkanen, T. (2014). *Do persuasive technologies persuade?-A review of empirical studies.* Paper presented at the International Conference on Persuasive Technology, Cham.

Han, S., Kong, W., Liu, Q., & Zhou, L. (2010). *Design and implementation of mobile English learning.* Paper presented at the International Conference on Intelligent System Design and Engineering Application (ISDEA), .

Hargis, J., Cavanaugh, C., Kamali, T., & Soto, M. (2014). A federal higher education iPad mobile learning initiative: Triangulation of data to determine early effectiveness. *Innovative Higher Education, 39*(1), 45-57.

He, J., Ren, J., Zhu, G., Cai, S., & Chen, G. (2014). *Mobile-based AR application helps to promote EFL children's vocabulary study.* Paper presented at the 14th International Conference on Advanced Learning Technologies (ICALT).

Herrington, A., & Herrington, J. (2007). *Authentic mobile learning in higher education.* Paper presented at the AARE 2007 International Educational Research Conference, Fremantle, Western Australia.

Hess, T., & Gunter, G. (2013). Serious game-based and nongame-based online courses: Learning experiences and outcomes. *British Journal of Educational Technology, 44*(3), 372-385.

Hevner, A., & Chatterjee, S. (2010). Design science research in information systems. In *Design Research in Information Systems* (pp. 9-22). USA: Springer.

Hevner, A. R. (2007). A three cycle view of design science research. *Scandinavian Journal of Information Systems, 19*(2), 87-92.

Hevner, A. R., & March, S. T. (2003). The information systems research cycle. *Computer, 36*(11), 111-113.

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2008). Design science in information systems research. *Management Information Systems Quarterly, 28*(1), 6.

Ho, Y.-W., & Lin, C.-C. (2015). *A preliminary study on Taiwanese EFL adolescents' perceptions of mobile-assisted post-reading tasks.* Paper presented at the 15th International Conference on Advanced Learning Technologies (ICALT), Hualien, Taiwan.

Hockly, N. (2012). Mobile learning. *Elt Journal, 67*(1), 80-84.

Hsu, C.-F., Chen, C.-M., & Cao, D. (2017). *Effects of design factors of game-based English vocabulary learning APP on learning performance, sustained attention, emotional state, and memory retention.* Paper presented at the 6th IIAI International Congress on Advanced Applied Informatics (IIAI-AAI), Hamamatsu, Japan.

Hsu, C.-K., Hwang, G.-J., & Chang, C.-K. (2013). A personalized recommendation-based mobile learning approach to improving the reading performance of EFL students. *Computers & Education, 63*, 327-336.

Hsu, Y.-C., & Ching, Y.-H. (2015). A review of models and frameworks for designing mobile learning experiences and environments. *Canadian Journal of Learning and Technology, 41*(3), 1-22.

Huizenga, J., Admiraal, W., Akkerman, S., & Dam, G. t. (2009). Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game. *Journal of Computer Assisted Learning, 25*(4), 332-344.

Hwang, W.-Y., & Chen, H. S. (2013). Users' familiar situational contexts facilitate the practice of EFL in elementary schools with mobile devices. *Computer assisted language learning, 26*(2), 101-125.

Hwang, W.-Y., Chen, H. S., Shadiev, R., Huang, R. Y.-M., & Chen, C.-Y. (2014). Improving English as a foreign language writing in elementary schools using mobile devices in familiar situational contexts. *Computer assisted language learning, 27*(5), 359-378.

Hwang, W.-Y., Shih, T. K., Ma, Z.-H., Shadiev, R., & Chen, S.-Y. (2016). Evaluating listening and speaking skills in a mobile game-based learning environment with situational contexts. *Computer assisted language learning, 29*(4), 639-657.

Isaias, P., & Issa, T. (2015). Introduction to information systems models and methodologies. In *High level models and methodologies for information systems* (pp. 1-19): Springer.

Islam, N., Beer, M., & Slack, F. (2015). E-learning challenges faced by academics in higher education. *Journal of Education Training Studies, 3*(5), 102-112.

Ismail, M. H., Ahmad, S. Z., Rosmani, A. F., & Shuib, N. L. M. (2012). *Smoke shooter: introducing danger of smoking to school children with persuasive technology.* Paper presented at the Symposium on Humanities, Science and Engineering Research (SHUSER).

Jalali, S., & Wohlin, C. (2012). *Systematic literature studies: Database searches vs. backward snowballing.* Paper presented at the Proceedings of the 2012 ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, Lund, Sweden.

Järvinen, P. (2007). Action research is similar to design science. *Quality & Quantity, 41*(1), 37-54.

John-Steiner, V., & Mahn, H. (1996). Sociocultural approaches to learning and development: A Vygotskian framework. *Educational Psychologist, 31*(3-4), 191-206.

Johnstone, R. M. (2002). *Addressing'the age factor': some implications for languages policy*. Retrieved from

Jung, H.-J. (2015). Fostering an English teaching environment: Factors influencing English as a foreign language teachers' adoption of mobile learning. *Informatics in Education, 14*(2), 219-241.

