Effectiveness of Avatars Representing Teachers in M-learning in Saudi Arabia Higher Education

By

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Abstract

The aim of this research has been to investigate how m-learning can be used to complement traditional learning environments in Higher Education in Saudi Arabia. Specific attention has been paid to how engagement and performance in learning can be influenced by the type of avatar representation of the teacher on the mobile device, which might be in the form of video, audio, image, cartoon or simple text. This study enhances the field of knowledge related to m-learning via three main contributions which are described and developed as the thesis progresses.

Firstly, the research develops, as an extension to the traditional technology acceptance model (TAM), an educational model, MADE-ME (Multi Avatar Delivery Environment for Mobile Education). This model defines how students can interact with different avatar representations of the teacher to deliver learning content. The model shows the relationships between factors such as engagement, interactive elements, gender, major of study, pedagogical performance, etc.

Secondly the research produces a framework MADE-ME (Multi Avatar Delivery Environment for Mobile Education) web-app that enables a range of avatars to represent the teacher in their purpose of delivering interactive learning content via mobile technologies, and which allows students to be tested on how much they have learnt from the content or lesson.

Thirdly, a comprehensive case study is undertaken with student groups studying on a compulsory English language module as part of their higher education in Saudi Arabia to determine how they engaged with the mobile content and how effective their learning was to evaluate and to validate the MADE-ME model and app. The data was collected by a mixed methods approach and used REGRESSION and UNIANOVA techniques for analysing the quantitative data from questionnaires, and a thematic approach for analysing qualitative data from open-ended questions.

The thesis concludes with recommendations for implementing m-learning in Saudi higher education, limitations of the current study and suggestions for further research.

DECLARATION

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Elements of the research presented in this thesis have been published in or submitted to academic journals and conference proceedings. A list of these first-authored publications and submissions can be found at the beginning of the thesis.

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DEDICATION

To my beloved parents, father Saeed, and my mother Nafra, who sadly passed away in the summer of 2005. Gone but never forgotten.

my lovely wife, Amal

my jewel daughters, Jumanah and Sulaf

my brothers and sisters

Ali Alowayr Publication List

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ABBREVIATIONS AND ACRONYMS

- AT: attitude toward
- CAGR: Compound Annual Growth Rate
- CSCL: Computer-Supported Collaborative Learning
- D-learning: Distance Learning
- E-learning: Electronic learning
- HCI: Human computer interactions
- ICT: Information and Communication Technology
- ICT: Information Communication Technology
- LMS: Learning Management System
- MADE-ME: Multi Avatar Delivery Environment for Mobile Education
- MALL: Mobile Assistance Language Learning
- M-learning: Mobile learning
- MOOCs: Massive Open Online Courses
- NCELDE: The National Centre for E-Learning and Distance Learning
- PC: Personal Computer
- PEOU: perceived ease of use
- PU: perceived usefulness
- SA: Saudi Arabia
- SDL: Saudi Digital Library
- SMS: Text Message Service
- STC: Saudi Telecom Company
- TAM: Technology Acceptance Model
- USP: Unique Selling Point
- UTAUT: Unified Theory of Acceptance and Use of Technology
- VLEs: Virtual Learning Environments
- VLEs: Virtual Learning Environments
- WAP: Wireless Application Protocol

1 Introduction

1.1 Preface of the Area

Information and Communication Technology (ICT) has grown tremendously over the past two decades, and this has had a great impact on the education system in general. No longer are classrooms restricted to the teacher-student environment; instead, there is increasing use of technology, to supplement traditional teaching methods. Initially, the use of technology was restricted to the classroom or laboratory environment and, whilst this offered a richer set of teaching resources, the physical limitations of desktop computers meant that students could not access learning materials in a place or location outside of their classrooms or schools (Mupfiga et al., 2017).

Growth in the use of programs for PCs, more affordable laptops, and improvements in communications technology facilitated the development of e-learning, leading to an increase in learner interactions, remote instructors and the delivery of knowledge and content to learners at a time and place convenient to them (Bidin & Ziden, 2013). E-learning courses also provided the opportunity for a social learning environment to be developed, portrayed by participation and interactivity for both learners and teachers (Brindley & Walti, 2009). In the 2000s, virtual learning environments were introduced to facilitate student involvement in the learning process and to provide them with access to a range of educational resources (Guy, 2009), as well as MOOCs (Massive Open Online Courses) as a means of delivering short courses to large cohorts of online learners (Michael, 2016).

Recently there has been a huge growth in the smartphone and tablet market across the world. Forrester research shows that this rate of growth is increasing steeply and by 2019, it is expected to reach 3.5 billion subscribers (Meena, 2014). The percentage of companies that planned to provide m-learning support for their staff rose from 38.5% in 2007 to 51% in 2011 (Quinn, 2011), indicating great potential for mobile applications to have significant penetration in the education marketplace (Meena, 2014). İşman et al. (2015) reported that the revenues generated in the Middle East in 2012 for m-learning products were $88.3 million, with estimated revenues for 2017 likely to more than double to $205.4 million.

As a result of this growth, teaching organisations in developed and some developing countries, including Saudi Arabia, are now adopting new teaching methods, informal learning approaches and emerging technologies, such as smartphones and tablets, to support the delivery of learning skills, materials, collaboration, knowledge sharing and lifelong learning (Hawkins, 2016; Bidin & Ziden, 2013). It can be said that m-learning has taken the advantages of e-learning even further by allowing easy access to study resources whilst "on-the-move" as part of blended, informal or distance learning (Ng & Lindgren, 2013; Omale et al. 2010; Nassuora, 2013).

Saudi Arabia is one of the world's fastest growing economies with growth in the education sector and use of ICT being key indicators of this economic development (Alhabeeb & Rowley, 2017; Elyas & Picard, 2010; Almarwani, 2011; Alothmanet al. 2017). To benefit from this growth, the higher education system in Saudi Arabia has been observed to have made significant progress in the implementation and adoption of technologically advanced systems and student learning approaches in response to global shifts towards modern educational methods (Al-Fahad, 2009). Indeed, most Saudi universities have set up e-learning and distance learning „deanships" to integrate the elements of e-learning across the entire educational pathway, from transforming traditional learning methods, to making lessons accessible to all students (Algahtani, 2011), and latterly to a focus on m-learning.

Recent developments in mobile technologies have highlighted their potential for use in formal education. For example, a study by Al-Fahad (2009) on mobile learning technologies and the perception of these technologies, suggests that mobile learning could pave the way to better student retention and understanding, thus becoming a very useful tool that aids education. Nassuora found that despite mobile learning being in the early stages of development in Saudi Arabia, the acceptance rates of m-learning technologies were quite high amongst both students and teachers alike. However, he also stated that full-scale studies of every aspect about m-learning will be needed as m-learning in Saudi Arabia progresses beyond its initial phase (Nassuora, 2013).

While much research has been conducted from various perspectives in mobile learning around the world, as yet, there is a lack of focussed research on the use of avatars for mobile learning globally and particularly in Saudi Arabia, despite studies showing that

this might be an important consideration for student engagement and achievement. For example, Ng & Lindgren examined the effects of avatar customisation and narrative on engagement and learning in video games, and have suggested that future studies could look at learners‟ interactions as a way of achieving excellent teaching and learning outcomes (Ng & Lindgren, 2013), and a study by Falloon showed that the use of avatars could provide for "a powerful, motivating, and educationally valuable learning opportunity" (Falloon, 2010).

The primary aim of this research is to investigate the increasing interest in m-learning from an educational point of view in Saudi Arabia and to ascertain how m-learning can be used as a tool to complement and/or substitute traditional learning environments. Within this general consideration of m-learning, specific attention is paid to the ways in which engagement and performance in learning can be influenced by the type of avatar representation of the teacher on the mobile device, which might be in the form of video, audio, image, cartoon or simple text. In other words, this study investigates how different ways of delivering learning content to students can influence learning outcomes especially when they are away from the traditional classroom. An extension to the traditional technology acceptance model (TAM) (Davis, 1985), is made to describe the interactions between avatar types, student preferences and pedagogic performance for m-learning in a Saudi context.

1.2 Research Objectives

For the purpose of this thesis, key terms are defined as following in the Table 1 - 1.

Table 1 - 1 Definition of key terms

Term	Definition	Purpose
M-learning	The learning that occurs across multiple contexts, through social and content interactions, using a personal electronic device (Crompton et al. 2016).	Domain of study
Avatar	A visual representation of human characters on the mobile interface in an educational environment (Haake, 2006).	Focus of study
Model	A simplified representation of a real system with any hypotheses required to describe the conceptual system, often statistically. A model concentrates on predicting how factors rely on or influence other factors based on formal	Conceptual solution to problem

	relationships that allow the conversion of numerical data into useful information (Adam & Pomerol, 2009).	
Framework	A physical or real representation of the model as layers of an application system that can be implemented with the intension to support the building of something that expands the structure into something useful (Rouse, 2015).	Physical representation of the model
Mobile Web-app	A small specialised program accessed or downloaded onto mobile devices such as iPhones/smart phones, tablets or iPads (Northern Ireland Social Care Council, 2014).	Implementation of the model on digital of the content
Experiment	Division of participants into two or more groups to test the effect of a specific treatment. The group that receives the training or series of runs is called the experimental group (Mertens, 2014).	Case study

To accomplish the main aim of the research, the following objectives apply:

1. To identify the main benefits, opportunities and challenges of m-learning when adopted in Saudi Arabia from a students‟ perspective, and to investigate students‟ readiness and willingness to use an m-learning approach in their studies within the context of a specific module within their degree courses.

2. To investigate the most preferred/engaging avatar representation of a teacher (audio, video, image, cartoon, text) for delivery of learning content via mobile technology.

3. To develop an educational model that links delivery of learning content via mobile technologies with pedagogical performance by:
   a) Setting the variables and factors that align with the research context.
   b) Testing a set of hypotheses to determine whether engagement with specific avatar types has a significant impact on pedagogical performance.

4. To design and create the framework for an online web-app that can deliver m-learning content to a mobile device via different avatar representations of the teacher (audio,

video, image, cartoon, text) and which can be used to test the pedagogical effectiveness of each approach by:

a) Constructing different m-learning avatar interfaces.

b) Delivering the content via mobile web-app.

c) Testing students‟ pedagogic performance of avatar interface type through the mobile we-app.

d) Providing students with the opportunity to co-create and re-design their best m-learning interface framework based on their opinions, preferences and performance.

5. To evaluate the proposed m-learning model and web-app through:

a) Testing the effectiveness of engagement and pedagogical performance through a first stage of experimental design via questionnaires and exam scores.

b) Assessing the second round of experiments based on participants‟ perceptions through a second stage of experimental design via questionnaires and exam scores.

1.3 Research Questions

Linked to these objectives the central questions of the research are:

1) What are the benefits, opportunities and challenges that m-learning can bring to the student population within specific higher education institutions in Saudi? (Objective 1)

2) What is the preferred/most engaging way of representing the teacher through an avatar (audio, video, image, cartoon, text) on a mobile device? (Objective 2)

3) Is there a significant relationship between students‟ preference for engagement with particular avatar types and their pedagogic performance; and can such potential relationships be represented on the research model? (Objective 3)

4) How can different avatar representations of the teacher be used to develop and deliver learning content via a mobile web-app in order to engage students and improve their pedagogic effectiveness? (Objective 4)

5) What conclusions can be drawn by investigating the links identified through the evaluation of engagement and pedagogical performance in m-learning when the teacher is represented by different avatar types using a cohort of students studying on a degree course at a university in Saudi Arabia? (Objective 5)

1.4 Research Contribution or the Novelty of the Research

This study enhances the field of knowledge related to m-learning via three main contributions which will be described and developed as the thesis progresses, in summary:

1- This research develops an educational model, MADE-ME (Multi Avatar Delivery Environment for Mobile Education). This model defines how students can interact with different avatar representations of the teacher to deliver learning content. The model shows the relationships between factors such as engagement, interactive elements, gender, major of study, pedagogical performance, etc.

2- This research produces a framework MADE-ME (Multi Avatar Delivery Environment for Mobile Education) web-app that enables a range of avatars to represent the teacher in their purpose of delivering interactive learning content via mobile technologies, and which allows students to be tested on how much they have learnt from the content or lesson.

3- A comprehensive case study and investigation of perceptions from student groups studying a particular module in higher education in Saudi Arabia in order to determine how they engaged with the mobile content and how effective their learning was in order to evaluate and validate the MADE-ME model and app. The data was collected by the mixed methods approach: using REGRESSION and UNIANOVA techniques for analysing the quantitative data from questionnaires, and the thematic approach used for analysing qualitative data from the open-ended questions.

1.5 Thesis Organisation

The research takes a scientific approach in order to devise the model and framework that are the key contributions. The thesis has been structured with the following chapters:

Chapter 2 discusses the Saudi Arabian education system, including the impact that culture and gender have on teaching delivery. The importance of introducing technology into higher education in Saudi Arabia and its current use in learning is discussed, as is the importance placed on the teaching of English to Saudi students.

Chapter 3, further introduces the concept of m-learning, and reviews literature related to the benefits and opportunities afforded by m-learning as well as some of the current challenges and barriers associated with it. The chapter also introduces the Technology Acceptance Mode (TAM) and some of its derivatives as a starting point for the development of a model to describe acceptance of m-learning in Saudi Arabia and the motivation for investigating this.

Chapter 4 covers topics related to user experience and how good design can impact on the use of technology for education. The chapter then discusses what avatars are, their origins and how they can be used as part of the learning process, some of the benefits of avatars and examples of avatars in a learning context are also given. It also introduces the integration of Human Computer Interactions (HCI) components and multimedia into the interface design and how these affect/influences by the learning theories and styles.

Chapter 5 reiterates the research aim and questions, and describes the research methodology and experimental design of the studies undertaken during the course of the research. An explanation of the research methodology used is provided, as well as the research approach, ethical considerations and data collection techniques which include pre and post questionnaires/surveys for the first and second studies and co-creation workshop with students in order to incorporate other collaborative and interactive elements.

Chapter 6 describes how the different m-learning technology acceptance models introduced in Chapter 3 can be combined and extended to develop a new pedagogical

model constructed specifically for this research to align m-learning in a Saudi context with human mobile interaction. This model included factors that might affect and optimise the m-learning for English content delivery. It also develops a number of hypotheses to be tested regarding characters in the model such as engagement, enjoyment, convenience, gender, interactive multimedia, performance expectancy, effectiveness and behavioural intention to use m-learning.

Chapter 7 describes the development and implementation of the m-learning web-application („web-app") framework using avatars which were developed to represent the teacher and deployed by using specific software for the selected institution to understand how well students can engage with the m-learning environment using avatars. Moreover, this web-app was also designed to enable the testing of how much a student has learnt from the content or lesson. In addition, this web-app is used to validate the relationships between factors based on the research model.

Chapter 8 presents the findings of the data collected. Qualitative and quantitative analyses are conducted to provide a better perspective of the problem and the current state. The m-learning application using avatars is also evaluated based on a pedagogical perspective. Quantitative data are analysed by using SPSS version 21. The open-ended questions and workshop comments are analysed by adopting the thematic analysis procedure.

Chapter 9 discusses and interprets the findings obtained from the data analysis and also presents the links between the results and the research hypotheses. In addition, consistencies and differences with other studies" findings are covered in this chapter. The research questions are revisited and the theoretical contribution for implementing this approach to learning is discussed.

Chapter 10 highlights the main contribution of this research. The chapter covers a summary of the research model and its implication to the field. It also summarises the developed web-app framework and draws together the recommendations for implementing m-learning in Saudi higher education that been found from the research findings. Lastly, it high lights the limitations and challenges the researcher encountered, and suggestions for further research areas are then presented.

1.6 Chapter Summary

This introductory chapter has presented a brief background to the area of study outlining the research problem, the current situation of m-learning in Saudi Arabia, the aim and its objectives together with the research questions that the study will address. Figure 1 - 1 provides an overview of the chapters‟ organisation.

The organisation of this thesis is shown in the following diagram.

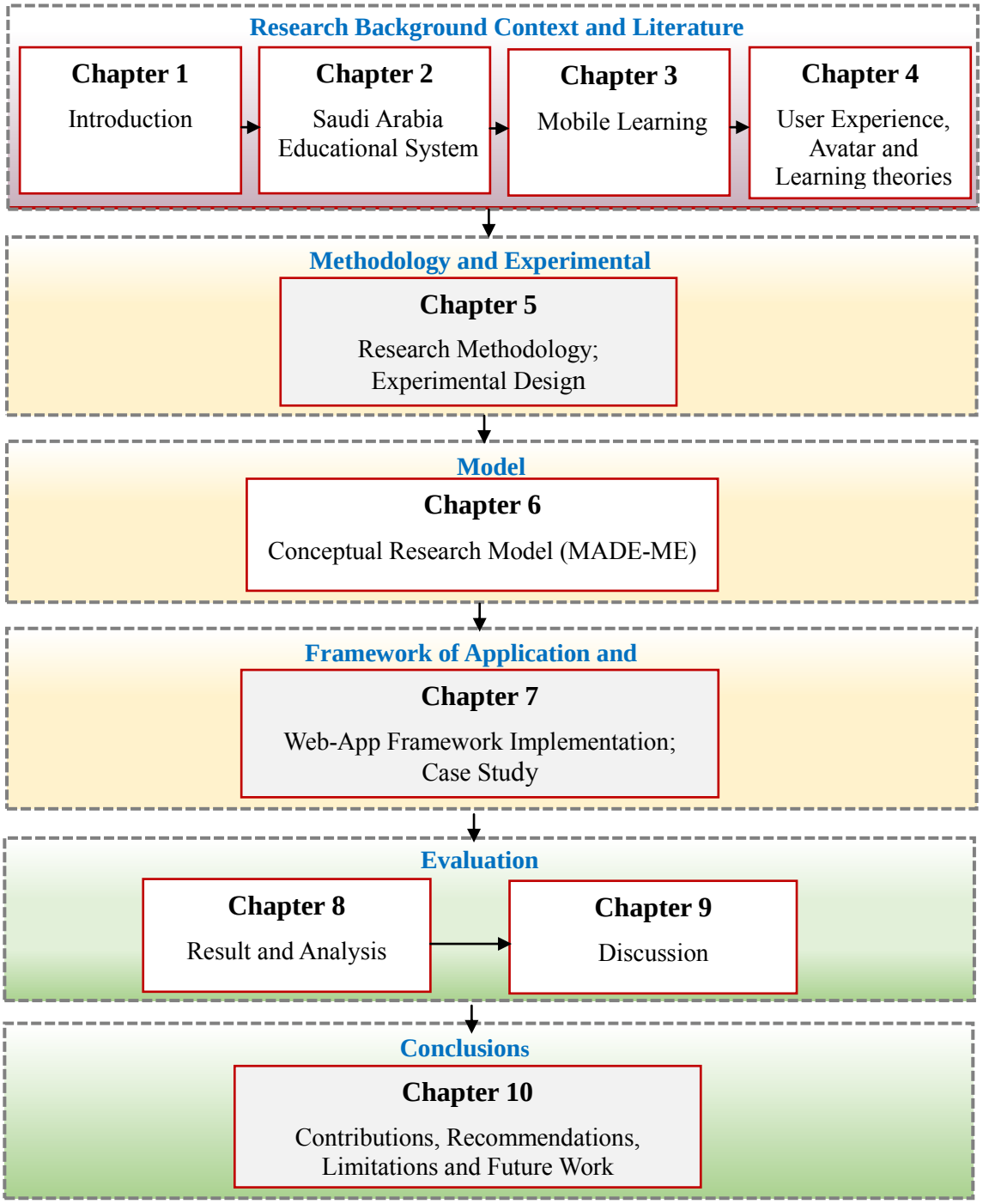


Figure 1 - 1 An overview of the chapters organisation

The next chapter provides the background and research context for education in Saudi Arabia.

2 Education System in Saudi Arabia

2.1 Introduction

There are various aspects that need to be considered while implementing advanced technologies to assist m-learning in higher education institutions. These aspects not only include the technological concerns but also relate to educational theories, acceptance of the technology, and cultural aspects. Care should be taken to understand the proposed scenario from these perspectives in order to establish how technology can be used to enhance the learning experience. This chapter sets the context of the research by describing the Saudi education system and important factors associated with it that might influence the parameters and focus of the research.

2.2 Education System and Context

The educational system in Saudi Arabia includes a variety of paths to cover the different needs of students. Compulsory education comprises six years of primary school, three years of secondary school, and is followed by three years of high school (Ghaith, 2013).

With regards to education after high school, students can progress to higher educational programs through either studying at public or private universities. In Saudi Arabia, the number of universities has grown over the past decade in response to the increasing population and an era of oil boom (Abubakar et al. 2016). There are currently 52 universities and colleges in Saudi Arabia, including 24 public universities, 8 private universities and 20 private colleges (Alfarani, 2016; MOE, 2015). The public universities are coordinated and funded by the Ministry of Higher Education (Abubakar et al. 2016). The government of Saudi Arabia has allocated a huge budget to this Ministry, recently investing around $57.9 billion in education, which represents 25 percent of the country's appropriations (Ministry of Finance, 2015). These universities provide a variety of disciplines including, Medicine, Engineering, Computer Science, Sciences, Business Administration and Arts. All curriculums of these mentioned disciplines must be taught in the English language.

The government of Saudi Arabia is looking to improve the quality of teaching and learning in its universities, not only by improving traditional teaching methods, but also

by improving learning through provision of various technologies ,increasing flexibility of learning, promoting a better learning atmosphere, improving cognition, enhancing the learning experience, and encouraging students to be more interactive and to actively participate in class through the adoption of new learning technologies including those to support online learning (Al-Fahad, 2009).The advantages of adopting technologies such as mobile learning in higher education for students have been well reported in previous studies, for example, (Al-emran et al. 2016; Aldhaban, 2016) and will be considered in the context of this thesis in Chapter 3 alongside potential challenges. It should be mentioned here, however, that although one of the barriers to implementing m-learning in developing countries is often the high cost of owning a device which is reliable and has multimedia functions to enable learning, Saudi Arabia has one of the world‟s richest economies and students get paid a monthly allowance while they study in higher education and hence can readily afford such devices (Alfarani, 2016).