Kakihara, M., & Sorensen, C. (2002). *Mobility: An extended perspective.* Paper presented at the Proceedings of the 35th Annual Hawaii International Conference on System Sciences.

Kalberer, U. (2007). *Rate of L2 acquisition and the influence of instruction time on achievement.* (M. Ed Unpublished), University of Manchester, Manchester, UK.

Kamaruzaman, M., & Zainol, I. (2012). *Behavior response among secondary school students development towards mobile learning application.* Paper presented at the Colloquium On Humanities, Science and Engineering (CHUSER).

Kanfer, R., Frese, M., & Johnson, R. E. (2017). Motivation related to work: A century of progress. *Journal of Applied Psychology, 102*(3), 338.

Kebritchi, M. & Hirumi, A. (2008). Examining the pedagogical foundations of modern educational computer games. *Computers & Education, 51*(4), 1729-1743.

Keegan, D. (2002). *The future of learning: From eLearning to mLearning*: Hagen, Germany, Fern University, Institution for Research into Distance Education.

Khan, I. (2016). Positive attitude and English language learning: Psycho-pedagogic connections. *Arab World English Journal (AWEJ), 7*(1), 432 - 444.

Khazaie, S., & Hayati, A. (2013). *Teaching English to Iranian foreign national police via mobile.* Paper presented at the 5th Conference on Information and Knowledge Technology (IKT), Shiraz, Iran.

Khowaja, K., & Salim, S. S. (2015). Heuristics to evaluate interactive systems for children with Autism Spectrum Disorder (ASD). *PloS One, 10*(7), e0132187.

Kim, I. (2014). Prototypical content development and evaluation of the Cognitive English Vocabulary-Learning Program for Korean university students. *International Journal of Pedagogies and Learning, 9*(1), 49-65.

Kim, S. (2006). The future of e-learning in medical education: current trend and future opportunity. *Journal of Educational Evaluation for Health Professions, 3*(3), 108-113.

Kirkpatrick, D. (1996). Great ideas revisited. *Training Development, 50*(1), 54-60.

Kondo, M., Ishikawa, Y., Smith, C., Sakamoto, K., Shimomura, H., & Wada, N. (2012). Mobile assisted language learning in university EFL courses in Japan: Developing attitudes and skills for self-regulated learning. *ReCALL, 24*(2), 169-187.

Korucu, A. T., & Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *Procedia-Social and Behavioral Sciences, 15*, 1925-1930.

Korucu, A. T., Alkan, A. J. P.-S., & Sciences, B. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *15*, 1925-1930.

Koszalka, T. A., & Ntloedibe-Kuswani, G. (2010). Literature on the safe and disruptive learning potential of mobile technologies. *Distance Education, 31*(2), 139-157.

Krathwohl, D., Bloom, B., & Masia, B. (1964). Taxonomy of educational objectives, Book II. Affective domain. New York, NY. David McKay Company. In: Inc.

Kuechler, B., & Vaishnavi, V. (2008). On theory development in design science research: Anatomy of a research project. *European Journal of Information Systems, 17*(5), 489-504.

Kurkovsky, S. (2013). Mobile game development: improving student engagement and motivation in introductory computing courses. *Computer Science Education, 23*(2), 138-157.

Kwon, S., Kim, H. J., & Moon, H. (2014). *Study on a new English education system design using the Hangeul code.* Paper presented at the International Conference

on Information and Communication Technology Convergence (ICTC), Busan, Korea.

Lai, C.-L., & Hwang, G.-J. (2015). *A comparison on mobile learning preferences of high school teachers with different academic backgrounds.* Paper presented at the 4th International Congress on Advanced Applied Informatics (IIAI-AAI), Okayama, Japan.

Lam, J., Yau, J., & Cheung, S. K. (2010). *A review of mobile learning in the mobile age.* Paper presented at the International Conference on Hybrid Learning, Berlin.

Lamb, M. (2013). 'Your mum and dad can't teach you!': constraints on agency among rural learners of English in the developing world. *Journal of Multilingual and Multicultural Development, 34*(1), 14-29.

Lanvers, U. (2017). Language learning motivation, global English and study modes: A comparative study. *The Language Learning Journal, 45*(2), 220-244.

Lee, C., Yeung, A. S., & Ip, T. (2016). Use of computer technology for English language learning: Do learning styles, gender, and age matter? *Computer assisted language learning, 29*(5), 1035-1051.

Lee, H.-c. (2014). Social media and student learning behavior: Plugging into mainstream music offers dynamic ways to learn English. *Computers in Human Behavior, 36*, 496-501.

Lee, P. (2014). *Are mobile devices more useful than conventional means as tools for learning vocabulary?* Paper presented at the 8th International Symposium on Embedded Multicore/Manycore SoCs (MCSoC).

Lenneberg, E. H. (1967). The biological foundations of language. *Hospital Practice, 2*(12), 59-67.

Leung, A. A., Nerenberg, K., Daskalopoulou, S. S., McBrien, K., Zarnke, K. B., Dasgupta, K., . . . Milot, A. (2016). Hypertension Canada's 2016 Canadian hypertension education program guidelines for blood pressure measurement, diagnosis, assessment of risk, prevention, and treatment of hypertension. *Canadian Journal of Cardiology, 32*(5), 569-588.

Levy, M. (1997). *Computer-assisted language learning: Context and conceptualization*: Oxford University Press.

Li, Y., & Li, J. (2011). *Learning on the move: a case study of mobile learning assisted English reading instruction in Chinese tertiary education.* Paper presented at the 6th International Conference on Computer Science & Education (ICCSE), Singapore.

Lin, T. C., Hwang, L. L., & Lai, Y. J. (2017). Effects of argument quality, source credibility and self-reported diabetes knowledge on message attitudes: an experiment using diabetes related messages. *Health Information & Libraries Journal, 34*(3), 225-235.

Lindgren, R., Tscholl, M., Wang, S., & Johnson, E. (2016). Enhancing learning and engagement through embodied interaction within a mixed reality simulation. *Computers & Education, 95*, 174-187.

Liu, P., Yuen, K.-W., Leung, W.-K., & Meng, H. (2012). *menunciate: Development of a computer-aided pronunciation training system on a cross-platform framework for mobile, speech-enabled application development.* Paper presented at the 8th International Symposium on Chinese Spoken Language Processing (ISCSLP), Hong Kong, China.

Liu, Q.-X., Fang, X.-Y., Wan, J.-J., & Zhou, Z.-K. (2016). Need satisfaction and adolescent pathological internet use: Comparison of satisfaction perceived online and offline. *Computers in Human Behavior, 55*, 695-700.

Liu, T.-Y., & Chu, Y.-L. (2010). Using ubiquitous games in an English listening and speaking course: Impact on learning outcomes and motivation. *Computers & Education, 55*(2), 630-643.

Lockton, D., Harrison, D., & Stanton, N. A. (2010). The design with intent method: A design tool for influencing user behaviour. *Applied Ergonomics, 41*(3), 382-392.

Lousado, J. P., Costa, C. M., Oliveira, I. P., & Roberto, M. T. G. (2011). *Audio folios management system for foreign language learning.* Paper presented at the 6th Iberian Conference on Information Systems and Technologies (CISTI), Chaves, Portugal.

Lucero, A., Zuloaga, R., Mota, S., & Muñoz, F. (2006). *Persuasive technologies in education: improving motivation to read and write for children.* Paper presented at the International Conference on Persuasive Technology.

Lucht, M., & Heidig, S. (2013). Applying HOPSCOTCH as an exer-learning game in English lessons: two exploratory studies. *Educational Technology Research and Development, 61*(5), 767-792.

Luster, J. (2011). A new protocol for teaching English language learners in middle and secondary schools. *Journal of International Education Research, 7*(4), 65-74.

Ma, Z.-H., Hwang, W.-Y., Chen, S.-Y., & Ding, W.-J. (2012). *Digital game-based after-school-assisted learning system in English.* Paper presented at the International Symposium on Intelligent Signal Processing and Communications Systems (ISPACS), New Taipei City, Taiwan.

Maddison, R., Baker, G., Bhabuta, L., Fitzgerald, G., Hindle, K., Song, J., . . . Wood, J. (1984). Feature analysis of five information systems methodologies. In *Beyond productivity: Information systems development for organizational effectiveness*. Minneapolis, Minnesota, USA: Elsevier Science Publishers, North Holland.

Malaysian Communications and Multimedia Commission. (2013). *Hand Phone Users Survey 2012*. Retrieved from https://www.skmm.gov.my/skmmgovmy/media/General/pdf/130717_HPUS2012.pdf

Martin, R. C. (2002). *Agile software development: Principles, patterns, and practices*: Prentice Hall.

Mathew, A. P. (2005). *Using the environment as an interactive interface to motivate positive behavior change in a subway station.* Paper presented at the CHI'05 Extended Abstracts on Human Factors in Computing Systems.

Mayo, M. d. P. G., & Lecumberri, M. L. G. (2003). *Age and the acquisition of English as a foreign language* (Vol. 4). Dublin, Ireland: Multilingual Matters.

McGinnis, T., Goodstein-Stolzenberg, A., & Saliani, E. C. (2007). "indnpride": Online spaces of transnational youth as sites of creative and sophisticated literacy and identity work. *Linguistics and Education, 18*(3-4), 283-304.

McInerney, D. M., Liem, G. A. D., & Walker, R. A. (2011). *Sociocultural theories of learning and motivation: Looking back, looking forward*: IAP.

McLaughlin, A., Gandy, M., Allaire, J., & Whitlock, L. (2012). Putting fun into video games for older adults. *Ergonomics in Design, 20*(2), 13-22.

Mehdipour, Y., & Zerehkafi, H. (2013). Mobile learning for education: Benefits and challenges. *International Journal of Computational Engineering Research, 3*(6), 93-101.