2.3 Culture and Gender in Education in Saudi Arabia

Saudi Arabia has a gender-segregated education system which reflects the traditional and cultural expectations of its society. Studies show that the demand for good education in Saudi Arabia is high, and that use of technology is also generally high driven in part by this gender based segregation (Alharthi et al., 2017; Alothman et al., 2017). Further and higher education institutions are using technology to provide teleconferencing and video conferencing to promote the mobility of women. These technologies play a key role in the education sector of Saudi Arabia as they promote and facilitate the acceleration of access to good education without a gender bias (Baki, 2004). However, some researchers argue that although there are these steps taken by the education sector to bridge the gender gap, there needs to be a significant change in the adoption of technology in order for access to education to reach all students and in order to promote an environment where there is significant participation amongst students (Al-Alwani, 2005; Baki, 2004). Additionally, some academic staff members feel that the use of technology does not provide enough incentives (Naveedet al., 2017), leading to some researchers identifying that there is a lack of enthusiasm to implement learning technologies by educational institutions and a lack of resources and trained staff to oversee the implementation in order to harness the benefits of these technological innovations (Al-Alwani, 2005; Naveedet al., 2017).

Gender segregation and the cultural expectations of society in upholding its beliefs and traditions have a profound impact on the education system in Saudi Arabia. Saudi Arabia has a distinct cultural and intellectual stance when compared to Western countries. Various traditions, beliefs and behaviours affect the implementation of technology in the educational sector, and these are quite different to Western culture (Alfarani, 2016), for example, the demographic variables (such as gender) influenced by the cultural traditions and norms of the country. The perceived usefulness of technology and the role technology plays in the education sector are also different when compared with Western counterparts (Hsu, 2013). While implementing technologies for education, there is a significant need for developers to understand these cultural perceptions and to ensure that the design and development of such technologies suit the needs and wants of the learners (Baker et al., 2007). Many researchers support this theory of planned behaviour, for example, Alenezi et al., (2010) and Seliaman & Al-Turki (2012) argue that it is imperative that cultural and social norms are taken into account while developing technology in order to improve its perceived usefulness. Technologies can be successfully implemented, if and only if, they are perceived to be useful by the end-users. For this implementation to be achieved, it becomes mandatory that the end-users can relate well to the technology and that it is visually appealing. The visual appeal of technologies can be achieved when users are presented with an environment which they are used to and which does not offend their beliefs (Al-Alwani, 2005). Therefore, whilst the use of available technologies in an educational field could help to overcome cultural issues and increase pedagogical performance, this can only occur if attention is paid to the users requirements.

2.4 Driving Forces for Technology in Education

In the modern era, the use of technology cannot be understated. Technology plays a key role in teaching and learning. Implementation of good technologies helps overcome various learning barriers and also provides a means to increase student interaction and participation (Brown, 2000). Many researchers support this theory and also argue that the use of technology in classrooms for the purposes of learning needs to be functional and reflect the „real world" as opposed to just traditional learning (Ghaith, 2013).

Education in Saudi Arabia is one of its fastest growing sectors and is also a key indicator of the economic development of the region (Alothmanet al. 2017). Given the growth rate of this sector, there is tremendous spending potential and universities and other higher education institutions are competing to provide better quality education that is accessible to both female and male students (Alharthi etal, 2017). From a Saudi Arabian context, technology plays an even more important role in the education sector as universities are finding it increasingly difficult to be able to employ skilled professionals to mentor students. Hence, universities are keen on implementing technologies such as smartphones to support the talented lecturers they employ and to help maximise the impact they can have on the quality of teaching (Alhabeeb & Rowley, 2017). With Saudi Arabia being the fourth largest user of the internet and other related technologies in the Arab world, this environment helps to leverage the use of technologies in an educational context (Al-Ghaith et al. 2010; Alothman et al., 2017).

Thus, technologies that promote education and provide opportunities for students to learn at their own pace and also use their creativity have now become very common in the country. Virtual learning environments that help collaboration between students and teachers through technology, such as smart phones, are also becoming a necessity, as opposed to a luxury for higher education institutions, and despite reservations by some teachers, students and other stakeholders universities are subsequently keen on looking at implementing technologies that would help students maximise their potential and help achieve a vibrant learning environment (Al-Fahad, 2009; Almalkiet al. 2013).

One key reason behind the motivation to study m-learning in Saudi Arabia is the rate of penetration of mobile technology in the country and correspondingly the growing potential to tap into the technology and leverage it for use in the academic field. Smartphone penetration is set to rise to 84% in Saudi Arabia by the end of 2016 among the very highest anywhere in the world according to Fox(2013), a figure backed up by historic data and from the Saudi Arabia Consumer Electronics Report 2010, where mobile phone sales accounted for around 22% in the year 2009 with expected the sales growth at the Compound Annual Growth Rate (CAGR) of 7% by 2014 (Report Linker, 2010 as cited in Chanchary & Islam, 2011), and from Our Mobile Planet statistics which show that roughly three in four people in Saudi Arabia own a smartphone, giving the

country one of the highest smartphone penetrations in the world (Fox, 2013) as shown Figure 2 - 1.

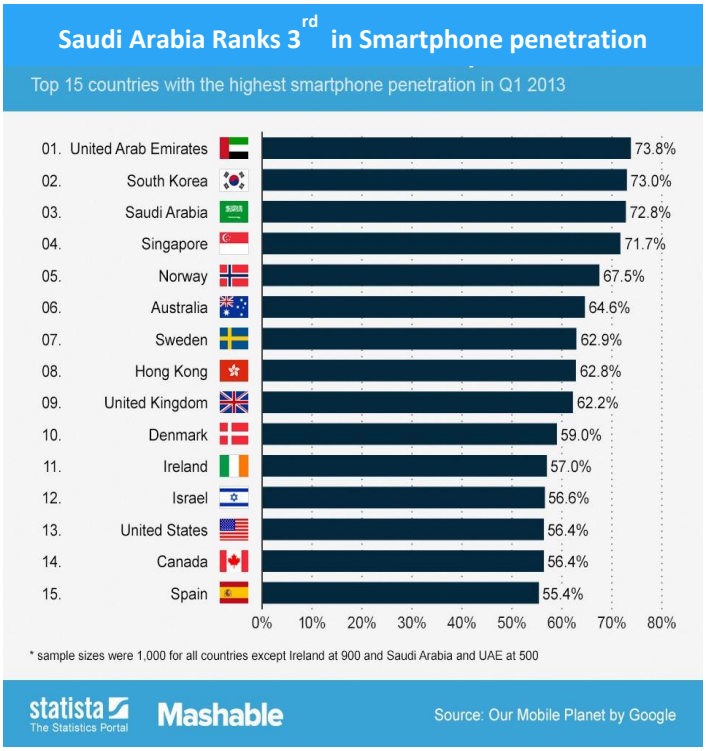


Figure 2 - 1 Countries with the highest smartphones penetration (Our Mobile Planet by Google (Fox, 2013)).

2.4.1 Current State of Technology in Saudi Arabia Higher Education

Studies have shown that the Saudi Arabian government and its educational institutions have made investments in terms of finance, time and resources to enhance the education system in the country (Alenezi et al., 2010). The government provides students with technological resources and computer tablets in order to motivate them to pursue education. Most students are provided with tablets, PCs and laptops including access to the internet in order to help them with their education (Alfarani, 2016). This engagement of the government and higher education institutions in Saudi Arabia to harness technological resources and promote a good education system has led to a significant increase in the number of students attending schools and taking up higher education (Alenezi et al., 2010). However, despite Saudi Arabia being categorised as one of the wealthiest countries from an economic point of view, its education environment is still considered to be that of a developing region (Alothman et al., 2017). Correspondingly, the question that arises is why, despite the enormous budget and resources that the Saudi Arabian government invests on developing education in the country, is the standard of education still low?

Many universities in Saudi Arabia constantly use technologies to aid day-to-day teaching. For example, video conferencing is used to facilitate male professors and lecturers teaching in female universities (Ismail et al. 2016). However, the lack of infrastructure in Saudi higher education is a major factor delaying further development, and may even decrease the quality of education in the country. The existence of generic smart technologies are gaining popularity in Saudi Arabian higher education institutions, but the usage of these technologies is small compared to higher education institutions worldwide (Al-zahrani, 2011). Also, Alenezi claims that whilst universities are willing to invest in tech-savvy tools and programs that would be appreciated by both the teachers and students alike, flexibility and improvement of skills are two main areas that universities must consider when implementing such technologies (Alenezi et al., 2010).

2.4.2 **Mobile Learning in Saudi Arabia**

Knowledge of the growth of e-learning within Saudi Arabia is important for understanding the background to m-learning. In educationally developing countries, such as Saudi Arabia, the evolution of e-learning in higher education has grown steadily (Jairak, Praneetpolgrang, & Mekhabunchakij, 2009). In the 1980s, e-learning started to appear in Saudi universities as an alternative learning approach to traditional face-to-face learning (Chanchary & Islam, 2011). Due to the rapid expansion of technology, personal computers became the most important tools of learning (Al-Fahad, 2009; Alshumaim & Alhassan, 2010), and in many cases, developments in technology have allowed students to study and communicate with teachers and peers through asynchronous tools in terms of distance learning or 'd-learning' (Al-Fahad, 2009).

Growth in technology has also given rise to a number of open universities in Saudi Arabia where e-learning platforms are common, and these open universities make use of e-learning technologies and platforms in order to support their distance education learners (Ismail et al. 2016; Alothman et al., 2017). The increase in education using d-learning can be described as a transitional step from PC learning to learning through mobile devices. Mobile learning was revealed in the 1990s with the successful development of Bluetooth and WAP (Wireless Application Protocol) which enabled students to access course materials 'on the go' (Nassuora, 2013), and which has subsequently developed to provide assisted teaching resources to support the students,

helping them to learn at their own pace, revisit material that they are not very comfortable with, and provide them with the flexibility to learn from any location. The concept of mobile learning is therefore not something new in the Saudi Arabian context. There are several applications for mobile devices which have been used at schools, working environments and in everyday life (Huang et al. 2010), and the Saudi government has funded a number of m-learning projects at many of the local universities, including Saudi Electronic University, King Imam Muhammad University, and King Abdul-Aziz University (Badwelan et al. 2016). Moreover, it has invested in a number of related infrastructure sub-projects, such as:

- The National Centre for E-Learning and Distance Learning (NCELDE).
- The National System for the Management of E-learning (JUSUR).
- The Learning Management System (LMS).
- The Saudi Digital Library (SDL).
- The Medicine Program at Qassim University (Almarwani, 2011; Badwelan et al. 2016).

These projects and systems show the rigorous infrastructure for online learning in the country which should support and encourage further integration of m-learning to take place.

In recent years, a number of studies have focused on learners‟ perceptions towards m-learning, such as users‟ acceptance of the technology and the impact of applying different m-learning approaches on students over traditional face-to-face learning (Abu-al-aish & Love, 2013; Alfarani, 2016). Given the high acceptance rates for mobile phone-related technologies in Saudi Arabia researchers believe that the acceptance rate will also be high for the implementation of such technologies in an educational context (Al-Fahad, 2009; Nassuora, 2013). However, an investigation into the acceptance of m-learning in Saudi Arabia by Seliaman and Al-Turki (2012), based on the extensive Technology Acceptance Model (TAM), concluded that, although there is a possibility of technology acceptance and higher perception of usefulness across Saudi Arabian staff and students, there are limitations when the technology does not offer innovation or use the state-of-the-art tools to develop a mobile learning platform (Seliaman & Al-Turki,

2012). Seliaman and Al-Turki also believe that there is a gap in using mobile learning technologies alongside regular education in Saudi Arabia.

2.4.3 **Importance of English for Saudi Students**

English is one of the most important languages in the world, and subsequently the teaching of English as an International language is becoming an increasingly important module in the universities of many developing countries, including those within Saudi Arabia. English is frequently the communication medium in fields such as education and business. Research from around the world shows that cross-border business communication is most often conducted in English (Geng & Chunling, 2017; Luo & Shenkar, 2017). Many opportunities in international regions and markets are created when learners have a working knowledge of English grammar. Its importance in the global market place therefore cannot be understated, and speaking and reading English opens up opportunities of job employment. It is therefore not surprising that English language is the dominant language of business and commerce within Saudi Arabia as well as the main language of instruction for university courses within the country (Almarwani, 2011).

Consequently, in Saudi Arabia, the English module is a core course to help prepare students for their instruction in English, and it must be completed and passed with a minimum mark of 60 percent by all undergraduate students in their first year of study in all universities (Sedgwick, 2001).

However, when trying to adopt a new technology in education, particularly in Saudi Arabia, there are some factors, such as cultural norms, which can affect the flow of uptake (Almarwani, 2011). The country is following gender-segregation of campuses whereby male instructors are not allowed to teach female students face-to-face. As a result of the gender policy, there is also a lack of female instructors but not of male instructors. Male instructors can therefore teach female students, through only via a closed circuit television system (Algahtani, 2011). In addition, male students cannot meet with female students or directly exchange their knowledge and experience.
Therefore, it is possible that m-learning can be used to more effectively support the current situation, which would help all students in general and female students

specifically, regardless of the segregation, so that both genders can access the same learning materials and achieve more positive outcomes.

2.5 Motivation for this Research

From this review it can be seen that Saudi Arabia is well placed both technologically and economically to implement m-learning within its universities, with the potential for enhancing the quality of its teaching as well as improving access to learning for both genders. The approach of teaching courses online has also been shown to be cost-effective enabling more students to be taught with fewer tutors than the number required for traditional face-to-face teaching (Wisneski et al. 2017).

One area where m-learning might have considerable potential is in the teaching of English language. A number of previous language studies focus on the use of mobile devices in different educational settings, including: listening skills, learning new vocabulary via SMS messaging, pronunciation, students‟ perceptions and students‟ usage (Eppard et al. 2016),however, there are few empirical studies about the use of mobile devices for teaching language grammar. The importance of this as an area within the context of this research is backed up by the performance and reviews of students from Al-Baha University. At Al-Baha University, students study 90% of their course modules and exams in English. Despite the extensive hours required for the English language module, there is a notable lack of student understanding about the English language in general, and in particular about grammar structures. Although importance is given to this module for university students, their levels of English language knowledge remains very low as noted while conducting this study (the average score of all students in the placement exam was only 28%. In addition, due to the extensive hours required for teaching this course, students frequently complain about having to attend a high number of lectures and they have indicated their desire to learn at their own time and place. Hence the concept of the adoption of m-learning as a way of delivering learning content needs to be investigated in order to tackle this issue.

Investment in developed and developing technologies and, Information and Communication Technologies (ICTs) to serve education in general and the provision of English learning in particular, may in turn improve the level of academic performance and enhanced the field of business.

2.6 Chapter Summary

This chapter has reviewed the educational system in Saudi Arabia, including the cultural aspects and how new technologies feed into this unique culture. This chapter helps to understand the cultural and the educational landscape in the country which needs to be kept in mind while designing and implementing new technology. For technological implementation to be successful, ensuring that the cultural values of the end users are respected plays a major role in determining how well the users are willing to engage with the technology. This chapter also described the introduction of technology into the Saudi education system and has identified the teaching of English language as a potential area that could benefit from the adoption of m-learning.

In the next chapter, the benefits and challenges associated with mobile learning and its introduction in the education systems are discussed along with models that assess acceptance of technology.

3 Mobile Learning

3.1 Introduction

Chapter 2 discussed m-learning within the context of the Saudi Arabian education. This chapter considers the concept of m-learning further and in particular discusses the benefits and opportunities afforded by m-learning as well as some of the challenges and barriers to its adoption. The chapter then looks at how acceptance of m-learning can be measured through the use of the Technology Acceptance Model (TAM) (Davis, 1985), and its derivatives in preparation for enhancing the model further within the context of this research.

3.2 Definition of Mobile Learning

Researchers define mobile learning (m-learning) as the process of learning in various contexts and social interactions by making use of personal electronic mobile devices such as iPhones and Android devices connected to the internet, thereby enabling students to access learning materials (Baek & Touati, 2017; Crompton et al. 2016).M-learning extends the advantages of e-learning by allowing easy access to study resources whilst "on-the-move" as part of blended, informal or distance learning through the use of mobile technology (Alebaikan, 2010; Park, 2011). M-learning can make learning more accessible, flexible, personalised and attractive as learning can be carried out anytime and anywhere, enabling students to study at their own convenient time and place (Lu, 2013; Helen, 2013; Singh & Reed, 2001). In relation to the current research context, m-learning refers to the use of mobile technologies as a way of delivering learning content to the learner in order to enhance their learning experience through having a representation of the teacher on their mobile device. While e-learning and m-learning can be used as a substitute for traditional face-to-face learning, many researchers believe that both e-learning and m-learning are more effective as an assistance to, or extension of, traditional teaching methods rather than as new independent and isolated tools (Alhassan, 2016). The increasing use of mobile and wireless technologies, and the potential for such technologies to make learning accessible to a wider range of individuals, thus creates great opportunities and exciting new avenues for blended learning.

The concept of blended learning is becoming increasingly popular, not only in the academic world but also in the corporate world. Blended learning can be defined as the combination of online learning and classroom learning on the same platform (Alfarani, 2016). Other definitions focus on the use of a variety of instructional media together with instructional modalities in order to effectively deliver a course module (Manwaring et al., 2017; Vaughan et al. 2014). Mobile devices have become more influential due to the presence of all types of gadgetry that offer the potential to bring different learning methods together (Al-Fahad, 2009). Researchers found evidence of m-learning being a highly significant approach to use for blended learning with learners able to access learning materials at anytime and from anywhere (Alhassan, 2016; Lu, 2013).Given that blended learning modules use technology and various instruction methodologies, it is becoming increasingly used in higher education environments and is gaining a lot of momentum in distance learning to deliver courses effectively (Thomson, 2002; Ng & Lindgren, 2013; Omale et al. 2009; Wiecha et al. 2010). Huang et al.'s study for example, indicated that by providing undergraduate students with facilities, content instruction and information which is available outside of classrooms, distance learning is becoming more acceptable among educational instructors (Huang et al. 2010).

3.3 Benefits and Opportunities of Mobile Learning

M-learning technologies offer a relatively new paradigm of learning that takes into account the experiences of the learner and which enable the learner to approach the lesson at their own pace. Research conducted by Naismith et al. in 2004, discussed the technologies that would help establish a good m-learning environment. Indeed, there are various advantages of an m-learning approach that no other methods of learning can compare with according to Perrin et al. (2006). Recently, Osakwe et al. conducted a comprehensive review on the features and usefulness of mobile technology and how it can be integrated into the educational field (Osakwe et al., 2017). Several studies have suggested that this type of learning environment is best suited to informal learning, including distance learning, part-time learning and open universities, as opposed to formal, physical learning environments (Park, 2011; Seifert, 2014). Perrin et al. (2006), suggest a number of factors which predict the success of m-learning such as: convenience, engagement, interaction, increases motivation, collaboration and

compatibility, which overlap with other identified benefits and advantages of involving mobile technology in learning including:

Portability: due to the size of mobile devices, one of the key advantages of mobile technologies in a learning environment is that the learner can carry them to different locations, making it easy for students to learn out of the classroom (Botha et al. 2010; Romrell et al. 2014). Evans (2008) also assumed that the reason behind students preference for podcasts over more traditional forms of learning was their portability. Additionally, according to Alharthi et al., (2017), the portability of m-learning can "automate" the process of teaching and help in managing the increasing number of students enrolling for higher education in Saudi Arabia.

Convenience: the convenience of learning through a mobile device comes from the flexibility it gives and from overcoming the restriction of needing a specific place and fixed set of time for learning. Several studies have revealed the convenience of using m-learning technologies which enable people to be in contact while outside the reach of conventional communication and learning spaces. For example, m-learning is argued by Guy (2009) to be a method whereby learners from across the globe can facilitate sharing, collaboration and access to data and study materials online via smartphones and other such devices, irrespective of physical barriers such as location and time zone. Mobile technologies have the ability to provide learning materials 24 hours a day and 7 days a week via online connectivity (İşman et al., 2015). However, although overall opinions are positive, Corbeil & Valdes-corbeil (2007) and Zhang and Aikman (2007) claim that the effectiveness of the technology can only be achieved, if and only if, the adopting education institutions have a thoroughly thought out plan to use the technology in addition to conventional teaching.

Repeatability: m-learning allows students to pause and replay desired parts of the information when necessary (Farsi, 2016; Stoicescu & Stanescu, 2015). This advantage of repeatability is unique to online learning over traditional face-to-face learning.

Collaboration and interaction: mobile technology has significantly improved in facilitating easier uploads and downloads of pedagogical materials and enabling collaboration between students worldwide, practises previously restricted in e-learning

environments. Singh et al. (2001) described the use of m-learning applications in combination with traditional resources in the classroom environment as the key factor for increasing learners‟ participation and collaboration. Furthermore, research has found that using m-learning technologies in a classroom environment leads to increased understanding of concepts, facilitates smoother communication, fosters a collaborative environment and helps continuing education outside the classroom environment (Huang et al., 2010). Learners can also communicate and interact more readily with their instructors and their colleagues, thus solving the obstacles of hiding behind large monitors. Al-Fahad (2009) found that mobile learning will bring new opportunities of learning, and other studies show that learning models in informal environments not only enable educators and educational institutions to share information with relative ease, but also to provide assessment and feedback for the courses and the ability to provide flexible collaborative means of learning (Asiimwe & Grönlund, 2017; Huang et al., 2010; İşman et al., 2015).

Engagement: the evolution of e-learning and m-learning technologies, their advancement to distance learning and informal learning approaches, and the subsequent adaptations of these technologies by higher education institutions are promoting motivating and stimulating study environments (Alhassan, 2016; Huang et al., 2010; Jeng et al., 2010). Algahtani (2011) reported that, the use of online learning with different multimedia elements would provide an enjoyable, interactive and motivational learning environment for students. Recent research claims that, the use of mobile devices in education stimulate motivation, strengthen engagements and deliver content (Asiimwe & Grönlund, 2017, p104). The overall belief is that both e-learning and m-learning gives the instructor a powerful medium through which to control the content, deliver a lecture in a more effective manner and engage students better in the learning process.