Meurant, R. C. (2010). *Providing every student with an iPad as a means of helping develop Korean EFL digital literacy.* Paper presented at the Sixth International Conference on Networked Computing and Advanced Information Management, Seoul, South Korea.

Mingyong, Z. (2015). *Instructional implications for adopting mobile technology in the teaching and learning of writing in English in international joint educational programs in Wuhan polytechnic.* Paper presented at the International Conference on Circuit, Power and Computing Technologies (ICCPCT), Nagercoil, India.

Mintz, J., & Aagaard, M. (2010). *The application of persuasive technology to educational settings: Sometheoretical from the HANDS Project.* Paper presented at the Fifth International Conference on PersuasiveTechnology.

Mintz, J., & Aagaard, M. (2012). The application of persuasive technology to educational settings. *Educational Technology Research and Development, 60*(3), 483-499.

Mitchell, A., & Savill-Smith, C. (2004). The use of computer and video games for learning: A review of the literature.

Mladenović, S., Žanko, Ž., & Mladenović, M. (2015). Elementary students' motivation towards informatics course. *Procedia-Social and Behavioral Sciences, 174*, 3780-3787.

Mohammed, A. (2015). EFL effective factors: anxiety and motivation and their effect on Saudi college student's achievement. *Arab World English Journal (AWEJ), 6*, 201-218.

Muhammed, A. A. (2017). The Role of Age and Gender Differences in Language Learning: A Case Study on Kurdish EFL Learners. *English Language, Literature Culture, 2*(5), 74.

Muhanna, W. (2012). Using online games for teaching English vocabulary for Jordanian students learning English as a foreign language. *Journal of College Teaching & Learning (Online), 9*(3), 235.

Mukattash, L. (1983). *The problem of difficulty in foreign language learning.* Paper presented at the Papers from the First Conference on the Problems of Teaching English Language and Literature at Arab Universities, Amman, Jordan.

Munteanu, C., Molyneaux, H., Maitland, J., McDonald, D., Leung, R., Fournier, H., & Lumsden, J. (2014). Hidden in plain sight: low-literacy adults in a developed country overcoming social and educational challenges through mobile learning support tools. *Personal and Ubiquitous Computing, 18*(6), 1455-1469.

Murty, V. P., LaBar, K. S., Hamilton, D. A., & Adcock, R. A. (2011). Is all motivation good for learning? Dissociable influences of approach and avoidance motivation in declarative memory. *Learning & Memory, 18*(11), 712-717.

Musa, N., Shaffiei, Z. A., & Mokhsin, M. (2010). *A review of persuasive techniques in developing children educational system.* Paper presented at the International Conference on Science and Social Research (CSSR), Kuala Lumpur, Malaysia.

Nah, K. C. (2011). Optimising the use of wireless application protocol (WAP) sites for listening activities in a Korean English as a foreign language (EFL) context. *Computer assisted language learning, 24*(2), 103-116.

National Research Council. (2011). *Learning science through computer games and simulations*: National Academies Press.

Negroponte, N. (1996). *Being digital*. New York: Alfred A. Knopf.

Nguyen, V. A., & Pham, V. C. (2012). *CAMLES: An adaptive mobile learning system to assist student in language learning.* Paper presented at the Seventh International Conference on Wireless, Mobile and Ubiquitous Technology in Education (WMUTE), Takamatsu, Japan.

Noels, K. A., Pelletier, L. G., Clément, R., & Vallerand, R. J. (2000). Why are you learning a second language? Motivational orientations and self-determination theory. *Language Learning, 50*(1), 57-85.

O'Neill, S., & Geoghegan, D. (2011). First year pre-service teachers' views about literacy: Exploring the breadth and depth of their pedagogical needs. *International Journal of Pedagogies and Learning, 6*(3), 187-205.

Oinas-Kukkonen, H., & Harjumaa, M. (2008). *A systematic framework for designing and evaluating persuasive systems.* Paper presented at the International conference on persuasive technology.

Oinas-Kukkonen, H., & Harjumaa, M. (2009). Persuasive systems design: key issues, process model and system features. In *Routledge Handbook of Policy Design* (pp. 105-123): Routledge.

Orlando, J. (2017). Curious Kids: Why do adults think video games are bad? *Curious kids.* Retrieved from http://theconversation.com/curious-kids-why-do-adults-think-video-games-are-bad-76699

Osman, A., Zam, M., & Ibrahim, R. (2016). The mHealth: A review of current persuasive technology design strategies. *IOSR Journal of Mobile Computing & Application, 3*(3), 29-33.

Oye, N., Salleh, M., & Iahad, N. (2012). E-learning methodologies and tools. *International Journal of Advanced Computer Science and Applications (IJACSA), 3*(2), 48-52.

Oz, H. (2014). Prospective English teachers' ownership and usage of mobile devices as m-learning tools. *Procedia-Social and Behavioral Sciences, 141*, 1031-1041.

Pallant, J. (2013). *SPSS survival manual*. UK: McGraw-Hill Education.

Palmer, D. J., & Goetz, E. T. (1988). Selection and use of study strategies: The role of the studier's beliefs about self and strategies. In *Learning and study strategies* (pp. 41-61): Elsevier.

Park, S., Kim, T., & Lee, B. G. (2011). *A study on the influential factors for continual usage of mobile English learning applications.* Paper presented at the Asia-Pacific Services Computing Conference (APSCC), Jeju, South Korea.

Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *The International Review of Research in Open and Distributed Learning, 12*(2), 78-102.

Paull, M., Whitsed, C., & Girardi, A. (2016). Applying the Kirkpatrick model: Evaluating an'interaction for learning framework'curriculum intervention. *Issues in Educational Research, 26*(3), 490.

Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of Management Information Systems, 24*(3), 45-77.

Perrotta, C., Featherstone, G., Aston, H., & Houghton, E. (2013). Game-based learning: Latest evidence and future directions. *Slough: NFER*.

Piaget, J. (2013). *Play, dreams and imitation in childhood*. New York: W.W. Norton and Company.

Ping, L. K., Poh, J. P., Meng, L. K., Husain, W., & Adnan, M. H. M. (2012). *A framework of a childhood obesity intervention using persuasive web-mobile technology.* Paper presented at the International Conference on Computer & Information Science (ICCIS), Kuala Lumpeu, Malaysia.

Pollak, J., Gay, G., Byrne, S., Wagner, E., Retelny, D., & Humphreys, L. (2010). It's time to eat! Using mobile games to promote healthy eating. *IEEE Pervasive Computing, 9*(3), 21-27.

Powell, C. (2018). *A phenomenological study of exemplary elementary school principalslLeading through conversational intimacy, interactivity, inclusion, and intentionality.* (Doctor of Education), Brandman University,

Praslova, L. (2010). Adaptation of Kirkpatrick's four level model of training criteria to assessment of learning outcomes and program evaluation in higher education. *Educational Assessment, Evaluation Accountability, 22*(3), 215-225.

Prensky, M. (2003). Digital game-based learning. *Computers in Entertainment, 1*(1), 21-21.

Qureshi, I. A., Ilyas, K., Yasmin, R., & Whitty, M. (2012). Challenges of implementing e-learning in a Pakistani university. *Knowledge Management & E-Learning: An International Journal (KM&EL), 4*(3), 310-324.

Rababah, G. (2003). Communication Problems Facing Arab Learners of English. *Journal of Language and Learning, 3*(1).

Rahimi, M., & Asadollahi, F. (2010). *Iranian university students' readiness for using podcasting: A comparison between English and non-English majors.* Paper presented at the Second International Conference on E-Learning and E-Teaching (ICeLeT), Tehran, Iran.

Rahimi, M., & Miri, S. S. (2014). The impact of mobile dictionary use on language learning. *Procedia-Social Behavioral Sciences, 98*, 1469-1474.

Rahimi, M., & Soleymani, E. (2015). The impact of mobile learning on listening anxiety and listening comprehension. *English Language Teaching, 8*(10), 152-161.

Raybourn, E. M., & Bos, N. (2005). *Design and evaluation challenges of serious games.* Paper presented at the CHI'05 Extended Abstracts on Human Factors in Computing Systems.

Rezaei, A., Mai, N., & Pesaranghader, A. (2013). *Effectiveness of using English vocabulary mobile applications on ESL's Learning performance.* Paper presented at the International Conference on Informatics and Creative Multimedia (ICICM), Kuala Lumpur, Malaysia.

Rikala, J. (2015). *Designing a mobile learning framework for a formal educational context.* (Master's Thesis), University of Jyväskylä, (220)

Rodriguez, D. M., Teesson, M., & Newton, N. C. (2014). A systematic review of computerised serious educational games about alcohol and other drugs for adolescents. *Drug and Alcohol Review, 33*(2), 129-135.

Rundensteiner, E. A. (1992). *Multiview: A methodology for supporting multiple views in object-oriented databases.* Paper presented at the VLDB.

Saarinen, T. (1990). System development methodology and project success: An assessment of situational approaches. *Information & Management, 19*(3), 183-193.

Saifudin, W. S. N. S., Salam, S., & Abdullah, M. H. L. (2012). Multimedia mobile content development framework and methodology for developing m-learning applications. *Journal of Technical Education and Training, 4*(1).

Sam-Oloyede, R. (2017). *Smart Multimedia Learning System for Automata Theory.* (PhD's Thesis),

Sánchez, J., & Olivares, R. (2011). Problem solving and collaboration using mobile serious games. *Computers & Education, 57*(3), 1943-1952.

Sandberg, J., Maris, M., & Geus, K. d. (2011). Mobile English learning: An evidence-based study with fifth graders. *Computers & Education, 57*, 1334–1347.

Sandberg, J., Maris, M., & Hoogendoorn, P. (2014). The added value of a gaming context and intelligent adaptation for a mobile learning application for vocabulary learning. *Computers & Education, 76*, 119-130.

Sarrab, M., Elbasir, M., & Alnaeli, S. (2016). Towards a quality model of technical aspects for mobile learning services: An empirical investigation. *Computers in Human Behavior, 55*, 100-112.