Effectiveness: several attempts have been made to provide effective methods to assist learners in the real world and to increase students‟ achievements through development of m-learning activities (Lai et al., 2016). For instance, the results of research by Hung et al, (2014) showed that, there was a positive learning attitude of the students towards the use of mobile learning when a video-based approach used. The incorporation of mobile technology and pervasive learning can enhance the effectiveness and

accessibility of learning activities. Recently, Kukulska-hulme revealed significant effectiveness though using mobile devices alongside traditional learning techniques in the teaching and learning of the English language (Kukulska-hulme, 2015). In addition, Leong et al. (2013) concluded from an experiment investigating the factors and variables that affect students intentions to use m-learning that perceived usefulness, perceived ease of use and perceived self-efficacy were positively correlated with students‟ intention to use m-learning.

Freedom: mobile technology meets a variety of students‟ needs and learning styles (Badwelan et al., 2016). This type of learning provides students with the freedom to choose how they learn or study. Furthermore, studies have shown that learners can also benefit from visualising their learning path and consequently reflecting on their learning experience (Guy, 2009). It is the potential for mobile learning to bridge pedagogically designed learning contexts, facilitate learner-generated contexts, and deliver content (both personal and collaborative), while providing personalisation and ubiquitous social connectedness, that sets it apart from more traditional learning environments (Cochrane, 2010).

In summary, mobile technologies represent a „coming of age‟ for m-learning with their incorporation of features such as in-built video players for displaying presentations, the portability of the devices, acceptable screen size, easy connectivity, large memory and battery capacity, the ability to support multimedia content and the ability to scan information (Eppard et al. 2016). Furthermore, as mobile technology improves, it becomes synergistic in nature, as the development and growing use of mobile technology emerges on the back of each former improvement to facilitate and enhance learners‟ collaboration and interaction by means of accessing, discussing and sharing related data via social networks within and across their educational environments (Jeng et al. 2010). There is also extensive research underway on how wireless technologies and hand-held devices could significantly lead to an educational breakthrough by creating a Computer-Supported Collaborative Learning (CSCL) environment that fosters „on-the-move‟ learning capability available to a wide range of learners globally, potentially surpassing any language or geographical barriers (Alfarani, 2016). Thus, as higher education students continue to depend on technological innovation in and out of

the classroom, it is critical that instructors discover approaches to address their needs (Annetta & Holmes, 2006).

3.4 Challenges and Barriers of m-Learning

Although the previous section focused on the positive advantages and benefits of mobile learning, there also exist challenges and barriers which might delay the adoption of m-learning. A number of researchers believe that inadequate planning processes for implementing e-learning and m-learning environments lead to its failure (Asiimwe & Grönlund, 2017; Bingimlas, 2009; Alhassan, 2016). There are also certain practical issues or barriers whilst implementing advanced technologies for education. For example, although avatars and Virtual Learning Environments (VLEs) provide a great platform for blended learning, when implementing mobile learning platforms, they pose certain restrictions. These restrictions are predominantly due to the limitation posed by mobile hardware and technologies, as despite a tremendous growth in the personal and handheld computing domain, the 3D technology and types of avatars sometimes used, require sophisticated design and high memory space and processing capacity to be able to display the contents effectively (Sohn et al., 2005). Additionally, with the integration of technology in the curriculum or as a part of assisted teaching, there is a paradigm shift in the teaching methodology. This, therefore, puts a lot of pressure on the teacher to be able to use the technology with ease. Furthermore, the design of m-learning interfaces and their usability is another potential barrier for both students and staff to their use. Based on the literature, other challenges and barriers that may significantly impact on the implementation of m-learning include:

Lack of the faculty members' technical expertise: one of the main obstacles of adopting m-learning is the poor experience of the lecturer with regards to designing lessons for use on a mobile device from both technological and pedagogic perspectives. Therefore, the lack of proper training to use the technology can be the major restriction to using the technology (Seifert, 2014; Corbeil & Valdes-corbeil, 2007; Zhang & Aikman, 2007). According to (Al-Azawei et al. 2016), staff resistance to any new experience is a challenge which hinders the online learning uptake. For example, Alabdulaziz & Higgins, (2016) found that the lack of training for teachers and the lack of technical

support on how to use technology effectively were major obstacles for adoption of the technology in teaching to overcome the mathematics difficulties in Saudi Arabia.

Lack of resources (hardware & software): according to Alhassan (2016), the poor reliability and usability of some mobile devices due to their small screen size and limited memory capacity may negatively affect their use of m-learning. This restriction however is increasingly becoming less of an issue as device screen sizes are getting steadily larger and more processing capacity is being added to the newer smartphones and tablets. Hyland (2010) discusses these issues from an access and resourcing point of view and argues that lack of adequate infrastructures to plan and implement the technology, and provision of good software prevents teachers from leveraging the technology to receive maximum benefit and at times provides a negative experience to the students.

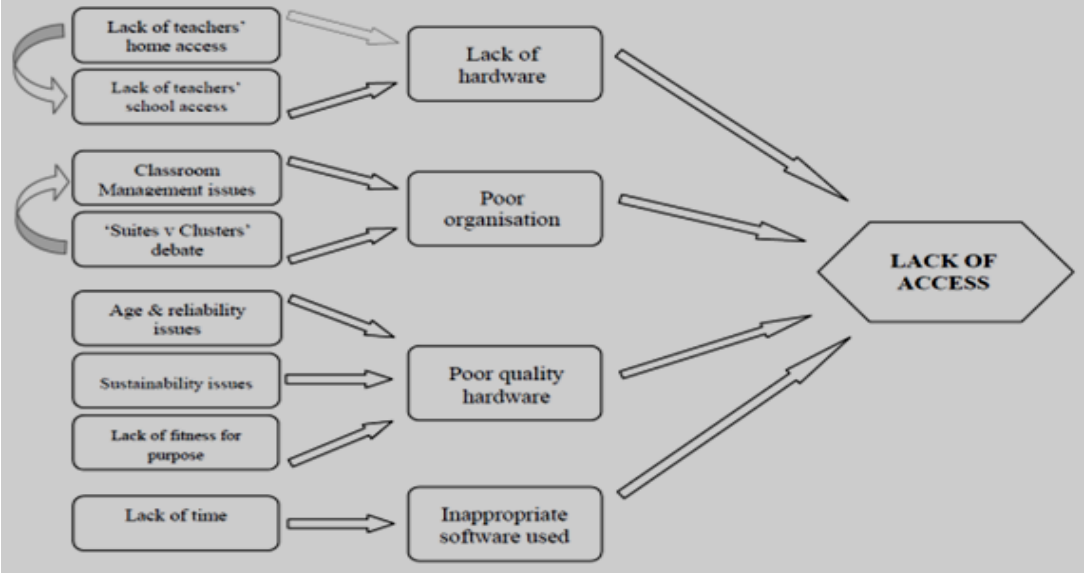


Figure 3 - 1 Issues relating to access to resources barrier (Jones, 2004)

Jones has classified the key barriers related to implementing technologies as shown in Figure 3 - 1. For example, poor quality or lack of hardware are reflected in a lack of access to the learning content (Jones, 2004). Having the right resources and the appropriate software to make use of the technology can make the difference between success and failure of the technology implementation (Ghavifekr et al. 2011; Hong & Songan, 2011). This is backed up by recent research which shows how poor infrastructure and limited resources, for example unreliable internet connections, affects access learning materials (Asiimwe and Grönlund, 2017).

Financial abilities: this includes the costs of having reliable smartphones and network connectivity billing. Further to these limitations, the lack of internet connectivity especially for some students who may not be able to afford subscriptions to faster internet tariffs is an issue (Asiimwe and Grönlund, 2017; Bingimlas, 2009; Chanchary and Islam, 2011; Perrin et al., 2006). This is however an issue at individual student level rather than in institutions or universities in Saudi Arabia.

Lack of confidence: Jones (2004) also identified lack of confidence in the use of the technologies by the teacher as potentially having a detrimental effect on the pedagogy, as shown in Figure 3 - 2, a factor agreed by Choy et al.(2009); and Seifert (2014). This barrier against the use of technology in learning and teaching may be due in part to the advanced age of some teachers coupled with a lack of knowledge regarding its benefits (Alabdulaziz & Higgins, 2016).

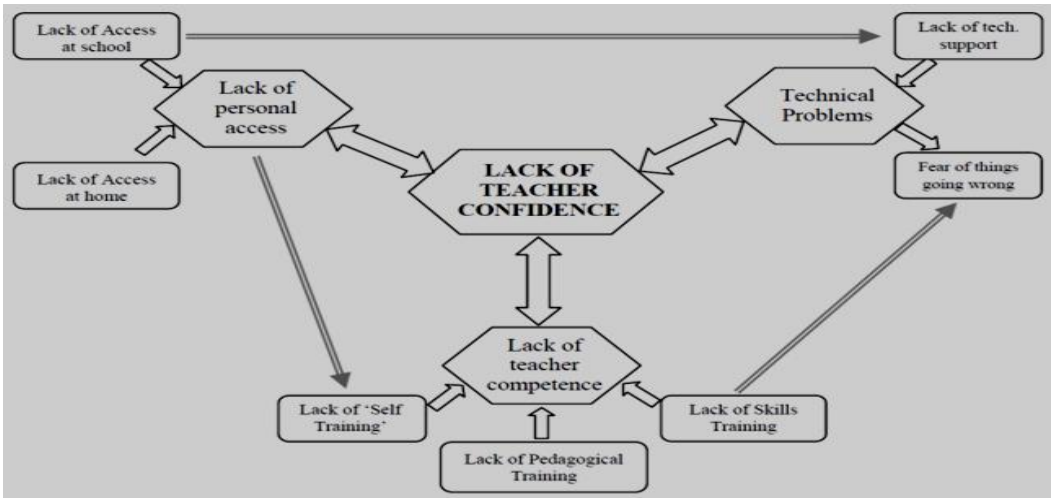


Figure 3 - 2 Relationships between confidence barrier and other barriers (Jones, 2004)

Less motivation: Ghavifekr et al. (2011) proposed that one of the key factors that can have an adverse effect on the uptake on m-learning is the teachers or students motivation. Al-Azawei et al. (2016), found that 47% of staff and 75% of students" were unwilling or demotivated to use e-learning because of other mentioned challenges. Therefore, significant effort should be placed on extending their academic understanding of the potential impacts of m-learning on different learning aspects such as learning engagement and pedagogical performance.

Poor management procedures: other challenges in using mobile learning environments are more concerned with the education systems and the management approaches that are

used to introduce mobile learning platforms such that they integrate effectively with the existing learning platforms (Naveed et al., 2017). Educators and academic institutions may lack formal procedures and management capabilities to roll out complex systems. For successful implementation, universities and other higher education institutions should therefore have in place management infrastructure along with good ICT resources to support teachers in coping with changes that ensue from the implementation of new technologies and also provide a smooth transition. For teachers and students to be able to appreciate the technology fully (Al-Azawei et al. 2016), they should also effectively implement policies and understand the implications of implementing mobile learning (Kukulska-Hulme et al., 2009).

Poor interactions with peers: Alhassan (2016), found one of the challenges that significantly affects the implementation of m-learning is the lack of interaction between the user and the designed interface. Corbeil & Valdes-corbeil (2007) added that a feeling of isolation or being „out of the loop" might occur for those not interested in the technology as opposed to those who embraced it.

Sections ß3.3 and ß3.4 have identified a number of benefits and opportunities, and challenges and barriers that can have an influence on the acceptance of the technology. Various researchers, for instance, Annetta & Holmes (2006), Deuchar & Carolyn (2003) and Falloon (2010) have also shown interest in the field of m-learning and have similarly identified both opportunities and challenges. It can be concluded that, acceptance of m-learning is a complex field with instructor, confidence, infrastructure, motivation, financial and institution management all being important dimensions that influence the use of m-learning systems. Another key challenges is the interaction of the students with the avatar online learning interface used to deliver the pedagogical content which may draw their attention and engagement to the material. The challenges that involve identifying areas of development and implementation of mobile learning interfaces in an educational scenario are described in the forthcoming chapters.

3.5 Technology Acceptance Model (TAM)

One of the aims of this research is to investigate students‟ readiness and willingness to use an m-learning approach in their studies and alongside this to determine their preferred avatar interface representation of the teacher and the interface which assists them most effectively with their learning. It is thus important to be able to model the factors that affect their acceptance of the technology and their performance when using it. Acceptance of technology depends on the perceived usefulness of the proposed technology and the attitude of the end-users towards the technology. The concept of „technology acceptance‟ began in the late 1970s as a result of many information technology projects failing on the basis of insufficient knowledge by the people using the system (Tabak & Nguyen, 2013). Thus, it became important to predict how well the users would embrace the technology. The Technology Acceptance Model (TAM) was therefore developed to understand if there would be acceptance or rejection of a particular technology (Davis, 1985). Davis predicted that user motivation was dependent on the stimulus obtained from the features of the system being developed and its capabilities. The main three variables of the TAM are „*perceived usefulness'* (PU), „*perceived ease of use'* (PEOU) and „*attitude toward'* (AT) or intention to use the new technology. Furthermore, another critical success framework to be considered for implementing new technology is the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003)determines which also the factors that influence the students‟ intention to use a technology. The theory of TAM and UTAUT provide theoretical bases and attempt to empirically compare factors from different technology acceptance models. The remainder of this chapter reviews the literature associated with the TAM and other learning models that have been derived from it with particular emphasis on m-learning acceptance factors.

3.5.1 **Intrinsic Motivation/Engagement**

In the original Technology Acceptance Model (TAM), the motivation of the users is discussed from three different perspectives, namely, (1) the perceived usefulness of the system that is to be deployed, (2) the perceived ease of use of the system proposed and (3) the users‟ intention towards using the proposed system (Davis, 1985) as depicted in Figure 3 - 3. The perceived usefulness/performance expectancy of the system is defined

as the level or degree to which the user believes that the system deployed would enhance their current performance while carrying out certain specific tasks.

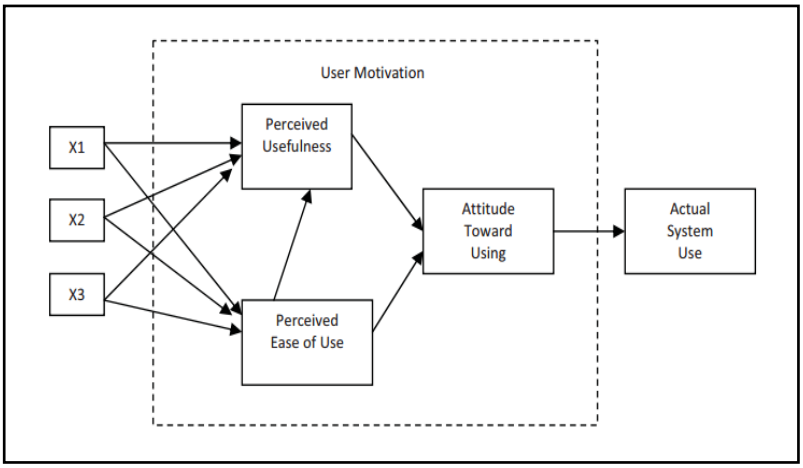


Figure 3 - 3 Technology Acceptance Model (Davis, 1985).

Subsequently, the attitude and behavioural intention towards using the system is influenced by the perceived ease of use and perceived usefulness. The perceived ease of use also has a direct influence on perceived usefulness.

The perceived ease of use of the system is defined as the degree or level to which the user believes that the system that is to be implemented would require less physical and/or mental efforts in order to perform regular and routine tasks (Davis, 1985). A concept enhanced by Davis as shown in Figure 3 - 4 to incorporate the view that a system‟s functionalities act as the stimulus to the user who then becomes motivated to use the system with the perception of usability seen in the actual response of using or rejecting the system that has been deployed.

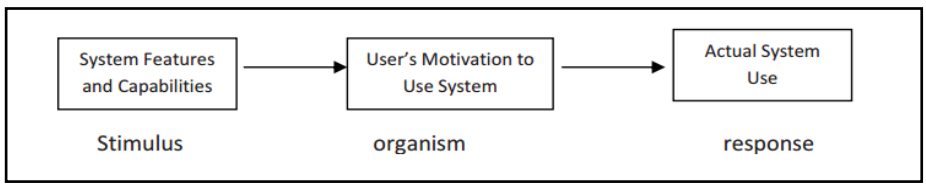


Figure 3 - 4 Conceptual model for technology acceptance (Davis, 1985)

A study “e-learning motivation and educational portal acceptance in developing countries” by Maldonado et al. (2010) empirically modified the UTAUT model by adding an “e-learning motivation” factor and determination of the significance influence of this factor on the use of e-learning (see Figure 3 - 5). The study was conducted in South American with a survey as the main instrument used to collect data from 150

students from 47 different schools. The findings revealed that the motivation variables had a positive influence on behavioural intention.

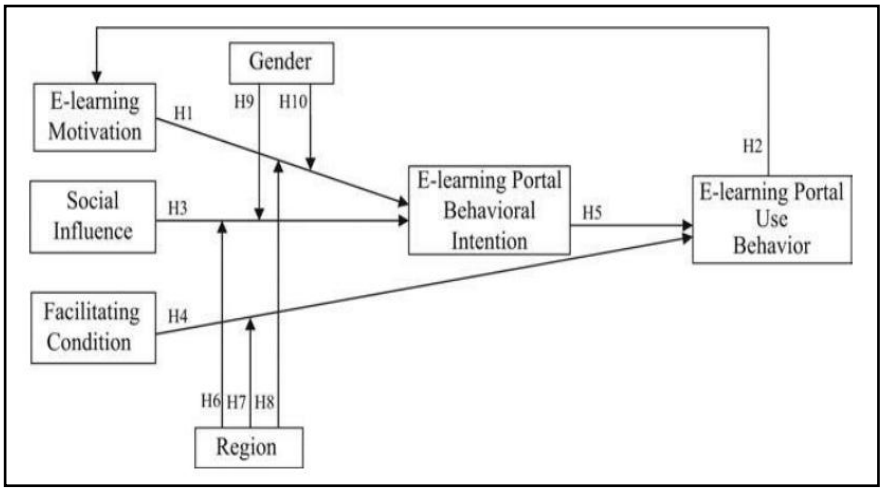


Figure 3 - 5 Proposed Research Model (Maldonado et al, 2010)

Motivation of students was influenced by their performance, and caused an increase in their engagement, which in turn, affected their behavioural intention to use the system (Maldonado et al. 2010). In addition, Maldonado et al., (2010, p70) claimed that "people will carry out an act only when the desired outcome is to be attained, or they will perform an action that is of value to them".

3.5.2 **Performance Expectancy**

Within the context of this research the factor of performance expectancy is equal to perceived usefulness. The definition of perceived usefulness can be adopted from Daviset al.(1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance". According to Osakwe et al. (2017, p21), performance expectancy and its relationship to mobile technologies is such that "performance expectancy advocates mobile learning will be found useful because it enables individuals to have quick access to information, any time and any place, and on their preferred device". Learners‟ acceptance of m-learning is a major factor when planning to design a successful m-learning application.

A study conducted by Jairak et al. (2009) used UTAUT based upon TAM and involved 390 higher education students learning through m-learning. The results revealed that performance expectancy, effort expectancy, and social factors have statistically

significant positive relationships with the behavioural intention to use that technology, but the „facilitating conditions" factor did not have a direct relationship Figure 3 - 6.

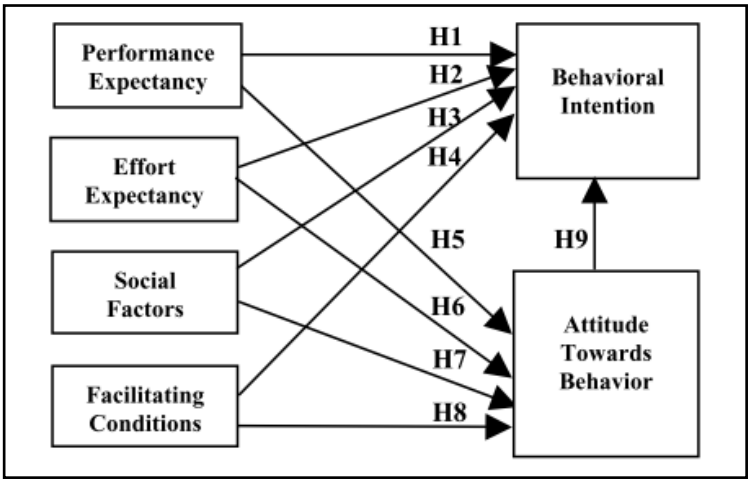


Figure 3 - 6 Research Framework (Jairak et al., 2009)

In 2010, Lowenthal investigated the UTAUT model factors in a study with 113 higher education students. The results here also highlighted that the effort expectancy and performance expectancy have statistically significant influences on behavioral intention to use an m-learning system. In addition, gender and age as moderators indicated that no statistically significant differences were found that play a role in the acceptance of m-learning. Figure 3 - 7 illustrates the research model of m-learning determinates.