Scanlon, E., Gaved, M., Jones, A., Kukulska-Hulme, A., Paletta, L., & Dunwell, I. (2014). *Representations of an incidental learning framework to support mobile learning.* Paper presented at the 10th International Conference on Mobile Learning, Madrid, Spain.

Šćepanović, S., Vujičić, T., Matijević, T., & Radunović, P. (2015). *Game based mobile learning–application development and evaluation*. Paper presented at the The Sixth International Conference on e-Learning (eLearning-2015), Belgrade, Serbia.

Scerbo, M. W. (1998). What's so boring about vigilance? In R. R. Hoffman, M. F. Sherrick, & J. S. Warm (Eds.), *Viewing spychology as a whole: The integrative science of William N. Dember*. Washington, DC, US: American Psychological Association.

Schmitz, B., Klemke, R., & Specht, M. (2012). Effects of mobile gaming patterns on learning outcomes: a literature review. *International Journal of Technology Enhanced Learning, 4*(5-6), 345-358.

Schrag, Z. M. (2010). *Ethical imperialism: Institutional review boards and the social sciences, 1965–2009*: JHU Press.

Schwabe, G., & Göth, C. (2005). Mobile learning with a mobile game: design and motivational effects. *Journal of Computer Assisted Learning, 21*(3), 204-216.

Scott, S., & Palincsar, A. (2013). Sociocultural theory. *Education. com*, 1-10.

Scurtu, V., Dai Ho, V., Preda, M., & Dang, C. (2011). *Audiovisual descriptors for a linguistic educational engine.* Paper presented at the Fifth FTRA International Conference on Multimedia and Ubiquitous Engineering, Loutraki, Greece.

Sefton-Green, J. (2004). *Literature review in informal learning with technology outside school*. Retrieved from

Sekaran, U., & Bougie, R. (2013). Research Methods for Business: A Skill Building Approach. New Jersey: John Willey and Sons. In: Inc.

Sharples, M., Taylor, J., & Vavoula, G. (2010). A theory of learning for the mobile age. In *Medienbildung in neuen Kulturräumen* (pp. 87-99): Springer.

Shen, C.-H. C. (2014). *Differentiating Digitally to Investigate Young EFL Learners.* Paper presented at the 14th International Conference on Advanced Learning Technologies (ICALT), Athens, Greece.

Shih, Y.-C., & Reynolds, B. L. (2015). Teaching adolescents EFL by integrating Think-Pair-Share and reading strategy instruction: A quasi-experimental study. *RELC Journal, 46*(3), 221-235.

Simonova, I. (2015). *Mobile-assisted language learning in technical and engineering education: Tools and learners' feedback.* Paper presented at the International Conference on Interactive Collaborative Learning (ICL), Florence, Italy.

Six to Start, & Alderman, N. (2012). Zombies, Run! (computer program). London: Six to Start.

Skogberg, B. (2010). *Android application development.* (Bachelor's thesis), Malmö University,

Soler, C., Zacarías, A., & Lucero, A. (2009). *Molarcropolis: a mobile persuasive game to raise oral health and dental hygiene awareness.* Paper presented at the Proceedings of the International Conference on Advances in Computer Enterntainment Technology.

Souriyavongsa, T., Abidin, M. J. Z., Sam, R., Mei, L. L., & Aloysius, I. B. (2013). Investigating learning English strategies and English needs of undergraduate students at the National University of Laos. *English Language Teaching, 6*(10), 57.

Southerton, C. (2014). Zombies, run!': Rethinking immersion in light of nontraditional gaming contexts. In D. Polson, A. M. Cook, & J. T. Velikovsky (Eds.), *Transmedia practice: A collective approach* (pp. 1-11): Interdisciplinary Press.

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences, fifth edition*. US: Routledge.

Straight, R. M. (2015). *An exploratory study of augmented reality and mobile games examining ingress player motivation and potential educational value.* (PhD's Thesis), Ohio University,

Suleiman, S. (1983). *Teaching English to Arab students at the university level.* Paper presented at the First Conference on the Problems of Teaching English Language and Literature at Arab Universities. University of Jordan, Amman, Jordan.

Sun, J. C.-Y., & Chang, K.-Y. (2016). Design and development of a location-based mobile learning system to facilitate English learning. *Universal Access in the Information Society, 15*(3), 345-357.

Sundar, S. S., & Kim, J. (2005). Interactivity and persuasion: Influencing attitudes with information and involvement. *Journal of Interactive Advertising, 5*(2), 5-18.

Sung, H.-Y., Hwang, G.-J., & Yen, Y.-F. (2015). Development of a contextual decision-making game for improving students' learning performance in a health education course. *Computers & Education, 82*, 179-190.

Sung, Y.-T., Chang, K.-E., & Liu, T.-C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education, 94*, 252-275.

Sung, Y.-T., Chang, K.-E., & Yang, J.-M. (2015). How effective are mobile devices for language learning? A meta-analysis. *Educational Research Review, 16*, 68-84.

Suwantarathip, O., & Orawiwatnakul, W. (2015). Using mobile-assisted exercises to support students' vocabulary skill development. *Turkish Online Journal of Educational Technology-TOJET, 14*(1), 163-171.

Sweidan, S. Z., & Darabkh, K. A. (2018). VREG: A virtual reality educational game with Arabic content using android smart phone. *Journal of Software Engineering and Applications, 11*, 500-520.

Szalma, J. L. (2014). On the application of motivation theory to human factors/ergonomics: Motivational design principles for human–technology interaction. *Human factors, 56*(8), 1453-1471.

Tao, S.-Y., Huang, Y.-H., & Tsai, M.-J. (2016). *Applying the flipped classroom with game-based learning in elementary school students' english learning.* Paper presented at the The Fifth International Conference on Educational Innovation through Technology (EITT), Tainan, Taiwan.

Teall, E., Wang, M., & Callaghan, V. (2011). *A synthesis of current mobile learning guidelines and frameworks.* Paper presented at the E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, Montreal, Quebec, Canada.

Team Bondi. (2011). LA Noire (computer program). Sydney: Rockstar Games.

Thajakan, N., & Sucaromana, U. (2014). Enhancing English phonemic awareness of Thai grade one students through multimedia computer-assisted language learning. *Theory & Practice in Language Studies, 4*(11), 2294-2301.

Thang, S. M., Wong, F. F., Noor, N. M., Mustaffa, R., Mahmud, N., & Ismail, K. (2012). Using a blended approach to teach English for academic purposes: Malaysian

students' perceptions of redesigned course materials. *International Journal of Pedagogies and Learning, 7*(2), 142-153.

The Glossary of Education Reform. (2015, July 07). Hidden curriculum. Retrieved from https://www.edglossary.org/hidden-curriculum/

Thurairaj, S., Hoon, E. P., Roy, S. S., & Fong, P. W. (2014). *English language usage in SNS and mobile phones: A bane or boon?* Paper presented at the 13th European Conference on e-Learning, Copenhagen, Denmark.

Trân, D. (2008). *Motivation and Persuasion in E-learning*. Retrieved from

Traxler, J. (2007). Defining, Discussing and Evaluating Mobile Learning: The moving finger writes and having writ… In: *The International Review of Research in Open and Distance Learning*, *8*(2).

Vaishnavi, V., & Kuechler, W. J. J. (2004). Design science research in information systems. *20*, 2004.

Valk, J.-H., Rashid, A. T., & Elder, L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *The International Review of Research in Open and Distributed Learning, 11*(1), 117-140.

Van Aken, J. E. (2005). Management research as a design science: Articulating the research products of mode 2 knowledge production in management. *British journal of management, 16*(1), 19-36.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*(4), 342-365.

Viberg, O., & Grönlund, Å. (2013). Cross-cultural analysis of users' attitudes toward the use of mobile devices in second and foreign language learning in higher education: A case from Sweden and China. *Computers & Education, 69*, 169-180.

Vistawide (n.d.). Why learn languages? 10 good reasons why you should be learning a foreign language Retrieved from http://www.vistawide.com/languages/why_languages.htm

Wang, M., Shen, R., Novak, D., & Pan, X. (2009). The impact of mobile learning on students' learning behaviours and performance: Report from a large blended classroom. *British Journal of Educational Technology, 40*(4), 673-695.

Weger, H. D. (2013). Examining English language learning motivation of adult international learners studying abroad in the US. *RELC Journal, 44*(1), 87-101.

Wei, Y., & So, H.-J. (2012). *A three-level evaluation framework for a systematic review of contextual mobile learning.* Paper presented at the 11th International Conference on Mobile and Contextual Learning Helsinki, Finland.

Weiss, T. R. (2017, June 20). 5 Billion people now subscribe to mobile services around the world. Retrieved from http://www.eweek.com/mobile/5-billion-people-now-subscribe-to-mobile-services-around-the-world

West, D. M. (2015). *Connected learning: How mobile technology can improve education*. Retrieved from Washington,DC, US:

Wiafe, I., & Nakata, K. (2012). Trends in persuasive systems design: Techniques, methods and application domain. *International Journal of Societal Applications of Computer Science, 1*(2), 84-92.

Wicha, S., & Temdee, P. (2013). *A Situated English vocabulary and conversation learning system (SEVCLS) for Thai rural residents.* Paper presented at the 13th International Symposium on Communications and Information Technologies (ISCIT), Samui Island, Thailand.

Wilson, L. O. (n.d.). Three domains of learning – cognitive, affective, psychomotor. Retrieved from http://thesecondprinciple.com/instructional-design/threedomainsoflearning/

Wlodkowski, R. J., & Ginsberg, M. B. (2017). *Enhancing adult motivation to learn: A comprehensive guide for teaching all adults*: John Wiley & Sons.

Wolf, M. J. (2008). *The video game explosion: A history from PONG to playstation and beyond*: ABC-CLIO.