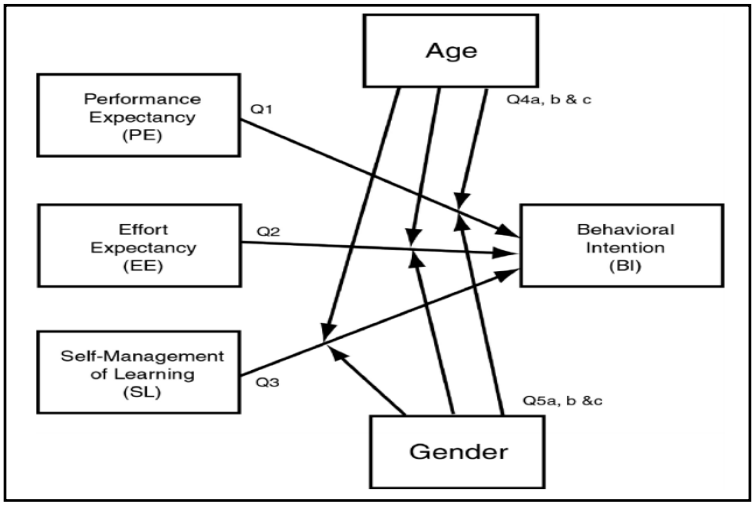


Figure 3 - 7 Research model of m-learning Determinates (Lowenthal, 2010)

3.5.3 **Moderating Effect of Gender**

A study conducted by Leong et al. (2013) found that the perceived enjoyment factor had a significant impact on mobile entertainment acceptance in Malaysia. Leong et al. (2013) also used gender as a moderator and investigated gender statistically with respect

to all other variables to understand how it influences the adoption of m-entertainment between users and found that there were no significant differences between gender as illustrated in Figure 3 - 8.

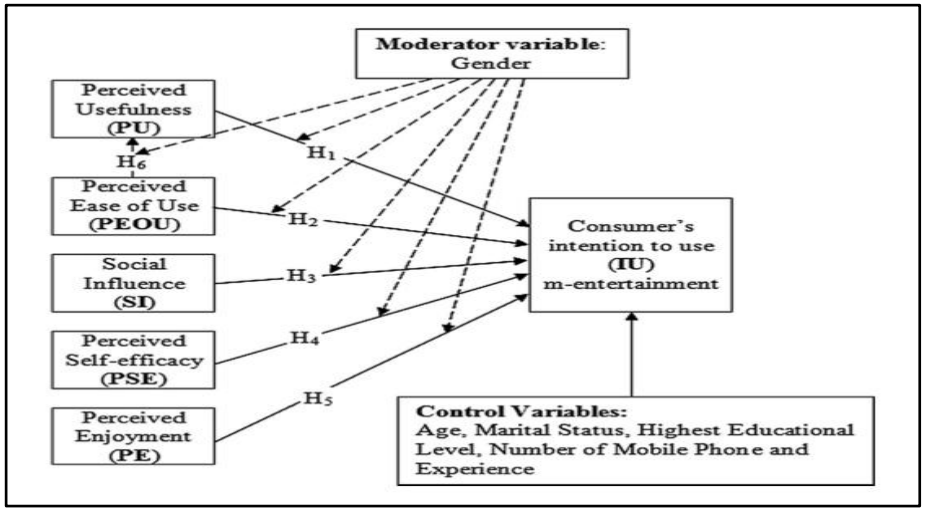


Figure 3 - 8 Research model of mobile entertainment adoption (Leong et al., 2013)

From a number of studies it can be noted that male students consider the perceived usefulness/performance expectancy more than female students (Koohang, 1989; Ong and Lai, 2006; Shashaani and Khalili, 2001; Leong et al. 2013). However, studies by Gefen and Straub (1997), and Al-emran et al. (2016), found differences suggesting that females perceived higher degrees of usefulness or performance expectancy than males when using computer technology. Taleb and Sohrabi (2012), found that female students have used mobile phones in education more than male students and claime that girls are more skilled in using multimedia, whilst boys are more skilled in advanced communication via using mobile phones.

3.5.4 **Perceived Enjoyment**

Another study was conducted by Liu (2008), who extended the UTAUT model by adding perceived enjoyment, mobility, attainment value, self-efficacy, and self-management factors in order to investigate learners behavioural intention to use m-learning. Perceived enjoyment is defined by Fosso (2017, p3) as "the extent to which an activity is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated". In order to promote learner motivation and engagement, it is important to make learning activities highly enjoyable. There is thus a direct relationship between the enjoyment/happiness and the intrinsic motivation to use a system (Leeet al., 2005; Baek & Touati, 2017). High levels of perceived enjoyment

while undergoing the learning process is a high indicator that students will use that type of technology and will accept it (Aleneziet al. 2010) (see Figure 3 - 9).

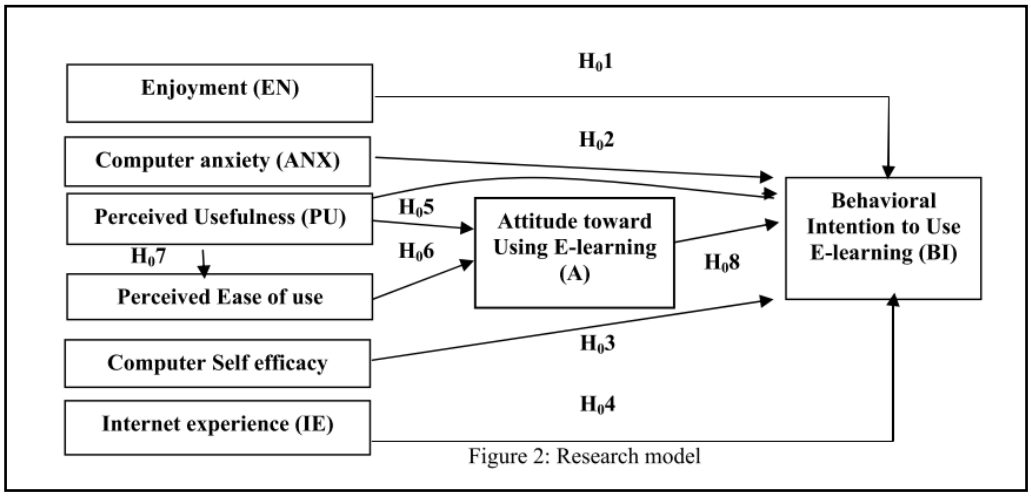


Figure 3 - 9 Research Model (Aleneziet al. 2010)

3.5.5 **Behaviour Intention to Use Technology and Effectiveness**

Some of the studies described above present a link between the acceptance and engagement factors toward the intention to use e-learning, and some show a correlation between the behavioural intention to use that technology in learning and its influence on effectiveness/pedagogical performance (Liaw, 2008). Furthermore, the adopted conceptual model proposed by Liaw includes a number of external variables such as e-learning multimedia instruction as one of the major predictors of e-learning performance and motivation among students see Figure 3 - 10.

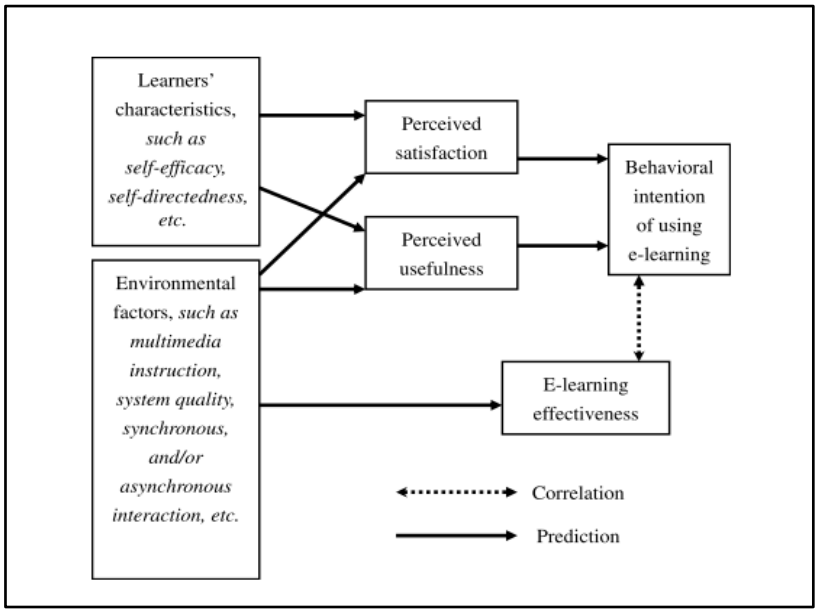


Figure 3 - 10 A conceptual model of users' satisfaction, behavioural intention, and effectiveness toward e-learning (Liaw, 2008).

In addition, multimedia instruction variables play a significance role on perceived usefulness/performance expectancy and perceived satisfaction.

Thus, when looking at the model of facilitating effective e-learning (see Figure 3 - 11), it can be noted that there are three fundamental e-learning components which need to be considered when designing effective e-learning: learners‟ self-efficacy, multimedia formats, and interaction environments (Liaw, 2008). Noteworthy, it is a likely assumption that factors which affect e-learning will be similarly affecting the m-learning.

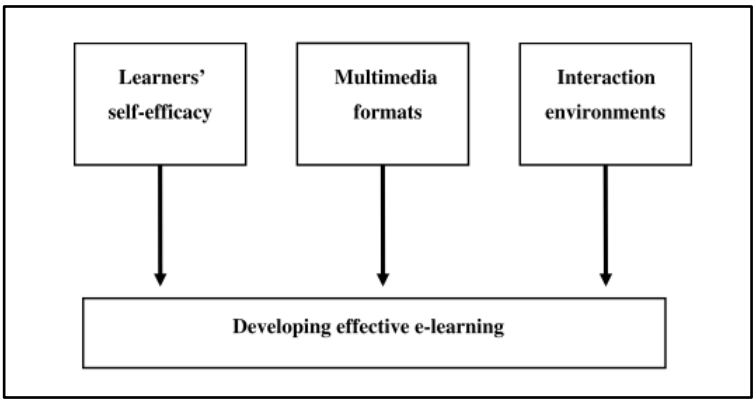


Figure 3 - 11 Consideration for developing effective e-learning (Liaw, 2008).

3.5.6 **Framework for Mobile Learning Design Requirement**

Mobile device use has expanded over recent years and many researchers, such as Brown et al.(2006) and Massey et al. (2006), have argued about whether these devices can enhance learning experiences. Brown et al. mapped qualitative data to the conceptual mobile-learning framework proposed by Parsonet al. (2006) that provides systematic support for mobile learning experience design. In addition, this model showed the relationship between the framework factors and m-learning design requirements, and suggested how m-learning applications can be designed with an understanding of these factors and requirements (see Figure 3 - 12).

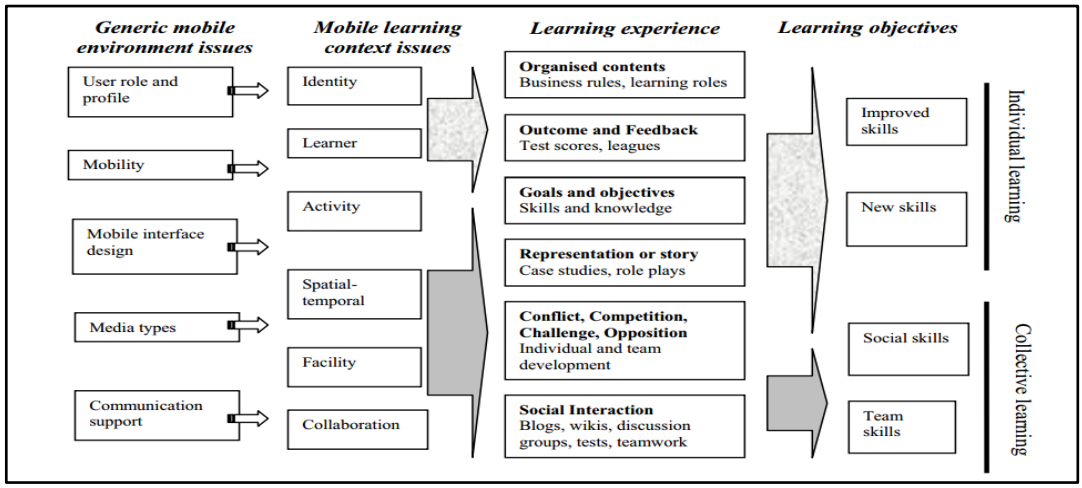


Figure 3 - 12 A framework for M-learning design requirements (Parson et al, 2006)

Parsonet al., (2006) showed in the above framework that there are four m-learning design requirements: generic mobile design issues, m-learning context, learning experience and learning objectives; and that these factors can engage the learner, facilitating self-motivation and self-regulation which in turn can improve students' learning situations (Brown et al., 2006). Important factors of this framework in relation to the PhD objectives include mobile interface design, media types, and activities to be undertaken by learners when considering outcomes and feedback towards improving engagement, performance and achievement from using m-learning. This framework provides a clear view to be taken in account when designing m-learning contexts which are different to traditional learning in class.

3.6 Motivation behind Constructing the M-learning Research Model

With the development of smartphone devices and the associated functions and facilities they provide, the main focus of this research is on their use within an education environment. In spite of the rapid development of m-learning applications in recent years, studies on the extent to which using different modalities on the mobile device affect attention, motivation and learning performance has seldom been studied (Chih-Ming & Chung-Hsin, 2015). Modality or the mode of content delivery can refer to the use of the most appropriate multimedia, such as video, audio, graphs, etc., for the potential teaching interface. Furthermore, m-learning is a relatively new concept which can help foster human interaction to create interest in learning, thereby improving delivery of courses and increasing the overall understanding of subject matter as it enables students to study at their own pace. Improvements in mobile technologies and

the availability of reliable mobile carriers and wireless networking has provided a great opportunity for both students and educators to improve autonomy of learning (Osakwe et al., 2017; Massey et al. 2006).

Despite a number of studies in the published literature showing the significant benefits of m-learning, it is important to gain an understanding of why some students do not engage with m-learning. According to an investigation by Jairak et al. (2009), the factors that influence the adoption of m-learning are the major principles which should be considered when planning to invest in m-learning. Models investigating individuals‟ acceptance and intention to use new technologies have been examined by Gefen and Straub (1997), Venkatesh & Morris (2000), Badwelan et al. (2016), and Al-hunaiyyan et al. (2017). Another researcher found that although more than 50% of the learners in his study had no experience with m-learning, they had high levels of acceptance and readiness to engage with m-learning and they had a good perception of how to integrate their learning via mobile devices (Nassuora, 2013). Abu-al-aish & Love (2013) claim that there are a number of issues that may prevent the adoption of m-learning, such as learners not being ready to use m-learning as it is still a new concept to them and hence may require a lot of effort to be implemented.

Abu-al-aish & Love (2013) conducted a study with 174 participants from Brunel University based on the unified theory of acceptance and use of technology (UTAUT) and found that performance expectancy and other factors significantly affected the behavioural intention to use m-learning. Consequently, students‟ performance expectancy with m-learning affects their performance outcome and hence adoption of an m-learning model is an urgent requirement that needs to be understood.

Saudi researchers in particular are interested in the concept of blended learning and how the implementation of m-learning technologies can be used to assist the traditional learning environment (Alebaikan, 2010; Alfarani, 2016). Previous research has shown that the majority of mobile devices can be integrated into the field of education (Alhassan, 2016; Nassuora, 2013). A number of studies have been focused on employing m-learning in Saudi Arabia, especially with regard to the prospects and challenges that universities and students face whilst implementing the technology (Bingimlas, 2009; Chanchary & Islam, 2011). Although there is a rich understanding of

the m-learning area, there are several gaps linked with the effectiveness of this method of learning which require more investigation (Wisneski et al., 2017). One such gap, cited by Laureano-cruceset al. (2016), is the need to study the impact of interfaces and ways of delivering learning materials over the mobile device. Also, from a review of the literature, few studies have examined the influence of higher education students‟ preferences for learning based on specific multimedia instruction, and students‟ engagement with the learning process, and their behavioural intention to use m-learning, hence it appears that little work has been done on how students engage with m-learning delivery mechanisms and how to assess what they have learned through mobile devices. Of particular interest is the potential of creating an environment for real-time interaction between learners and the content through mobile devices and to investigate whether there is a connection between students‟ engagement with/preference for a particular multimedia type and their pedagogic performance.

Therefore, one of the contributions of this research is to develop a model for m-learning that encompasses a range of different multimedia types for use in Saudi Arabia‟s higher education system. The model enables implementation of good design and user experience practices and incorporates the main elements of m-learning design requirements, such as the design principles, mobile context, Saudi Arabian culture, student learning experiences, how to achieve the best learning outcomes, and how to show whether these factors are linked and influence each other.

3.6 Chapter Summary

This chapter has considered further the concept of m-learning, and in particular it has discussed its key benefits and features, and how they are correlated to education. It also covered the barriers and challenges which might affect the implementation of mobile technology in education. Further, it has discussed how acceptance of a new technology and its influencing features can be modelled.

As a consequence, one of the interesting areas to research further is how mobile interfaces between physical and online learning can be investigated in order to support learning in Saudi Arabia. Another important aspect associated with the development of technology and its acceptance is the user experience and the interaction between learners and the representation of the teacher. This will be discussed in the next chapter.

4 User Experience, Avatar and Learning Theories

4.1 Introduction

Chapter 3 shows that m-learning has become a reality which makes learning available anywhere and anytime, providing opportunities for enriching the learning experience and enhancing learning motivation and preference. One way to ensure that m-learning is effective and that it creates a positive user experience is to improve the design of the user interface by including good use of interactive elements, multimedia components and clear avatar representations of the teacher to engage the learners. This chapter considers the relationships between user experience design, avatar based user interfaces and learning theories and styles.

4.2 User Experience (UX)

A mobile learning approach can be used to deliver learning materials to students, but the materials must be designed properly to compensate for factors such as the small screen display. According to Adham et al., (2016) and Hodhod, (2010), engaging learners and enhancing their motivation to learn and achieve the desired learning outcomes can occur through supplying a graphical interface that shows the representative of the teacher on the online learning environment. Within the context of this research, the m-learning interface must be adjusted to prevent information overload and it should coordinate the interaction between the user and the learning material staking into account any technology limitations. „User experience (UX)“ as a concept has evolved gradually over the last two decades, with increasing focus being given to both the design and the user journey, while developing software and technology solutions. There has been a paradigm shift in the way software development takes place, which has moved from focusing primarily on functionality to making the design and approach more user-centric, with the aim of concentrating on the needs of the user rather than on just the functionality of the system (Vermeerenet al. 2010).

The effectiveness of software or a system is enhanced when the user has a good experience. There are various key factors that affect the perceived usefulness and user experience of the system. This perception is affected by the satisfaction of the user from using the software. For the end users to be satisfied, the environment provided by the

system should be stimulating, enhancing and provide an opportunity for learners to engage, interact and involve themselves with the learning materials (Kim et al., 2013). In addition, features of interaction and immersion are important elements to motivate and engage students to learn through virtual learning environments and influence their academic performance (Nguyen et al., 2017; Huang et al., 2010).

In many cases, user experience acts as a distinguishing factor between the success and failure of a software system. When a system concentrates only on the product development cycle to deliver maximum functionality without keeping in mind the robustness and usability of the design, it leads to the failure of the software product. In many cases, user experience makes a product stand out and becomes the product‟s Unique Selling Point (USP) which in turn makes users want to try out the software as well as creating a sense of perceived usefulness (Nguyen et al., 2017; Väänänen-Vainio-Mattila, 2008).

4.2.1 **User Experience in Education**

There are various tools and technologies that are used to promote student interaction and involvement in higher education. Huang et al. (2010, p1179) showed that "interaction is a crucial factor to affect learning performance". Moreover, various distance learning programs use state-of-the-art technologies in order to increase student satisfaction and learning outcomes (Stoddart et al., 2016). Assisted teaching techniques rely on the fact that the whole experience of the student is pleasant and this psychologically gives the student the motivation to interact and engage in the learning process (Machado and Tao, 2007). As proposed by Botha (2010), end-users or „learners‟ often indicate frustration with the technology as being a major barrier to the use of and participation in technology enhanced learning systems. Consequently, components that might impact on the discourse between the domain requirements and technology affordances, are explored in the field of Mobile Human Computer Interaction (MHCI). Botha (2010) has illustrated the relationship between MHCI and m-learning as shown in Figure 4 - 1.

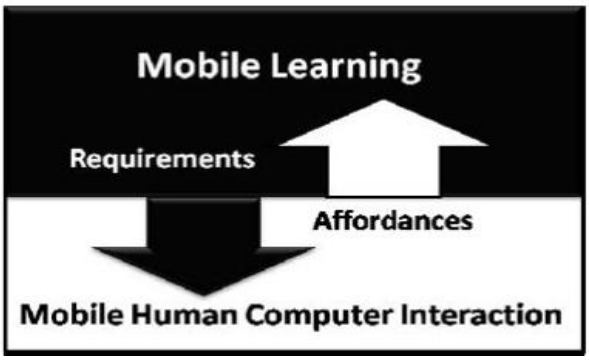


Figure 4 - 1 MHCI as support for m-learning (Botha, 2010)

Botha (2010) highlights the link between student satisfaction in distance education and assisted learning, and the use of user-centric design principles that can increase the users‟ interaction with the system and allow them to communicate effectively despite geographic and other barriers. When good user-centric design approaches are followed and industry best practices are used while developing the system, care is taken to ensure that the end product is easy-to-use, user friendly and the entire end user journey is elevated to a higher level (Allen & Bourhis, 2002; İşman et al., 2015).

It can be seen that when user experience design is highly developed, students find the process of education interesting and retention of information is made easier (Huang et al., 2010). Studies with distance education environments that use technologies to assist with learning and which provide a conducive learning environment show that students do not find distance education a barrier anymore, as they feel that the technology facilitates their interaction and makes them feel a part of the system (Machado & Tao, 2007). A number of previous studies have primarily concentrated on how learning outcomes can be improved and how strategies can be implemented in order to blend traditional learning approaches with mobile learning technologies (Vaughan et al., 2014).

4.2.2 **User Experience Design Principles**

There is a plethora of literature that describes various views on what good user experience design principles are, for example, (Arnold et al.2016; García-Peñalvo and Durán-Escudero, 2017). Most researchers, however, believe that user experience design should not just be related to the engineering process but should also involve good strategies from both a management and organisation perspective. While designing a software solution, the management of the learning institution should actively ensure that

the proposed designs are in line with industry standards and best practices. The cultural norms of the organisation environment also play a key role in determining the design attitude and approach that is taken during the design process both of which can have a great impact on the end design (Alenazi, 2015).

Researchers argue that the best way to create a good user experience is by keeping the design simple and elegant (Botha et al., 2010; Nielsen, 1995). This ensures that the complexities of the design are eliminated and that the user journey is smooth and enjoyable. In addition to simplicity, the design should also take into account Human Computer Interaction (HCI) factors and the design principles that affect the usability of the system and the perception of its usability in the eyes of the end user (Shneiderman & Plaisant, 2004; Nielsen, 1995). When addressing the effectiveness of receiving learning materials in various media formats (e.g. text, graphics, video) and in the right proportions, designers must also keep in mind the goal of the system and the target users of the system (Bates, 2015). Care also should be taken to ensure that any cultural aspects of the target users of the system are considered and that these cultural restrictions and requirements are met. Poor understanding of these concepts will likely lead to the failure of the project and non-acceptance of the system by the end user (Gulliksenet al. 2003).

Games are highly motivating in nature and contain constructive aspects, such as fantasy, control and curiosity that engage the learner. Some researchers believe that game-based theories and approaches for system design can be used, even in cases of non-game based contexts and solutions. Game theory encompasses using various elements of games, such as avatars, characters, video, sound, text and pictures, incorporating them in a traditional application in order to enhance the experience and increase the likeability of the application (Mazlan, 2012). Game theory strongly focuses on user interaction and user inputs to improve the involvement of the user (Ng and Lindgren, 2013). It may also create a virtual world whereby the user can connect to a specific game character, and thus increase the users‟ interest in the environment and in the system. Implementing game theory concepts includes enriched designs for heuristics and pattern combinations, providing opportunities for interaction and finally making the user comfortable with the virtual reality system (Deterdinget al. 2011).

4.3 Avatars and Mobile Learning Interfaces

Teaching organisations are now adopting new learning methods, informal learning approaches, emerging technologies such as Virtual Environments (VEs), and social applications of m-learning that support collaboration, knowledge sharing and lifelong learning. In some developing countries, mobile phones provide the main communication network available to the public in general and, as such, represent an indispensable channel for expanding accessibility to learning opportunities. This section introduces the concept of avatars and highlights the effect they can have on online learning environments. Virtual Environments (VEs) are defined as artificial environments generated by computers using various graphical technologies to create a perceived sense of artificial reality amongst the users. They may also include artificial, computer-generated humans placing themselves in a virtual two or three dimensional space in a visual manner, as opposed to users having a physical presence (Haake, 2006; Deuchar & Carolyn, 2003). There can be the ability to sense the presence of other people and one's co-presence among them, in a „face-to-face" classroom setting, however, this ability is generally limited to the dates and times during which a particular class is scheduled.

Educators and researchers now believe that learning can happen anywhere given the technological advancements and the paradigm shift in the learning environment (Lu, 2013; Singh & Reed, 2001). The technological landscape has undergone a complete revamp and increasing numbers of advanced technologies are being developed at a previously unimaginable pace. This leads to educators wanting to harness the power of technology in order to provide better pedagogical services to students. The use of state-of-the-art technology has now become more of a requirement in today"s competitive world as higher education institutions and universities becoming increasingly and more interested in acting as a technology enabler for students (Johnson et al. 2015; Thomson, 2002).

The use of human representative technologies, for example by displaying instructor characters as avatars, is becoming increasingly popular in learning, as researchers find that there is a strong positive correlation between the use of avatars and the cognition of the student (Fox et al., 2015; Omale et al., 2009), due to the provision of a positive

social experience and promotion of the social presence of the learner (Mazlan and Burd, 2011). Although the use of avatars or the technology itself contributes to the cognitive presence of the learner, it also increases the involvement of the participants in the learning process which in turn has a positive impact on the cognition of the learner (Omale et al., 2009). The results also show that using avatars in an e-learning environment greatly improves the quality of the learning environment and enhances the teaching and delivery of the subject matter. Avatar-based learning environments and social games thus provide important resources for learning and can help foster an active, effective learning process (Vasalou et al., 2017).

Virtual worlds and avatars provide a means to improve the quality of education, and especially distance education (Lu, 2013), through the provision of avatars that support and enhance the online learning environment. The characteristics of such environments, as described by Lu (2013), include:

- Virtual representation whereby the avatar character is used to portray the teacher or the mentor of the real-world.
- User-generated content, where learners and teachers alike can generate content and actively participate in the discussions. This social attribute fosters and nurtures participation and interaction amongst the participants.
- User interaction where users are able to contribute or interact with the system, pause and learn at their own pace, unlike with traditional methods of teaching.
- Autonomy which gives the learner the power to learn without 'real world' interruptions and provides the flexibility for students to study at their convenient time and place.
- Rich Media Environment (RMA) which includes the use of media such as sound, video, animation, etc. to enhance the learning experience.
- Easy access for authorised users, which enables learners to view and re-view content any number of times to get a better understanding of the topic, unlike with traditional learning environments.

4.3.1 **Definition of Avatars**

Avatars have been defined by Haake (2006) and Chae et al. (2016) as a visual representation of human characters in an educational environment. In another study, Peterson (2006) expressed avatars as an online appearance of signs in a virtual world that are intended to improve communication and interaction in a virtual environment. Deuchar & Carolyn (2003, p255) defined avatars as a channels that allow the user to take an online and a visible persona in the virtual environment and provides them with "the opportunity to engage in surreal and imaginary experiences that transcend the actual world in which they live". Avatars can be defined as pictorial representations whereby human participants are allowed interaction thereby providing a face-to-face e-learning environment between students and the instructors (Biocca & Harms, 2002).

4.3.2 **Avatars in Pedagogy Services**

Advanced developments in technology and the digital revolution has meant that virtual reality and avatars can now be used across different industries and for different purposes to support collaborative working environments and to support corresponding behavioural shifts and thought patterns (Yoon & Vargas, 2014). The concept of avatars and virtual reality in the context of increased interaction, accessibility and better cognition has been studied by various researchers (Antonacci et al. 2008; Brekel, 2007; Greenwald et al., 2017). Avatars, according to these researchers, have the potential to help overcome the difficulty of face-to-face interactions, crossing the limitations of geographic and language barriers. In doing so, avatars enable the free-flow of communication amongst participants in the group and enhance their social interaction by bringing learners together using a common platform and providing them with the flexibility to stay connected yet anonymous (Adham at al, 2016).

Avatars in a pedagogical perspective can be thought of as characters or figures that can be created and customised as per the needs of the learner. Avatars often give full control of the character and features of the character to the end user. For example, end users are given the option to change its colour, physical features, and appearance details, depending on personal preferences, the simplicity that it provides and the interest that it spurs amongst learners and facilitations within an interactive working environment (Al-Alwani, 2005).

The use of avatars in pedagogical services has been presented across world conferences and round tables. Cyber campuses have been used by universities across the globe. Deeds (2013) shows the prototype of avatars used by a South Korean University‟s cyber campus Figure 4 - 2.

Figure 4 - 2 Avatars in South Korean Cyber Campus (Deeds, 2013)

The research by Deeds (2013) also shows that avatars in many cases help to bridge language barriers in pedagogical services and can be implemented in environments where the teachers and students do not speak a common language.

Barrow (2009) explained that avatars can be used in a wide variety of contexts in education and can provide an engaging platform for learners to participate in engaging learning, and as a means to increase the creative streak in students and pique their interest in the learning space. Figure 4 - 3, shows various online manifestations of avatars (Barrow, 2009).

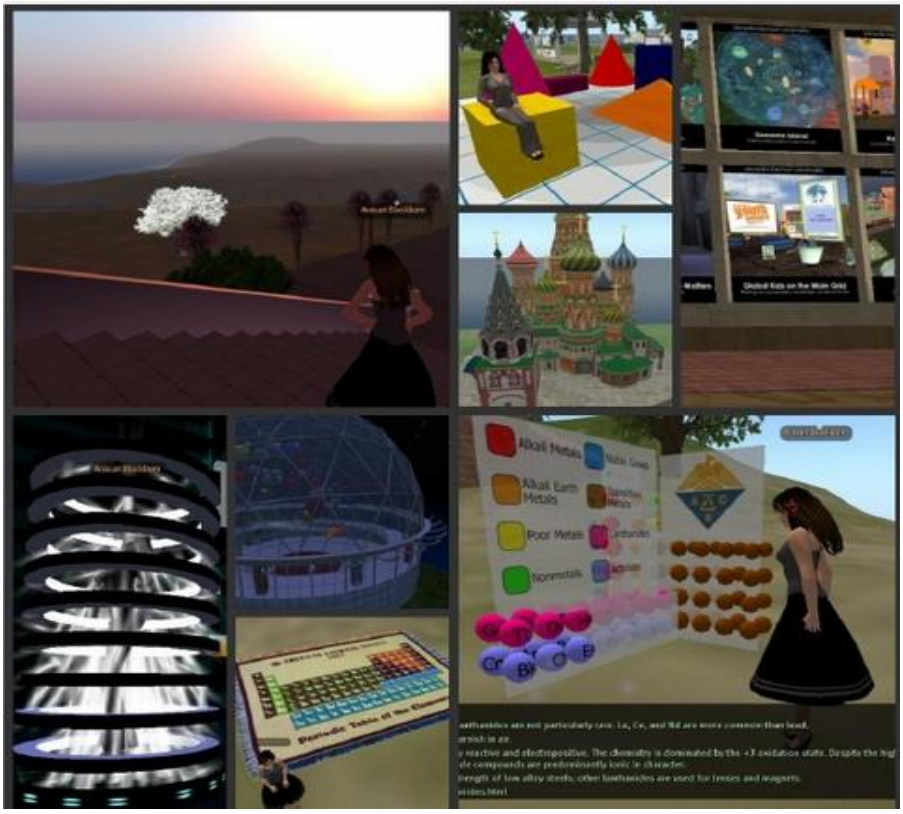


Figure 4 - 3 Avatar manifestation in various virtual world scenarios (Barrow, 2009).

Most previous studies, for example (Annetta & Holmes, 2006; Falloon, 2010; Ng & Lindgren, 2013), have investigated using avatars in virtual space for informal communication and diversion purposes, however, there is still a lack in the use of avatars in a more formal educational context to optimise the learning and engage students within the framework of learning models and styles.

4.3.3 **Avatars and Mobile Learning**

This thesis focuses on the uses of avatars in m-learning technologies. The m-learning concept using avatars is gaining a lot of popularity and research conducted over the past two decades has studied its implications, advantages and disadvantages (Kukulska-Hulme et al. 2009; Omale et al. 2009; Adham et al., 2016). Significant developments in game technology and the rapid acceptance of mobile technology has led researchers to consider integrating these technologies in order to effectively leverage the advantage afforded by their combined potential in order to provide an enhanced learning environment (Sharples, 2002).

There are researchers who concentrate on understanding the m-learning environment using avatars in computer games, and specifically in online games e.g. „Massively

Multiplayer Online Role-Playing Games‟ (MMORPGs) (McManus, 2002; Mazlan 2012). Avatars play an important role in presenting an e-learning lesson by drawing learners' intention and making learning more interesting, personal, and attractive (Chae et al., 2016). Previous studies have primarily concentrated on m-learning environments and the use of avatars from a psychological perspective, considering how such environments can be used for study and research purposes and the implications of using such technologies (Yeeet al. 2007). Social impacts and the impacts of using such technologies are also discussed by researchers (Mitchellet al. 2007), Mitchellet al., for example, primarily focus on the social needs, structures and implications of using such technologies from the point of view of society. M-learning using avatars is still in a relatively early development stage. Research has shown that learners‟ perceptions towards avatars affects the ways they interact with the system and increase the participation intention in an online learning environment (Blascovich, 2002; Chae et al., 2016).

Avatars, gaming technologies and virtual worlds have always been successful in capturing the attention of young people. The use of avatars in electronic/mobile learning has been taken up by researchers after the success of avatars in computer games (McManus, 2002; Mazlan, 2012). There is a lot of research around adapting specific game techniques and avatars such as CLEV-R (Hodhod, 2010; Jones, 2016; Ng & Lindgren, 2013) and the 3D environment on various platforms, including smartphones, using an interactive game technique approach. The development of this platform is in its initial stages but researchers believe that this project when developed could help students by keeping them engaged and sustaining their interest (Jones, 2016). An avatar can be an important device for presenting m-learning lessons. Adding a face to a module can add interest and motivation for learners. The avatar can also present material in more conversational tones‟ while the appearance of avatars and the environment, along with their interactions, can affect people‟s sense of presence in the metaverse as virtual reality learning environments (Annetta & Holmes, 2006; Mazlan, 2012; Greenwald et al., 2017).

When implementing avatars in mobile learning environments, there are various considerations that must be taken into account. These include not only the cost and technological considerations but also the social, psychological and cultural aspects.

These perceptions and ideas need to be catered for when developing avatars in order for the end users to wholly be involved with the avatar learning environment and actively participate in the learning process. Only when there is active participation of the end-user is the usefulness of the technology wholly realised (Omale et al., 2009; Adham et al., 2016).

Studies show that avatars need not just represent the instructor in an educational setting. For children, interest in the subject can be piqued when they are allowed to choose a „cool" image and an avatar that they feel represents themselves. This kind of learning environment enables teacher-student communication, and effective tracking of work progress of the student in real-time is made possible. Such communication and activity-based learning can also be used in lower grades to help children concentrate and participate in the class. The activities that the child is involved in, and behavioural aspects that the child shows, can also be recorded and monitored for review by parents as well as teachers as shown in Figure 4 - 4 (Barrow, 2009).

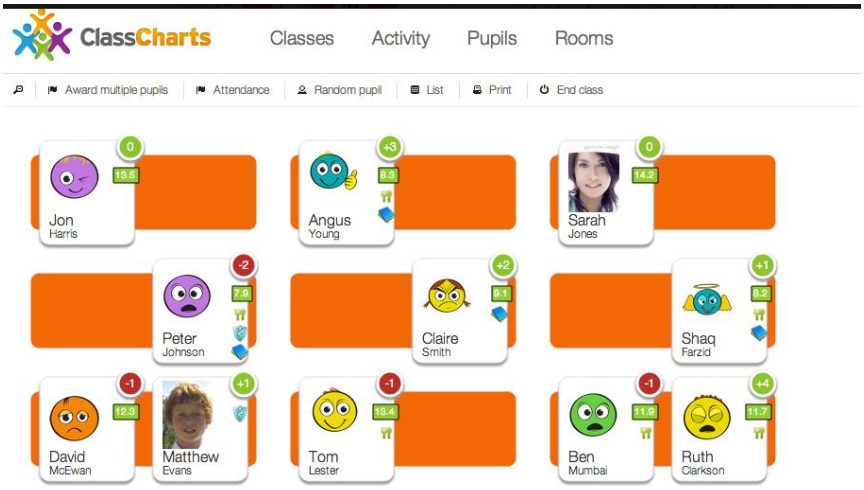


Figure 4 - 4 Avatar selection and customisation for students in a class (Barrow, 2009)

4.3.4 **Examples of Virtual Pedagogical Avatars**

The fundamental purpose behind including virtual pedagogical avatars in educational applications is their potential to generate engagement with and motivation for learning (Haake, 2006). For example, Falloon (2010, p120) found that using avatars in an educational environment can allow for "a powerful, motivating, and educationally valuable learning opportunity". According to Haake (2006), there are an increasing number of pedagogical avatars that had been used for educational systems, for example,

as instructors, virtual teachers, presenters or guides with the avatar taking the form of a cartoon, a series of still photographs, a 3D character, or a video of an actor (Chae et al., 2016) (see Figure 4 - 5 to Figure 4 - 9).

Figure 4 - 5 Virtual teacher

Figure 4 - 6 Instructor avatar

Figure 4 - 7 Presenter/guider avatar (Haake, 2006)

Figure 4 - 8 Avatars were used to communicate specific messages to target audiences (Falloon, 2010).

Figure 4 - 9 Cartoon avatar

4.4 Theories of Learning

This section aims to link interface design and multimedia content learning theories. The section discusses how the motivation to learn, universal design for learning (UDL) and different, learning styles can be combined in order to create effective pedagogic performance.

4.4.1 The Theory of Motivation/Engagement to Learn

The motivation to learn has been defined in previous studies in a variety of ways, including by MacIntyre et al. (2001) who defined motivation as "an attribute of the individual describing the psychological qualities underlying behaviour with respect to a particular task", and by Huang et al. (2010, p1179) who defined it as an "internal state or condition that activates, guides, and maintains or directs behaviour". Alongside these definitions are suggestions as to why technology can increase motivation to learn. For

example, Guo and Goh, (2015) found that students‟ engagement and learning motivation is increased when they interact with learning materials through the technology interface; Alabdulaziz & Higgins (2017) reported an increase in student motivation relating to the use of interactive whiteboards in a very interactive student-directed way; and Mazlan (2012) stated that interactivity, feedback and multimedia elements (audio, graphic, video, animation and text) are the significant factors of learners‟ motivation to learn. Mazlan (2012) also reports that the use of avatars in an online environment might contribute to the motivation of learning. This is due to the elements of the avatar and its ability to represent human characteristics which make the learning more realistic.

Other strategies which help learners to be more engaged and increase their motivation to learn are provision to the students of immediate self-assessment and tests frequent feedback about their learning progress as well as the use of personalised and focused multimedia content to enhance student learning as shown in Figure 4 - 5 (SEG Research, 2008). Research by Han & Finkelstein (2013) strongly supports the idea of the feedback intervention in online learning environments which in turn affect students‟ learning performance.

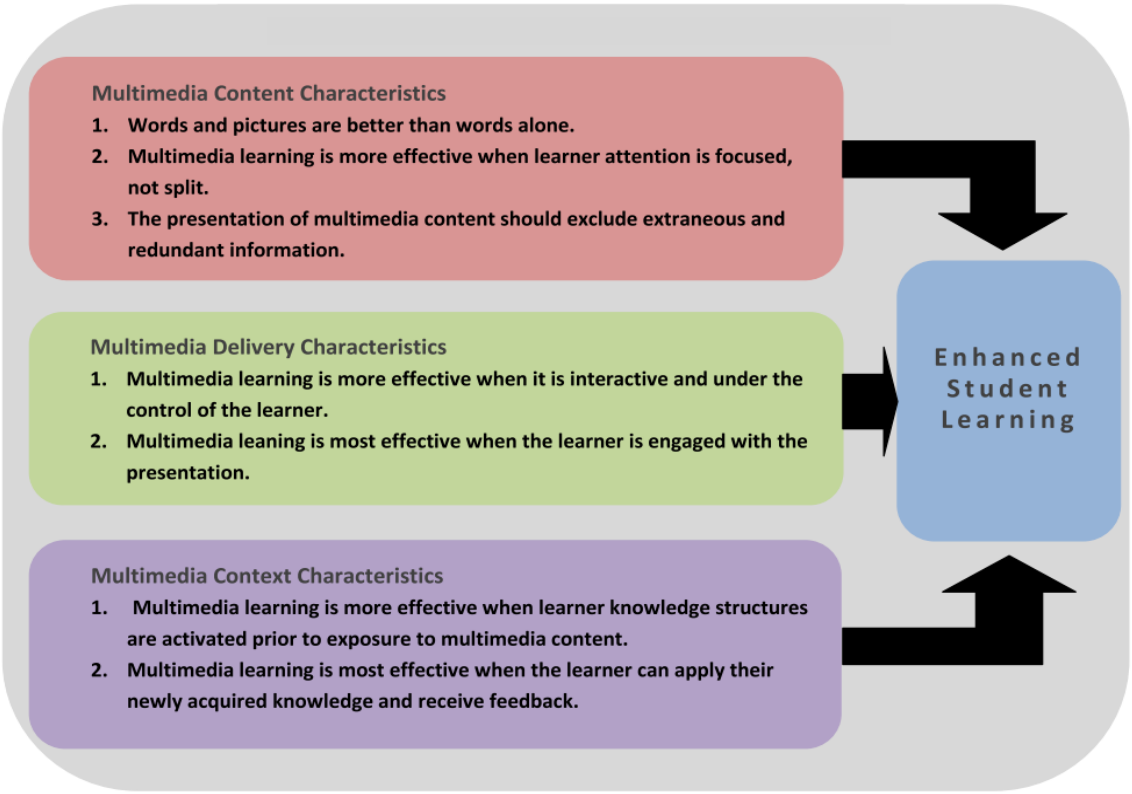


Figure 4 - 5 Summary of Multimedia Learning Principles (SEG research, 2008).

These principles also support two important theories which are the Universal Design for Learning (UDL), and Universal Design of Instruction (UDI). Both UDL and UDI focus on how online learning materials can be designed to enable all learners to participate and make the learning outcomes achievable regardless of their abilities, language skills and learning styles (Bühler & Fisseler, 2007). UDL and UDI support the design of instruction and learning such that it is "usable by all students… without the need for adaption or specialized design" (Burgstahler, 2015, p2). Connell et al. (1997), list the principles of universal design for instruction and learning in the context of online learning as following:

1- *Equitable use*: the design is useful and marketable to people with diverse abilities.
2- *Flexibility in use*: the design accommodates a wide range of individual preferences and abilities.
3- *Simple and intuitive*: use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4- *Tolerance for error*: the design minimizes hazards and the adverse consequences of accidental or unintended actions. Automated tests within an e-learning course should not

only give feedback whether an answer is wrong or right, but also why an answer is wrong (Burgstahler, 2015).

Interestingly, such principles have overlaps with the 10 heuristics of Nielsen (1995) and the 8 golden rules of Shneiderman (2004) for interface design, with selected heuristics as follows:

- *Visibility of system status:* the system should guide the user by providing feedback within good time.
- *Match between system and the real world:* the system should be designed with the learners‟ language.
- *User control and freedom:* support undo and redo.
- *Consistency and standards:* follow platform conventions
- *Flexibility and efficiency of use*: allow users to tailor frequent actions
- *Recognition rather than recall*: instructions for use of the system should be visible or easily retrievable whenever appropriate.

Thus, principles of UDL & UDI can be applied to the design of e/m-learning and educational technology. Because these principles aim to improve access to learning based on learning styles, digital media can play a significant role in achieving access through the presentation of learning information via a range of media types such as text, images, audio and video as presented in the next section.