Wong, L.-H., & Looi, C.-K. (2010a). *Mobile-assisted vocabulary learning in real-life setting for primary school students: Two case studies.* Paper presented at the 6th International Conference on Wireless, Mobile and Ubiquitous Technologies in Education (WMUTE), Kaohsiung, Taiwan.

Wong, L.-H., & Looi, C.-K. (2010b). Vocabulary learning by mobile-assisted authentic content creation and social meaning-making: two case studies. *Journal of Computer Assisted Learning, 26*(5), 421-433.

Wouters, P., Nimwegen, V. C., Oostendorp, V. H., & Spek, E. V. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology, 105*(2), 249.

Wright, W., & Bogost, I. (2007). *Persuasive games: The expressive power of videogames*: Mit Press.

Wu, Q. (2015). Designing a smartphone app to teach English (L2) vocabulary. *Computers & Education, 85*, 170-179.

Wu, T. T. (2018). Improving the effectiveness of English vocabulary review by integrating ARCS with mobile game-based learning. *Journal of Computer Assisted Learning, 34*(3), 315-323.

Wylie, C. G., & Coulton, P. (2009). *Mobile persuasive exergaming.* Paper presented at the International IEEE Consumer Electronics Society's Games Innovations Conference, London, United Kingdom.

Xiao, J., & Luo, Y. (2014). *The speech evaluation method of English phoneme mobile learning system.* Paper presented at the Workshop on Advanced Research and Technology in Industry Applications (WARTIA), Ottawa, ON, Canada.

Yang, F.-C. O. (2012). *Using personalized VLS on mobile english vocabulary learning.* Paper presented at the Seventh International Conference on Wireless, Mobile and Ubiquitous Technology in Education (WMUTE), Takamatsu, Japan.

Yang, M.-T., & Liao, W.-C. (2014). Computer-assisted culture learning in an online augmented reality environment based on free-hand gesture interaction. *IEEE Transactions on Learning Technologies, 7*(2), 107-117.

Yapp, E. (2014, October 29). Asian smartphone use eclipsing the West: Google-TNS survey. Retrieved from http://www.digitalnewsasia.com/mobile-telco/asian-smartphone-use-eclipsing-the-west-google-tns-survey

Yilmaz, R. M. (2016). Educational magic toys developed with augmented reality technology for early childhood education. *Computers in Human Behavior, 54*, 240-248.

Yoganathan, D., & Kajanan, S. (2013). *Persuasive Technology for Smartphone Fitness Apps.* Paper presented at the Pacific Asia Conference on Information Systems (PACIS), Jeju Island, South Korea.

Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., . . . Yukhymenko, M. (2012). Our princess is in another castle: A review of trends in serious gaming for education. *Review of Educational Research, 82*(1), 61-89.

Yu, S., Chen, I.-J., Yang, K.-F., Wang, T.-F., & Yen, L.-L. (2007). A feasibility study on the adoption of e-learning for public health nurse continuing education in Taiwan. *Nurse Education Today, 27*(7), 755-761.

Zarzycka-Piskorz, E. (2016). Kahoot it or not? Can games be motivating in learning grammar? *Teaching English with Technology, 16*(3), 17-36.

Zughoul, M. R. (1987). Restructuring the English department in Third World universities. *IRAL: International Review of Applied Linguistics in Language Teaching, 25*(3), 221.

LIST OF PUBLICATIONS AND PAPERS PRESENTED

Elaish, M. M., Shuib, L., Ghani, N. A., Yadegaridehkordi, E., & Alaa, M. (2017). Mobile learning for English language acquisition: Taxonomy, challenges, and recommendations. *IEEE Access, 5*, 19033-19047.

Elaish, M. M., Shuib, L., Ghani, N. A., & Yadegaridehkordi, E. (2019). Mobile English Language Learning (MELL): A literature review. *Educational Review, 71*(2).

Elaish, M. M, Shuib, L., Ghani, N. A., Mujtaba, G., & Ebrahim. N. A. (2019). A bibliometric analysis of mobile learning from topic inception to 2015. *International Journal of M-learning and Organisation, 13*(1), 91-112.

Elaish, M. M, Ghani, N. A., Shuib, L., & Al-Haiqi. A. M. (2019). Development of a mobile game application to boost students' motivation in learning English vocabulary. *IEEE Access, 7,* 13326 - 13337.

Elaish, M. M., Ghani, N. A., Shuib, L., & Al-Haiqi, A. M. (2018). Mobile games for language learning. In *Mobile Applications and Solutions for Social Inclusion* (pp. 137-156). IGI Global.

Elaish, M. M., Ghani, N. A., & Shuib, L. (2017). *Mobile game applications (MGAs) for English language learning: A guideline for development*. 94th IASTEM International Conference, Kuala, Lumpur, Malaysia, 11-16.

Elaish, M. M., Ghani, N. A., Shuib, L., & Shennat, A. I. (2019). Game framework to improve English language learners' motivation and performance. In: Arai K., Bhatia R., Kapoor S. (eds), *Advances in Intelligent Systems and Computing: Proceedings of the Future Technologies Conference (FTC) 2018* (pp. 1029-1040). Springer, Cham.