4.4.2 **Learning Styles and Pedagogic Effectiveness**

Learning styles in the context of this thesis may be defined as “the manner in which individuals perceive and process information in learning situations” Brown (2000). There are various learning styles that affect the way students‟ learn, which may be effective for some learners but not for others (Hawk & Shah, 2007). Most researchers categorise learning styles based on the medium used for teaching, learning and the possibility for improvement in learner performance. A number of researchers, such as Farsi (2016) and Lowenthal (2010) believe that learning styles influence and promote learning based on the personality of the individual and that choosing the right learning style becomes essential in determining how well a student is able to grasp the subject matter. It is important to understand that each student is different and has different

learning preferences and different speeds of learning (Farsi, 2016; Lowenthal, 2010). Within the context of this thesis the VARK model, is adopted which combines four different modalities of learning styles (Visual, Aural, Reading/Writing, and Kinaesthetic). This model claims that learners should have one preference or learning style which takes precedence over other styles (Gilakjani, 2011), and consequently some students may prefer visual styles while others prefer auditory or kinaesthetic styles of learning. Further advantages arise when pulling learners‟ attention into their own learning styles in the form of "higher interest and motivation in the learning process, increased student responsibility for their own learning, and greater classroom community. These are affective changes, and the changes have resulted in more effective learning". Farsi (2016) defines these styles as follow:

- *Visual preference:* learners are most comfortable with pictures (graphs, images, illustrations, animation/video or pictorial representations) while learning and retaining information.
- *Aural preference:* learners learn by listening to lectures and reading or discussions.
- *Read/write:* learners learn from printed text and words.
- *Kinaesthetic:* learners prefer to learn by doing and they favour interaction with the physical world.

Gilakjani (2011) conducted a study to analyse the learning styles of Iranian university students who were learning English as a Foreign Language (EFL). They completed a questionnaire to determine if they preferred visual, auditory or kinaesthetic learning styles, with results showing that they preferred a visual learning style. The reason behind some learners preferring visual styles is these some learners retain and memorise the information of the subject that they have seen visually better than learning via aurally presented items (Kassaian, 2007). Thus, the use of mobile technologies in collaboration with multimedia in education can lead to individualization. Bonk et al. (2006) confirm that online learning will soon support a greater range of learning styles and individual differences in learning, for instance, blended environments will enable the learner to call up and manipulate pictures, charts, graphs, animations, simulations, and video-clips. Guo & Goh (2015) suggest that providing a visual agent within the

online learning environment could enrich learning experiences and help to attract learners‟ attention. However, these findings are contrary to a study conducted by Sweller & Van Merriënboer (2005) who found that using multiple styles in teaching can raise the amount of information that needs to be mentally processed. They explain that the delivery of too much information can be an ineffective way to learn and can interfere with the ability of brain to process information and cause unsuccessful retention and integration of information in memory.

Another model is the information processing model based on Mayer (2005) principles, illustrated in Figure 4 – 6.

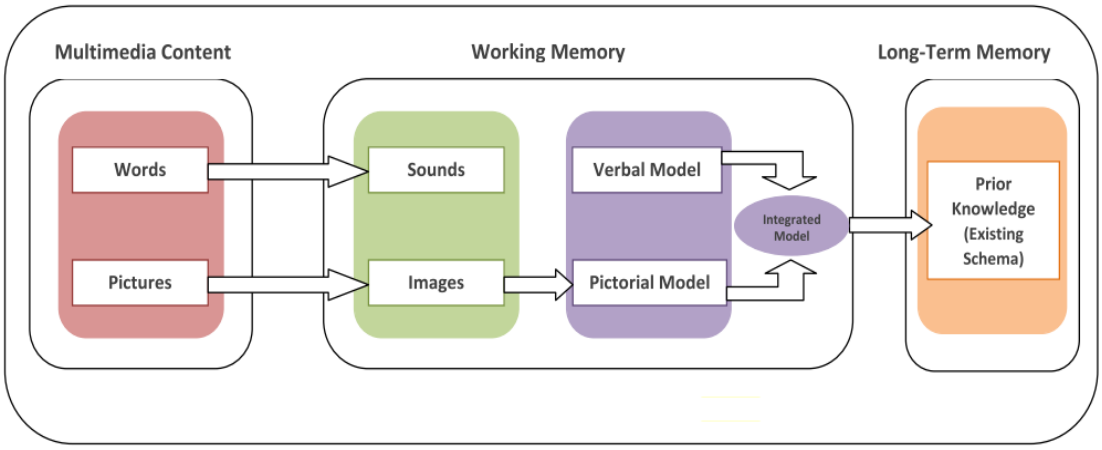


Figure 4 - 6 Information Processing Model Based on (Mayer, 2005)

Mayer‟s (2005) principles prove that by using multimedia in collaboration with learning content and by considering the balance between the animation of presentation and its narration it is more likely to be effective. It also more effective when the learner can interact with presentations which reflect on increasing student enjoyment of the experience and improves student pedagogical performance when tested.

The effectiveness or pedagogical performance can be defined as the achievement of goals (Algahtani, 2011). Within the context of this thesis pedagogical effectiveness is defined as “determining whether the interactive learning system accomplishes its objectives within the immediate or short-term context of it is implementation” Reeves & Hedberg (2003, p61). This means that the empirical attempts to improve learners‟ outcomes by enhancing the learning environment, which aim to measure the impact of m-learning technologies on the achievements of the learners can be identified as an effectiveness. According to Zhang et al. (2006) and Liaw (2008), there are a number of

factors such as the interactive learning activities and the use of multimedia formats during the design phase, which if considered in the context of online learning, they facilitate the effectiveness of the learning environment and increase the potential of students‟ motivation for the learning. Liaw (2008), also found that multimedia instruction was the biggest predictor which influenced the e-learning effectiveness. This researcher assumed that the higher interactivity can lead to higher engagement of the learner which can give better learning outcome. The use of different settings while designing online learning material has become a promising alternative to the traditional face-to-face learning (Zhanget al. 2006), due to the implication of providing different preferred learning styles which may suit the individual learners‟ needs and impact on their performance.

4.5 Chapter Summary

This chapter has focused on the mobile interface and the interaction between the learner and learning content. It has identified the user experience (UX) and interface design principles which need to be considered when planning to use mobile technology in education. The chapter has also defined the concept of avatar, has illustrated its benefits and discussed how they could be designed in a pedagogical environment. It has shown how the UX is interlinked with learning theories, and has highlighted some of the key theories that have been used in this thesis such as engagement, learning styles and pedagogical effectiveness, which may play a part in increasing students‟ engagement and which might enhance the learning process throughout representations of teachers as avatars on the m-learning interface.

Moving forward from the literature reviews of chapters, 2, 3, and 4, it is important to understand further the needs and requirements of students and how they prefer their courses to be delivered, especially in distance learning through a conceptual research model. It is important for instructors to incorporate learning styles, multimedia and interactive components into their course materials design which in turn supports the learners positively in their learning outcomes. In particular, this research aims to investigate whether or not having a range of avatars can supply opportunities for learners to be engaged in and to interact through interfaces designed with representational characters of their tutors as avatars.

These chapter highlight a number of areas which should be considered in this Ph.D. Firstly, the research requires an extension to the TAM model and its derivatives to take into account additional factors associated with m-learning in this context. It also requires development of m-learning web-app including different avatars that can be used for delivering learning content onto the learners and collecting their perceptions and views associated with their use. The proposed m-learning platform will provide the key multimedia attributes including audio, video and visual characters, as well as incorporating the learning styles of the VARK model to enable learners to visualising, listen, reading and interact with learning content. As a part of the study, the pedagogical performance or effectiveness of each approach will be measured and evaluated by through examining students on the lessons content that has been delivered to the students.

To date there has been little discussion in the literature with regards to how avatars can enhance learning. This research aims to experimentally investigate the factors that influence a proposed acceptance model for m-learning and its variable relationships with by using an English module for Saudi higher education students delivered via the proposed web-app.

To assess the improvement of the participants and their ability to engage and progress well in the module through m-learning, the research has focused on the effectiveness and retention of information of the learner when different avatar types are used to represent the teacher on the mobile device.

By pulling all the elements mentioned in the literature reviews together, they should back up the anticipated outcomes of the proposed research model and the web-app delivery platform. In the next chapter, the research methodology that will be used to investigate the aims and objectives of the thesis will be discussed.

5 Research Methodology and Experimental design

5.1 Introduction

This chapter describes the research philosophy and methodology adopted to effectively answer the proposed research questions. In particular, this chapter discusses the overall research processes and the methods used to accomplish the objectives of this study. The research strategies, techniques and procedures used for data collection instruments and data analysis methods are described. In addition, a detailed description is provided of the experiments and implementation procedures which were used to enhance the research data validity and reliability. The methodological approach adopted follows the "research onion" model proposed by Saunders & Tosey, (2012), as shown in Figure 5 - 1.

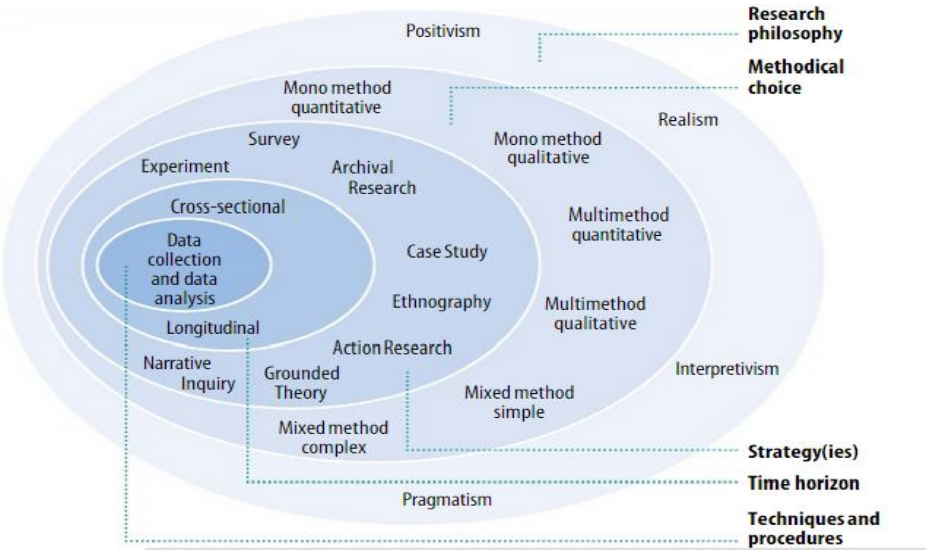


Figure 5 - 1 The Research Onion Model of Research (Saunders & Tosey, 2012)

A suitable methodology should guide research towards fulfilling the targeted aims. As shown in Figure 5 - 1, each layer of the „research onion" describes a more detailed and concrete stage of the research process, providing an effective progression through which the research process for a particular study can be designed. The usefulness of this model lies in its adaptability for almost any type of research methodology, its applicability in a variety of contexts and the way in which it sets out the stages through which the researcher must pass when formulating an effective methodology (Saunders & Tosey, 2012). First, the research philosophy requires definition. This creates the starting point for the appropriate selection of the research approach, as indicated in the second layer of

the model. In the third layer, the adopted research strategy defines in more detail the strategies such as experiments, questionnaires, co-creation and grounded theory that are appropriate for the research. The fourth layer identifies the target sample of the study, while the fifth layer represents the stage at which the data collection process is defined in detail and the way in which the selected tools/strategies will be used for data collection. Taken together these layers create a series of stages by which the different methods of data collection can be understood and applied in an ordered and appropriate sequence. This chapter describes this layered approach within the context of the aims and objectives of this research.

5.2 Research Philosophy and Approach (Layer 1)

A research philosophy influences the way in which the research is conducted, the strategies used, the research instruments and different methodologies selected; in short it ensures that the methodologies selected are appropriate to investigate the stated research objectives.

Several major research philosophies have been identified in the Western tradition of science including realism, interpretivism, pragmatism and positivism, the latter sometimes being called “scientific research” (Galliers & Land, 1987).

Positivism or scientific research, offers the perspective that research is concerned with gaining knowledge in a world which is objective, using scientific modes of enquiry, such as experiments and questionnaires where quantitative data is the norm (Flowers, 2009). Related to this approach reality is fixed and exists externally to social actors, is directly measurable and knowable with just one truth (Rubin & Rubin, 2012). The key aim of positivism can be stated as “to collect measurable, empirical evidence in an experiment related to a hypothesis, the results aiming to support or contradict a theory” (Bradford, 2017). The nature of the methods within positivism are structured and analysis of the resultant data is generally achieved through the use of rigorous mathematical and/or statistical techniques. Conversely, interpretivism assumes that people create and associate their own subjective and inter-subjective meanings as they interact with the world around them. In another words, research is based on the idea that it is not objective; it is always a subjective process, using qualitative techniques such as interviews or open-ended questions (Korning & Hebo, 2014). This method may also

accept that there is a reality, however, it cannot be measured directly (Rubin & Rubin, 2012), and allows for an understanding of the participants interpretations of the world (Saunders & Tosey, 2012).

For the purpose of this study, a pragmatist approach has been adopted which allows for the combination of positivism and interpretivism research philosophies. Positivism is used to define cause and effect relationships within a suitable approach as it starts with research questions, constructs hypotheses and designs, executes, and evaluates experiments, which can then be analysed using statistical methods (Bradford, 2017) as shown in Figure 5 – 2.

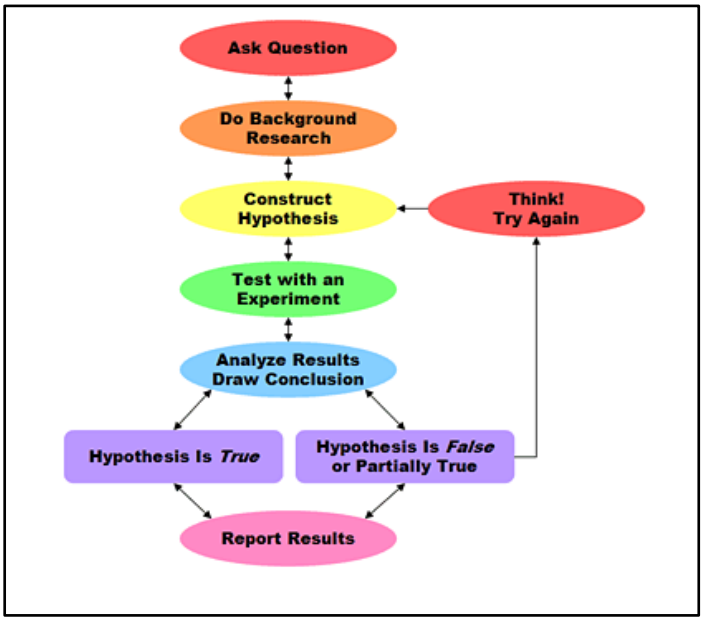


Figure 5 - 2 The steps of the scientific method (Bradford, 2017)

Positivism will therefore enable collection of all relevant information related to this study, using the main tools of data collection, such as experimental designs and questionnaires. Interpretivism is adopted to understand and interpret how relevant participants assess the current reality of the m-learning web application through their perceptions, open-ended comments and co-design activities as shown in Figure 5 - 3.

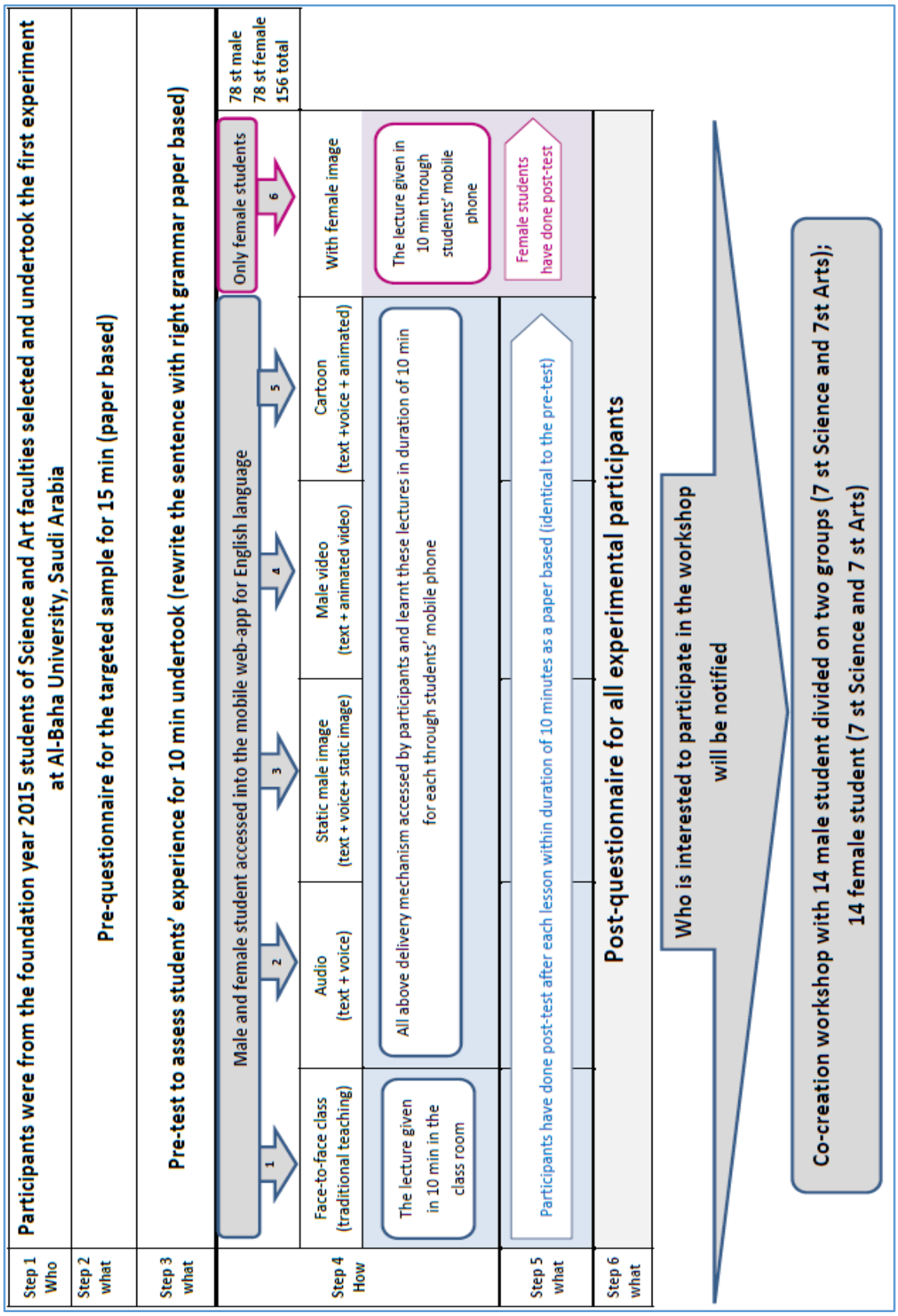


Figure 5 - 3 Procedure of implementing experiment (1)

5.3 Research Methodology Choice (Layer 2)

The purpose of research is to discover answers to questions through the application of scientific procedures. This section discusses the methods to be used for this study. There are two basic approaches to research, the quantitative approach and the qualitative approach, as well as means to incorporate and combine elements of both into the mixed methods approach often associated with the pragmatist research philosophy (Creswell, 2013; Edmonds & Kennedy, 2017).

5.3.1 Quantitative Methods

Quantitative studies rely on experimental design linked to research objectives. According to Mazlan (2012, p55), experimental design is used to "test hypotheses regarding causation, for example, that a particular instructional strategy leads to better student performance". Quantitative methods are usually applied to measure the collection of data with the purpose of verifying hypotheses or theories (Johnson and Larry, 2008) or to measure variables in a quantifiable way (Mertens, 2014). The use of quantitative methods helps to test theories, ensuring they are valid and reliable by assessing their effectiveness in any given circumstance or scenario by using structured and scientific approaches (Creswell, 2013).

Quantitative methods are frequently used when questionnaires are conducted that enable the capture of responses of the participants in a clear and concise manner (Edmonds & Kennedy, 2017). One or more hypotheses can also be tested using statistical methods if the data collection techniques limits the answer choices given to the participants.

In this study, the purpose of the questionnaires was to assess how engaged and motivated the students were to use an m-learning approach and to measure how effective each media type was at enabling students to retain the learning content delivered. As the nature of the research seeks to assess the Human-Mobile Interaction (HMI) between the participant and the mobile device interface, whilst also evaluating the level of interaction taking place during visual, textual and audio learning styles, the researcher is in complete control of the environment and no flexibility is given to deviate.

5.3.2 **Qualitative Methods**

Qualitative methods capture words, pictures, and artefacts (Mertens, 2014).They help to gain a deeper insight into the problem statement and have been used in this research to analyse the open-ended questions and comments, which are included as part of the post-questionnaire and which allow analysis of participants‟ overall feedback to identify whether or not there were differences of opinion. These type of questions enabled the researcher to ascertain the participants‟ perceptions of the benefits and challenges toward implementing m-learning in Saudi higher education. Furthermore, this research has also used focus groups and co-creation workshops with male students to obtain qualitative data, while female students were interviewed in focus groups through the use of video conferencing due to the aforementioned cultural context in Saudi Arabia. Qualitative methods have various advantages including helping a researcher to obtain detailed views of the perceptions of a group of participants which can otherwise be omitted from quantitative methods (Alebaikan, 2010). In this study, the focus groups provided an environment for the researcher to gather in-depth data as questions were flexibly modified by the researcher based on the responses of participants.

5.3.3 **Mixed Methods**

Mixed methods involve combining the collection of both quantitative and qualitative data in a research study (Mertens, 2014). It has been defined an approach to professional research that incorporates the collection and analysis of qualitative (textual) *and* quantitative (numerical) data (Creswell, 2009; and Ghaith, 2013). For example, a researcher may collect data by quantitative methods through experimental procedures, and then follow this up with structured interviews with a selection of individuals who participated in the experiment to support and explain their views on the experimental outcomes. Alternatively, the researcher may start by collecting data through qualitative approaches and follow this up with quantitative data in an exploratory research approach (Edmonds & Kennedy, 2017).

Early thoughts about the value of the mixed method approach resided in the idea that all methods had bias and weaknesses, and that the collection of both quantitative and qualitative data mitigated the weaknesses of each form of data (Creswell, 2009)

This research uses both quantitative and qualitative methods for the purposes of collecting data in order to gain a better understanding of the research and also explore the problem statement set out in the opening chapter, in a very detailed and in-depth manner. This approach often makes use of one or more quantitative data collection techniques (for example, structured questionnaires) with associated statistical analysis procedures as well as using one or more of the qualitative data collection techniques,(for example, structured interviews, observations and semi-structured focus group) (Creswell, 2013). The purpose of using a mixed method approach in this instance is to co-create ideal avatars which incorporate interactive elements to be used with associated analysis techniques. Setting up of co-creation workshops with students, offered significant potential for participants to assist with further developing their most preferred avatars and adding features they would like to see. The combinations of data collected from the quantitative and qualitative methods are to measure two main objectives:

First: Effectiveness and retention of information that participants have learned and how well they perform pedagogically.
Second: Preferences of avatar type usability and how engaged and motivated the students are to use them.

5.4 Strategies and Tools (Layer 3)

As stated in the above section, there are a number of strategies and tools that can be used for qualitative and quantitative data collection with a mixed methods research approach. These tools include questionnaires, focus groups, co-creation workshops, experimental design and grounded theory.

5.4.1 **Questionnaires**

Baker (1999) defines the questionnaire as “a method of collecting data in which specifically defined groups of individuals are asked to answer a number of questions". Questionnaires often make use of checklists and rating scales. A rating scale is more useful when perception needs to be evaluated on a continuum. There may be different stages to conducting questionnaire surveys, such as using pre-questionnaires and post-questionnaires to participants of taking part in experiments to grape their views before and after an activity. The primary goal of a pre-questionnaire is to facilitate the

researcher with the specific information necessary for the study and discourage the participants from diverging from the question (Cheng & Warren, 2006). According to Alenazi (2015), questionnaires area suitable tool for collecting data from large audiences with the purpose of generalising the findings. Assuming questions have been appropriately written, questionnaires are the most appropriate instrument in term of avoiding researcher bias and influence on the participants‟ responses at the data collection stage, is due to the absence of direct interaction between the researcher and participants (Algahtani, 2011). In addition, the purpose of asking participants to both a pre- and post-questionnaire is to compare levels of achievements and understand whether participants have been affected by the experiments or not. The aim of the questionnaire in this study is to collect data that will allow the investigator to measure differences in participants‟ perceptions of m-learning and their motivation to learn with it when presented with different avatar representations of the teacher.

5.4.2 **Focus Groups**

Focus groups can play an important role in enhancing a questionnaire‟s validity and providing useful information to understand the processes behind observed results and assess changes in people‟s perceptions of their well-being or views (Norris, 2016). Furthermore, a focus group can be used to improve the quality of survey-based quantitative evaluations by helping generate evaluation hypothesis; strengthening the design of survey questionnaires and expanding or clarifying quantitative evaluation findings (Cochranet al. 2016). Breakwell et al. (2006, p276), define this type of method as “discussion-based interviews that produces a particular type of qualitative data generated via group interaction”.

5.4.3 **Co-creation**

Co-creation is a development process whereby design professionals empower, encourage, and guide users to develop solutions by themselves or to help efficiently transfer an innovative solution from users into an institution domain (Joyce, 2017; Vázquez-Casielles et al. 2017). Co-creation encourages the blurring of the role between user and designer, focusing on the process by which the design objective is created. The idea of co-creation in this research is to actively involve users in the design and development of a future online learning, m-learning approach in a creative collaboration

between instructors and students (Pilleret al. 2012). The term co-create/co-design has become popular in mobile phone development, where the two perspectives of hardware and software design are brought into a co-design process. According to Alebaikan (2010), co-creation through focus group workshops create the opportunity for different ideas to be discussed directly and specifically. The reason behind adopting this method is to turn the passive learning materials which might contain huge amount of information into interactive learning materials based on the learners‟ ideas (Seifert, 2014).

5.4.4 **Experiments**

The definition of an experiment can be adopted from Montgomery(2017, p2) as “a test or series of runs in which purposeful changes are made to the input variables of a process or system so that we may observe and identify the reasons for changes that may be observed in the output response”. Experimentation is the deliberate act of changing one or more process variable or factor in order to observe the effect and the changes have on one or more response variables (Bates, 2015). According to Mertens (2014, p4), the definition of experimental groups is that “the researcher can divide the participants into two or more groups to test the effect of a specific treatment. . . the group that receives the training is called the experimental group”. When designing an experiment, there are some elements need to be considered such as defining the population of the study, variables, and the experimental design. When planned to determine which input variables are responsible for the observed changes in the response, the development of a model relating the response to the important input variables is required with subsequent use this model for process or system improvement (Montgomery, 2017).

5.4.5 **Grounded Theory**

Grounded Theory (GT) is a systematic methodology in the social sciences involving the construction of theory through the analysis of data and is an inductive method used to predict and explain behaviour to build theory (Glaser, 2017). This starts with data being collected from a pilot study then, based on the results of the data, the researcher will rebuild and amend the planning of this experimental materials. GT provides a way to focus on groups of participants, a methodology and a set of methods and analytical tools to investigate and report on what is happening within a specific context. This enables

both quantitative and qualitative data to be collected and analysed using, allowing the researcher to use a variety of tests and materials such as questionnaires, focus groups that may be further developed as the study progresses (Crittenden, 2006).

For this Ph.D study the researcher decided to use a mixed method approach which includes use of questionnaires, experimental designs, co-creations and grounded theory, whereby the stages are going to be built up to validate the proposed hypotheses through implementing this research.

5.5 Research Design

As stated, experimental investigations were performed to explore the common and particular factors for optimal mobile learning using avatars interfaces. The study was designed to measure how engaged and motivated students were when using mobile learning devices with different types of avatars to represent the teacher. Furthermore, the effectiveness of this approach on information retention by students using m-learning was investigated and measured.

Table 5 - 1 demonstrates the activities undertaken deriving the research:

Table 5 - 1 Demonstration of research procedure

Phases	Activity
Design and development phase	
1	Develop the (MADE-ME) research model
2	Design a pre-questionnaire.
3	Develop the mobile learning web-application (MADE-ME)
4	Design and develop a range of avatars for the course contents.
5	Design the post-questionnaire.
6	Submit the Ethical of the research.
Experiments implementations phase	
1	Conduct the pilot study
2	Implement Experiment 1
3	Distribute of pre-questionnaire on the main sample of the study
4	Conduct the learning through the MADE-ME web-app
5	Develop the m-test through web-app
6	Distribute of post-questionnaire and collect them when completed
7	Set up the co-creation workshop
8	Develop prefered avatar interface types further to incorporate interactive elements
9	Conduct experiment 2 with the co-created avatar interface.
10	Collect questionnaires and the m-test result.

The design and development phases took into consideration the framework that has been proposed as a part of the research while considering the user engagement, design of the interface, mobile platform and the cultural and ethical constraints within Saudi Arabia and its education system.

5.5.1 Ethical Approval Procedure

The ethical dimension identifies those issues that need to be addressed when developing and implementing this research. An approval of the procedure was obtained from the Ethics Committee of the System Engineering School, University of Reading. The ethics application is attached as (Appendix A). The consent of participants is necessary to ensure that all the ethical constraints of the research are met. Issues such as cultural diversity and gender segregation while collecting primary data for the research are important factors in the Saudi context. It was therefore imperative that the ethical issues took account of how primary data was collected and whether there were any issues that the researcher needed to take into consideration while collecting such data and if these would have any implications on the research. Permission to set up the co-creation workshop of students group within the university of Al-Baha University was obtained.

Harris et al.(2008) discuss the importance of how research ethics and list a number of its key principles, for example:

- How to encourage people to participate and the approach that will be taken.
- Displaying the objectives of the research to participants
- Underlining the confidentiality of the data collected from the participants.

The main issues required for this research context which needed consideration were confidentiality, data protection and participant consent.

5.5.1.1 Confidentiality and data protections

There is an ethical and legal requirement to protect the identity of the people who take part in the research process, both in the surveys and in focus groups. Depending on the type of data collected, this could also be a legal requirement. According to Giordanoet al. (2007) when the researcher collects personally identifiable information (PII) from the sample of chosen participants, it is imperative that the researcher takes adequate

measures to protect participant information and assure participants the data will not be used except for the purpose of this study only, but that the data can be used for publications connected to the research, such as the thesis and any journal papers that stem from this thesis. Also, it is necessary for the participants to get a thorough understanding about how their details will be stored confidentially and be given the option to not disclose any personally identifiable information. Each participant was assigned a sequential number so that no result or comment can be attributed directly to any named individual but would instead be linked to that number directly. In addition, within this experiment, arrangements for any confidential material generated by the research will be stored securely within the researcher‟s store and, where appropriate, subsequently be disposed of securely. The researcher, in order to maintain the research ethics, took absolute care not to collect any personal details from the participants if it would not be used in the analysis or help answer the research question (Mertens, 2015).

5.5.1.2 Consent of participants

Researchers collect primary data from a chosen sample or samples. Students who participate in the research process either by means of completing a survey form or attending the focus group must not be subjected to any unethical means or coercion by the researcher (Johnson & Larry, 2008). This research, in line with standard practices, clearly provide the participants with an option to withdraw from the workshop or survey or even decline to participate without having to explain the reasons (Giordano et al., 2007). It is essential for the researcher to therefore obtain explicit permission from the participants to participate in the research by clearly explaining to them the reason for the research and how the data obtained would be used (Harris et al., 2008). In this study, students participated voluntarily in the study, signed a consent form and were informed that they could leave the study at any point they chose.

5.6 Pilot Study

Pilot testing was conducted in order to confirm that all the instruments used in the study were clearly and appropriately presented working clearly. As claimed by Mazlan (2012, p67), pilot testing is “to try the experiment on a few participants first to see whether it makes sense to them, to uncover any serious flaws or problems that might have been

overlooked at the design stage and to generally „fine-tune" the procedure". Pilot studies are useful to ensure the clarity and appropriateness of questions in the questionnaire.

A pilot study with seven Saudi students at the University of Reading was undertaken to ensure readability and clarity of the questions prior to administering the questionnaire to the targeted sample of undergraduate students in Saudi Arabia before and after they undertook a learning activity delivered on their mobile devices via each different avatar types. The level of English for all participants in this pilot was the same level as that of the participants in the research, which is elementary. In this study, particular emphasis was placed on the pre/post questionnaires in order to examine understanding of the meaning of the statements.

The researcher measured the reliability of questionnaires" items by using Cronbach"s coefficient Alpha as the common measurement(Harris et al. 2008). The reason behind using this type of test is because it is the most commonly used test to determine the reliability of data when having multiple Likert questions in a questionnaire. The range of the reliability should be between 0 to 1, with coefficients equal to 0.70 or above usually considered adequately reliable (Harris et al. 2008). Cronbach"s Alpha was calculated in this research by using SPSS software version 21, See Table 5 - 2.

Table 5 - 2 Values of Cronbach's Alpha for Experiment 1

No	Sections	Number of Questions	Cronbach's Alpha
1	Preference for m-learning mode of delivery	6	0.70
2	Effectiveness/performance expectation	7	0.88
3	Engagements of m-learning	3	0.79
4	Behavioural intention to use	5	0.82
5	Convenience of m-learning	4	0.76
6	Enjoyments of m-learning	3	0.70

From Table 5 - 2, it can be seen that the reliability coefficients are acceptable values of reliability for the research procedures to continue.

5.6.1 **Subjects Targeted**

The study focused on the English language module, a compulsory course which is mandatory for the foundation year in Al-Baha University. The reason for choosing this module is the extensive hours required for teaching this course. Students complain

about the high number of sessions for this course, which are 20 hours face-to-face time plus another 14 hours of six different modules each week with attendance being compulsory. In addition, despite the extensive number of hours for this course, there is a notable lack of student success in terms of English knowledge in general and grammar structures in particular. Furthermore, all Science students are required to study all their courses for the full undergraduate degree modules in English, partially for Arts students. This English model is thus an important element within the Saudi education system and is one where m-learning if successful can have a significant impact on both individual students and education in Saudi as a whole.

English language is the dominant learning and teaching language and it has become almost a necessity for students to learn English if they are wishing to enter a global workforce in Saudi Arabia. While many studies around the world have investigated the use of language learning for improving language skills, most research into language learning strategies involving Arab English Foreign Language learners - particularly Saudi Arabian learners - remain in the early stages of development compared to other nationalities and ethnic groups (Aljuaid, 2010). According to the Education First English Proficiency Index (Alhaisoni, 2012), the English language proficiency level in Saudi Arabia is rated as low.

Research has highlighted some of the main reasons behind the low English language proficiency of Arabic students, such as poor teaching methods and lack of motivation and engagement (Al-khairy, 2013; Al-Tamimi & Shuib, 2009). Therefore, the main purpose of this research is to investigate the benefits, opportunities and challenges that mobile learning brings to the higher education process in Saudi Arabia by creating an environment of real-time interactions amongst learners and their instructors through their mobile devices with application to the English language module.

The researcher contacted an English lecturer in Al-Baha University seeking his support to prepare for him six equivalent English grammar topics together with their exam questions. The lecturer collaborated with another lecturers at the department and they checked the outlines of the English language module which contain 11 main units covering a range of listed topics, one of them being the tenses grammar chapter. This chapter has several units. It should be noted that the contents of all lessons prepared for

use in this study were identical in their level of difficulty. These topics included two sub-topics of „simple present", two sub-topics of „simple past", „present progressive" and „future tense". The lecturers also provided the researcher with a copy of the course objectives. To ensure that there is no bias in the outcome of the experiment, the learning requirements, pathways, modes as well as the course goals and objectives remained the same across all the topics, the researcher"s supervisor checked them and confirmed the validity of these learning materials.

5.6.2 **Learning Objectives**

Within the context of the experimental lesson, the students should be familiar with how to use the appropriate context of any grammar and be able to demonstrate understanding the following:

1. Pronouns and how they can be used.
2. The structure of the basic positive sentence modal.
3. The structure of the basic negative sentence modal.
4. The question formation of tenses taught.
5. The answering formation of any tense"s question with the right form.

The selected module was also favoured because it added value to the students" prior knowledge of English language.

5.7 Population and Time Horizon (Layer 4)

According to (Mertens, 2014) the definition of population is "the group to whom you want to apply your results" (P.4). The targeted population of this study was students in Al-Baha University, a public university in Saudi Arabia. Participants were recruited across two different colleges for the foundational year: Science and Arts Colleges. Therefore, Arts and Science faculties were considered the main specialization of those students who participated in this study because they are the main specializations in all Saudi higher education universities. In addition, there are several majors/subject that fall under these two faculties. The Science School contains Chemistry, Physics, Biology and Mathematics disciplines and the Arts school contains English, Arabic language and Islamic disciplines. The research was conducted with both male and female participants, as previously explained. The justification for conducting this study in Saudi Arabia was

because it focuses on whether this approach is most effective and preferred way of learning studying within a Higher Education program in Saudi Arabia.

5.7.1 **Participants/Sample**

The „sample" is the group within a population who will be studied by the researcher (Mertens, 2014). For the context of the research, the researcher selected to use a non-probability sample at a specific (cross-sectional) rather than longitudinal point in time, which can be defined as stated "a sample that deliberately avoids representing the wider population; it seeks only to represent a particular group, a particular named section of the wider population such as a class of students. . . two or three groups of students"(Cohen et al., 2007, p110). Hence, participants were recruited across two different Colleges for the foundational year. Recruitment took place via the Student Affair's office, with four classrooms being selected for the study and the sample being representative of the gender segregation for education in Saudi Arabia for social and cultural factors. A total of 160 questionnaires were distributed and 156 were returned (97.5%). The ages of the students ranged from 18 to 22 years old with a median age of 19 and with 91% of them aged less than 20 years old. The male:female gender split was 50:50. Students participated voluntarily in the study. Table 5 - 3, provides a breakdown of the demographic for respondents for Experiments - 1.

Table 5 - 3 Demographics Profile of Respondents

Respondent's Profile	Classification	Frequency	%
Gender	Male	78	50
	Female	78	50
Age	18-20	145	92.9
	21-22	11	7.0
Faculty	Science	83	53.2
	Arts	73	46.7
Average daily hours usage of mobile phones	More than 3hr	102	65.3
	2-3 hrs	37	23.7
	1-2 hrs	8	5.1
	Less than 1 hr	7	4.4
I know m-Learning	Yes, a lot	10	6.4
	Yes, a little	68	43.5
	Not sure	24	15.3
	No	54	34.6
I heard the term of Avatar/ Representative of the instructor	Yes	43	27.5
	No	51	32.6
	Not sure	62	39.7

5.8 Experimental - 1 Procedure and Implementation (Layer 5)

This section describes the procedure of the first experiment, data collection via (questionnaires) and tests the steps being chronicled as follows:

5.8.1 **Procedural Steps**

- The researcher received the Ethics approval letter from the Ethics Committee of the System Engineering School at the University of Reading, confirming that there to be no refusal on an ethical basis to conducting the research (Appendix A).
- The researcher provided a letter from his research supervisor, to the head of the Saudi Cultural Bureau in London, seeking permission for the researcher to undertake his research at the Al-Baha University in Saudi Arabia, and to communicate and teach the targeted sample for three months for the first semester from 16.10.2015 to 16.01.2016 (Appendix B).
- The researcher received the approval letter from the head of Saudi Cultural Bureau, confirming that the Al-Baha University had no objection to allowing the researcher to conduct his study at the Colleges of Science and Arts(Appendix C).
- Because the researcher needed to run his study on the foundational year at the two colleges, he asked the Vice Chancellor of Graduate Studies and Scientific Research, at the Al-Baha University to allow the research to go ahead (Appendix D). The Vice Chancellor confirmed the research could go ahead and wrote to the two College Deans to allow the researcher to carry out the study and to provide him with all possible facilitations.
- Because the researcher needed to run his study on the students who were already registered on the English course, he held a meeting with the head of English course and discussed with him the objectives of the research and how they might improve and affect the students‟ level in English. The head of English‟s response was positive and he stated that he welcomed such research.
- The researcher asked the manager of the English course to provide him with the targeted number of the sample list names and was provided with a list of four groups of male and female students.

- The researcher then had a face-to-face meeting with the male instructors and a meeting via video conferencing with the female instructors and again discussed the aims and objectives of the proposed study, each of whom welcomed the study.
- The dates and time were arranged with participating instructors in order to run the experiment steps with targeted participants.
- At the beginning of the study, the researcher provided an introduction to each group during the first week of the study about the objectives and aims of the current research and how the steps of the experiments would be carried out. The targeted sample of students were encouraged to participate in the experiment of English language learning via a mobile device.
- In carrying out the experiment, the first phase was to identify the source of information both from primary and secondary data. All primary data was collected from the sample identified in step one by using semi-structured pre-questionnaires and the second phase was obtained from the literature review. The researcher circulated the pre-questionnaire manually amongst the participants and collected them within 20 minutes for each group.
- In order to examine whether or not there were initial significant improvements in the students‟ experience and performance of English language grammar, a paper based pre-test was conducted on all participants for 15 minutes prior to each lesson.
- After that, students used their smartphones devices such as iPhone and Android to receive English language course materials through the MADE-ME web application. Participants received mini-lectures via the five different user interfaces as (1) text; (2) static image; (3) cartoon; (4) audio; (5) video. The same lessons were provided to both the male and female students, plus one more which was a female static image avatar. The justification for why each one of the participants interacted with each method of learning was because that allowed them to compare preferences and engagement.
- Male participants were then given one more lesson by the researcher via a traditional face-to-face lecture, while the manager of English modules in the female departments was in charge of giving the same lesson to the female participants.

5.8.2 **Implementation**

In this experiment, the researcher proposed that the study develop five types of mobile interfaces using avatars to represent the teacher for male students and six types of interface for female foundational year student. The five lessons were as video, audio,

static, cartoon and text, further the sixth type of female was (female static image avatar). Participant were taking two lessons per day as two different modes of delivery via mobile smartphones. The researcher randomised the links of lessons to ensure that the students did not accumulate their information and progress well on the later test rather than the earlier. He divided each group of the main four groups into two sub-groups (A and B) in order to randomise the order of lessons between the two groups. For example, one group undertook the first day's video and audio lessons, while the other group undertook cartoon and text lessons and vice versa for the next day/session. See Table 5 - 4; Table 5 - 5.

Table 5 - 4 Process of data collection with group A

Day no.	Activity
1	Pre-questionnaire
2	Pre-test of text - cartoon and its post-test
3	Pre-test of audio - static image and its post-test
4	Pre-test of F2F - video and its post-test
5	Post-questionnaire

Table 5 - 5 Process of data collection with group B

Day no.	Activity
1	Pre-questionnaire
2	Pre-test of video- F2F and its post-test
3	Pre-test of text - cartoon and its post-test
4	Pre-test of audio - static image and its post-test
5	Post-questionnaire

Students were given five-minute breaks after finishing each lesson and they undertook the post-test immediately. The researcher then collected the post-test from the participants. Five days after the beginning of the experiment, each group had completed the learning via each of the different the modes of delivery, and at this point, the researcher distributed the post-questionnaire to all participants and collecting them within 20 minutes.

5.9 Data Collection

Data collection was undertaken over a three month period from September 2015 to December 2015. All data were collected from the research instruments were as pre/post-tests, pre/post-questionnaires and information from the co-creation workshop which was facilitated by the researcher. The researcher was the primary coder of the data, checking scale reliability and was responsible for assessing all code consistencies. Data privacy was protected through the distribution and separation procedures. The personal data collected, such as the demographic information through questionnaires, were coded by numbers in order to not identify individual participants. Moreover, the test results were

protected by coding them with the same code number as the questionnaires and, then once converting them into a digital format as Microsoft Office Excel sheet, the raw questionnaire were stored securely offsite. The digital data is protected by password on a personal computer. Data backups were made and stored on another device. The Excel sheet was imported into Statistical Package for Social Science (SPSS) version 21.

5.9.1 **Questionnaires**

As stated, the questionnaires were completed in two stages: one before the implementation of the experiment (pre-questionnaire) and the other after the experiment was conducted (post-questionnaire). The aim of the pre-questionnaire was to obtain student responses as preliminary information such as:

- Demographic information e.g. gender, age and academic disciplines of study.
- Demographic of mobile device e.g. average use of mobiles device and types of owned phones.
- M-learning experience and gathering inputs on the m-learning platform that would be launched or used.
- The student preferences of multimedia types and identifying avatars.
- The attitudes of users towards using the technology in education.
- The initial perception of engagement for using m-learning.

These information helped to understand the perception of all the participants before using the MADE-ME app to understand their acceptance of the technology. A further pos-questionnaire, based on the outcomes of the initial questionnaire, was circulated to the participants sample to collate information regarding the usability aspects of the MADE-ME app and to determine how likely m-learning with an avatar would be successfully implemented in Saudi Arabian higher education institutions. Students completed the post-questionnaires based on how they would feel if mobile technologies were to be used for learning on a core course in their first year of their undergraduate degree. This post-questionnaire was divided into the following categories:

- Demographic information.
- Effort/Important.

- Engagement/Motivation.
- Enjoyment/Interest.
- Students‟ expecting their Effectiveness/Usefulness of retaining information taught by the approach.
- The perceived intention to use the technology.

The demographic information section gathered data about participant‟s age, gender, faculty, year of study and asked also for the technological demographic, such as general daily mobile usage and for how long they had owned them, whether participants had used mobile devices in any education-related activities and to what extent they rated features such as the convenience of mobile learning. Furthermore, in the post questionnaire, participants were also asked to rate how well they thought they had done in the test using their favourite interface and mode of lesson delivery using 5-points, ranging from 5- Great; 4- Good; 3- Average; 2- Poor; 1- Do not know.

Questionnaires were paper based and needed to be filled by hand in order to collect the data only for the target sample. There was a short introduction at the start of the questionnaire to explain the objective of the study and to reassure participants that their data would be held confidentially and that responses would not be attributable to any individual. M-learning terminology was defined within the questionnaire as it was new to their academic environment. The design of the questionnaire went through several stages:

- Both questionnaires (pre and post) were designed with reference to previous studies‟ questionnaires in the literatures. Suitable phrases were taken from these studies and some were modified and rephrased to suit the requirements of the current research. The reason was to assist in ensuring the validity and reliability of the questions was maintained.
- The investigator then submitted the draft questionnaire to his supervisor, at the University of Reading and also to academic staff in the English department at the University of Al-Baha in Saudi Arabia, who suggested amendments and valuable comments.
- In order to ensure the validity of the pre and post questionnaires used in this study, they were reviewed by three researchers/educationalists: two were experts in computer

science/m-learning to provide feedback on the questions and their relevance to the research and whether they able to measure what they intended investigate. The third expert was a statistician in the Statistical Services Centre at the University of Reading, to evaluate and ensure the selection of the appropriate statistical techniques for the data analysis.

- After refining the questionnaire by making the required amendments, the pre-questionnaire consisted of 45 statements and the post questionnaire consisted of 42.
- As all the students who participated in the study were Arabs, who generally have low levels of English language understanding and who may have found difficulties when responding to these questionnaires in English, the researcher translated the questionnaires into Arabic after the supervisor"s approval.
- The Arabic version of the questionnaires was then submitted to two separate specialists in linguistics at the Al-Baha University whose first language is Arabic, to ensure the clarity, the correct translation between the languages and to give their opinions on the translation, and also to ensure the correction of the Arabic grammatical phrasing of the statements. The researcher asked two of his colleagues as a lecturers in the English department in Saudi Arabia and native Arabic speakers to translate the Arabic version of the questionnaire to English without looking at the original English version.
- The investigator subsequently made a comparison of the two English versions, where the researcher found no significant differences between the two versions in terms of meaning, although, his supervisor recommended him to do some minor amendments.
- The questionnaires used in this study consisted primarily of closed question checklists and Likert scales and rankings, but there were also several open-ended questions that gave students the opportunity to express their views regarding their perceived potential benefits and negatives toward m-learning.

The measurement scale that has been used in this questionnaire was based on an ordinal measurement ranking of a 1-5 point Likert scale of agreement. As stated by Dawes (2008), the five point Likert scale is the most commonly used scale in any study and its validity and reliability are better and more accurate than for scales with fewer points. The scale to be used in these questionnaires is as follows (Appendix E):

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral or Undecided

- 4 = Agree
- 5 = Strongly Agree

- Participants undertook the experiments and completed the comprehensive pre and post questionnaires in order to investigate their preferences for and performance with five different user interfaces: (1) text; (2) static image; (3) cartoon; (4) audio; (5) video for males, plus and an extra interface for female students using a female static image.
- The questionnaires‟ reliability was checked to verify the coefficient (Cronbach‟s Alpha) was high which more than (0.7) in this case study and was shown to meet the reliability requirements in SPSS, as was shown in Table 5 - 2 in Chapter 5 (p70).

5.9.2 **Test phase**

Learning performance or pedagogical effectiveness was evaluated by designing tests based on the learning content. To measure the students‟ effectiveness using this approach, assessments (grades on/across all modes of delivery) were performed. The test/exam for this study was prepared by a specialist team of academic staff from the English department. Participants in this study conducted the pre- and post-tests. The purpose of the pre-test was to ascertain what aspects of English grammar they knew and were familiar with. Both tests were identical in order to measure and assess the students‟ progress using the experimental approach. The questions required the students to re-write the correct structure of each sentence using two different forms. To explain this in more detail, if the students were given the sentence in a positive format, they were required to re-write the sentence in both a negative and question format and vice versa of that tense grammar. The team checked the correctness of the questions with regard to the scientific content. In addition, they ensured the suitability of each question and that they were relative to the objectives of the lessons. Furthermore, they ensured the language of each question was clear and easily understood. The average time each exam required was 15 minutes. According to the statistical analysis, the pilot study confirmed that all lessons‟ exams questions had the same level of difficulty, which showed consistency between these ways of learning. Analytical results provided the evidence that these tests were strongly reliable in evaluating learning performance.

5.10 The Implementation of a Co-creation Workshop (Focus Group)

Focus groups or co-creation workshops are being increasingly used in the field of education for "gathering data on attitudes, values and opinions" (Cohen,et al. 2007, p.376). Structured focus groups are used to reveal detailed information from the participants as they communicate and interact within the group. In this manner, co-creation can contribute towards validity of the research and insure the real views of participants and their perceptions are provided. According to Liaw (2008), by considering the responses of students who participated in e-learning courses, a greater understanding of the reasons why learners are often not satisfied with the e-learning experience can be gained. It should be noted that learners were passively learning with all the previous content delivery mechanism, however, in this stage, the researcher set up a workshop with a number of invited participants with the aim of working with them to co-create, customise and reinvent the avatars as active or interactive learning interfaces including extending features they liked and discarding what they did not like. As highlighted by Liaw (2008, p868), "learning activities in which learners play active roles will engage and motivate students‟ learning more effectively than learning activities where learners are passive".

Co-creation is about working together for a strong community and more effective social design. It starts from the idea that designs are successful only when the people being served are involved (Maenpaa, 2012). Participants will then get the chance of choosing the best avatars and design their own mobile learning interfaces. In addition, in this experiment the researcher intended to investigate student preferences for the best way to learn through mobile phone technology. The researcher selected seven participants from each of the two classes (Arts and Science), drawing students from both the male and female classes. The total number of workshop participants was 28 students and they were divided into four groups. The selection was based on random selection from the previous participants in order to find different experiences. The workshop was carried out in a suitable and quiet place at the College of Science in Al-Baha University (See Figure 5 - 4). The workshop the students undertook lasted between 45 minutes to one hour.

Figure 5 - 4 Co-Creation Workshop Session Managed by the Researcher (published with consent of the participants)

The researcher concentrated in this session on the creativity of learners, based on their views and perspectives on the previous experiment and added new elements which they missed and wished to have while learning through mobile phones. The researcher and groups of students went through various activities during the workshop; for example:

1. A „brainstorming" session about the effectiveness of m-learning for the English module.
2. Sketching ideas on how to optimize the learning process on paper worksheets.
3. They were encouraged by the researcher to design a storyboard and prototype their engaged mobile interface (See Figure 5 - 5).
4. They were asked deeper questions based on the initial results of their previous questionnaire, and they were asked further about the advantages and obstacles of English learning regarding the teaching methods.
5. Students tried to improve or merge elements from the different types of m-learning interfaces.

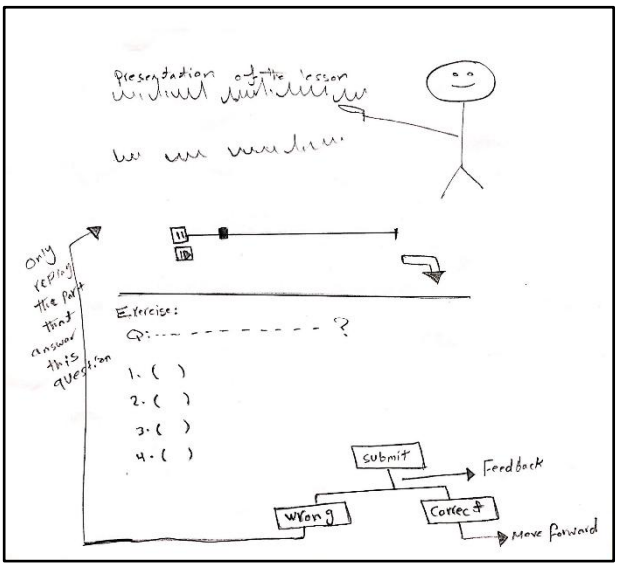


Figure 5 - 5 Sample of participants prototyping

The researcher collected and analysed the qualitative data for the purpose of designing a new prototype and developing the mobile application based on the final result. In summary, students wanted a balance between passive learning and active/interactive learning to engage them more with the content, which could help them to retain the information they have learned. According to the data collected, the web-app needed to have the following functions and features:

- The ability to keep students motivated and engaged by providing exercises in between concepts.
- The ability to provide instant feedback.
- The ability to direct the learner to revise information if their answer was wrong.

All of these characteristics and features are highlighted by Eppard et al. (2016). Additionally, students pointed out their enthusiasm to learn from the animated instructor (video interface avatar). Finally, when the researcher completed the case study and collected the required data, he received a release letter from the main supervisor who monitored the experiment at Al-Baha University which confirmed the success of completion (Appendix H).

5.11 Experimental - 2 Procedure and Implementation (Layer 5)

Based on data from the first experiment, three types of avatars (audio; video; cartoon) were further developed with 28 students in a co-creation workshop in order to incorporate other collaborative and interactive elements to support the learning process. A second experiment was conducted using the avatar interfaces co-created by the students, to compare levels of engagement and pedagogic performance in relation to mobile learning and traditional teaching of English as a foreign language to 103 students in the same higher education institution in Saudi Arabia.

This section discusses the procedure of the second experiment data collections and tests. The experiment went through the following stages:

- This second round of experimentation was based on the results of the initial testing, with the same objectives and sample population and environment in Al-Baha University in Saudi Arabia.
- The design of the lesson was based on using of Articulate Storyline 2 software and PowToon website as explained in details in Chapter 7.
- For the data collection method, questionnaire which contains closed questions and open ended questions designed through the identical stages that been used in first experiment (Appendix F).
- The experiment was conducted between 23/11/2016 to 15/12/2016.
- The researcher contacted the Heads of the English course, in the male college and in the female college, initially by email and subsequently by phone, to select the two groups from each gender in the Science and Arts classes.
- The researcher asked the managers to provide him with the targeted number of sample list names, then with the contact with students‟ affairs, they provided him with the four groups of male and female lists of names.
- The researcher sent the instrument tools, such as a letter detailing the instructions for the experiment and also electronic pre-test and electronic questionnaire, as links by email to the two managers. This experiment underwent several steps see Figure 5 - 6.

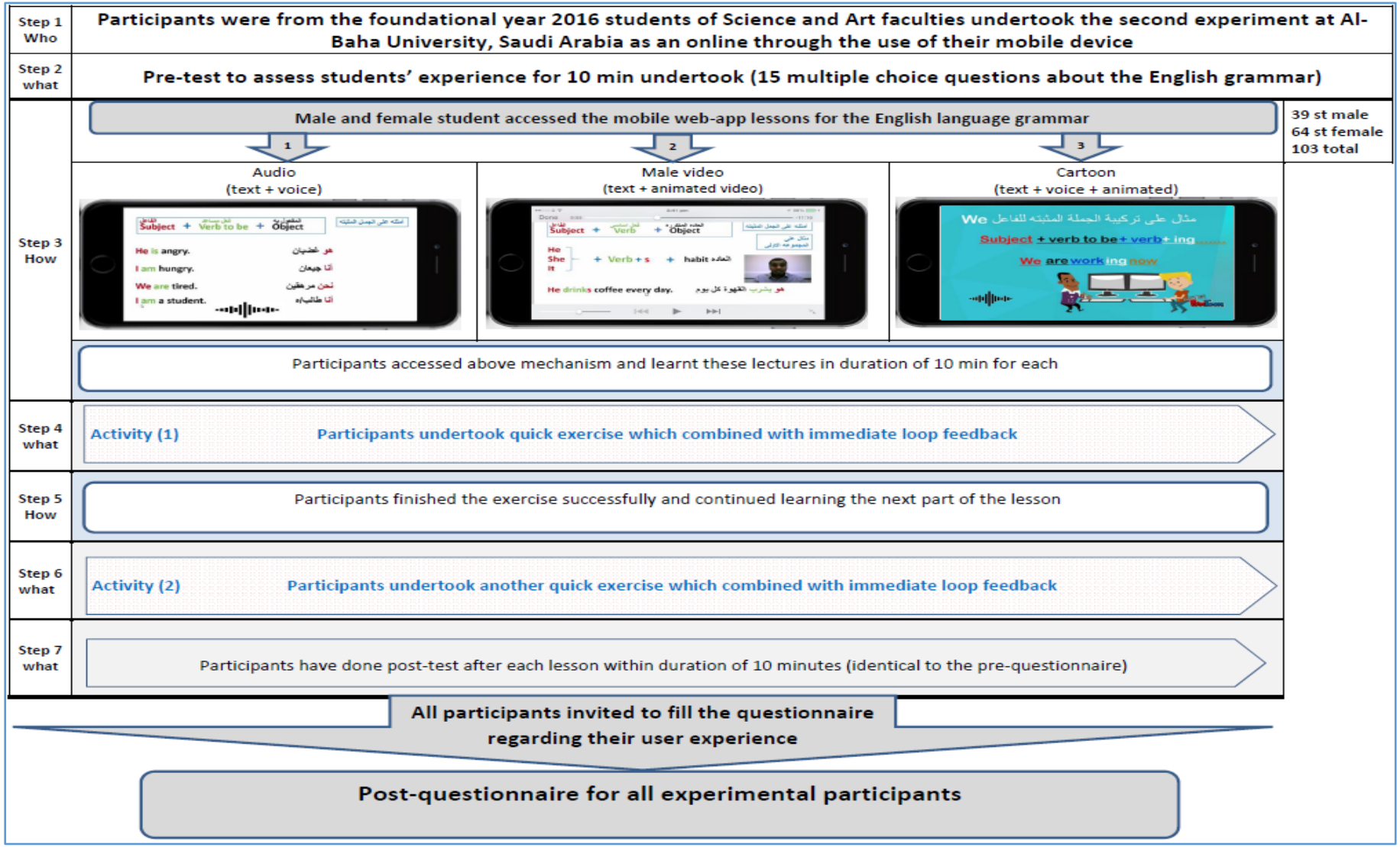


Figure 5 - 6 Procedure of implementing experiment (2)

- When all the participants understood how the system worked, they started by connecting their mobile devices to the internet and followed the steps in the instructions‟ letter by accessing the pre-test for 15 minutes via their smart phones.
- After finishing the pre-test and submitting their tests electronically, they were given a web link which took them through three lessons (audio, video and cartoon) lasting approximately 30 minutes in total. The participants used headphones to hear the lessons without disturbing others. This period gave the students extra time to review the learning material. The lesson was divided into three modalities of delivery and each mode had the intervention of two exercises.
- The following day, participants were able to access the second link which directed them to a second test, identical to the pre-test. After submitting electronically, they received a link which took them through the questionnaire for 20 minutes. The tests were multi-choice questions about the lecture content.
- After the post-test, each participant received the final link which required them to fill out a questionnaire to assess her or his perceived motivation/engagement, interaction and expected effectiveness and also to give feedback on the web-app system and their learning experience.

In this experiment, the researcher proposed that the study developed three types of mobile interfaces within interactive elements for each delivery mechanism. Based on the grammar they the students learning in their lessons, they undertook exercises with immediate auto feedback if their answers were correct; they were then able to carry on to the next concept of the lesson. If they answered incorrectly, the system provided feedback informing them of their incorrect answer and transferred the learner back to the point in the lesson linked to this question. Learners were able to go back to that later question and try to answer it through the previous process. With the intention here was to show whether providing learners with feedback and self-assessment could effectively transform the learning process.

5.12 Data Analysis Method

This section presents the type of quantitative and qualitative data collected during this research. In order to achieve the objectives of this research (identifying the participants‟ motivation/engagement) and to test the research hypotheses, questionnaires were

conducted as the main tool to garner participants‟ views and perceptions, and the pre/post-tests were the main data used to analyse their pedagogical effectiveness/achievement quantitatively. Additionally, the open-ended questions and co-creation workshops were analysed qualitatively. Accordingly, this section describes the core methods and tests used to analyse these datasets.

5.12.1 **Quantitative Analysis**

The quantitative data obtained from the post-questionnaire for the first and second experiments, were the primary data source for this study, and were analysed using the statistical analysis software, „SPSS‟ (Statistical Package for Social Science). Statistical methods helped the researcher to compute specific and numerical values relating to the research questions. The research questions not only considered the perceptions of the participants but also focused on obtaining facts and figures, thus limiting the flexibility of response of the participants. It also led the participants to answer only the point in question, which might sometimes make them resistant (Mertens, 2015). In addition, this type of data enabled the researcher to make comparison between learning methods in term of preferences, engagement and effectiveness. The method also allowed the researcher to run different analyses and tests on the addressed hypotheses, which answered significant portions of the main research questions. Noteworthy, was that these statistical analyses techniques were chosen based on statisticians‟ advice from the Statistical Services Centre at the University of Reading. Based on the post-questionnaire completions, the data was converted into SPSS software. The following factors were considered the most important for the data analysis:

1. *Analysis of the preferred mode for content delivery and avatar teacher representation:* determined the content delivery modality most favoured by students, which theoretically translate to an increase in learning experience and learning effectiveness.
2. *Analysis of performance expectancy (usefulness):* explored how well students felt they had understood the learning content according to the different learning modalities.

3. *Analysis of engagement:* determined which method of learning delivery was most interesting and held students attention while they were learning and which extended their motivation to learn and progress well in their education.
4. *Analysis of enjoyment:* related to the learning modality engagement which led to the feeling of an attractive learning environment which might influence achievement in the learning process and outcomes positively.
5. *Analysis of convenience:* explored the variables of convenience and differences according to gender.
6. *Analysis of behavioural intention to use m-learning:* determined the adoption of m-learning. It was important to analyse the students‟ intention to use the technology and particularly which mode of delivery was the best according to their engagement and the effectiveness of their learning.
7. *Analysis of effectiveness (achievement):*similar to the engagement factor but exploring which students had pedagogically performed (test score) well with these modes of learning delivery.

While the participants had their own views about how much the mobile web-app improved their engagement, preferences, enjoyment, intention to use and pedagogical performance/effectiveness, this did not necessarily mean that they succeeded in having the right method of learning. Therefore, the qualitative approach of open-ended questions and co-creation workshops, allowed them to explain the quantitative findings further, with specific reference to the questions related to the hypotheses.

5.12.2 **Qualitative Analysis**

This study adopted a mixed methods approach, using quantitative data to display results and then using qualitative data to support or reject the initial data (Creswell et al. 2011). Further to the quantitative analysis, more insightful analysis was extracted from the use of open-ended questions and through co-creation workshops. Participants were asked question during the workshop about key of interest, as well as getting them involved in the customisation of their ideal avatar-based user interfaces for content delivered.

One of aims of this research was to reveal and explore the benefits, opportunities and challenges that m-learning might bring to the higher education process in Saudi Arabia, in order to understand how to improve m-learning by optimising the learning interfaces.

Some of the participants responded to the open-ended questions. After analysing the data quantitatively, the researcher transcribed all comments from the open-ended questions in preparation for analysis. The themes for this research were explored via five phases of process according to Kabilan(2016):

1) *Familiarisation with the data:* reading all the data to be familiar with.
2) *Creating primary code:* the primary codes were created by phrases or/and keywords directly linked to the ideas and views.
3) *Searching for themes:* grouping all data relevant to potential themes.
4) *Reviewing themes:* checking all created themes and drawing them as a thematic (map) of the analysis.
5) *Naming and defining themes:* generating a clear name or definitions for each theme (category) in order to write the final analysis and link them to the research questions and literature reviews.

Comments from the open-ended questions were read several times to identify proper themes and categories. Then, each theme was coded to specifically describe the master theme. As the comments were written in Arabic. The main themes and students‟ comments were translated into English in order to be used in the current research.

Additionally, outside of the main research questions, after conducting the experiments, a couple of the participants‟ instructors were also interviewed to provide their perceptions and feedbacks with regard to the students‟ motivations and progression. Their comments were also analysed and are included in the results in Chapter 8 to add extra insight to the research findings.

Overall, the study methodology progressed through several stages which began with the research paradigms and ended with the data collection techniques. The most important layers are illustrated in Figure 5 - 7.

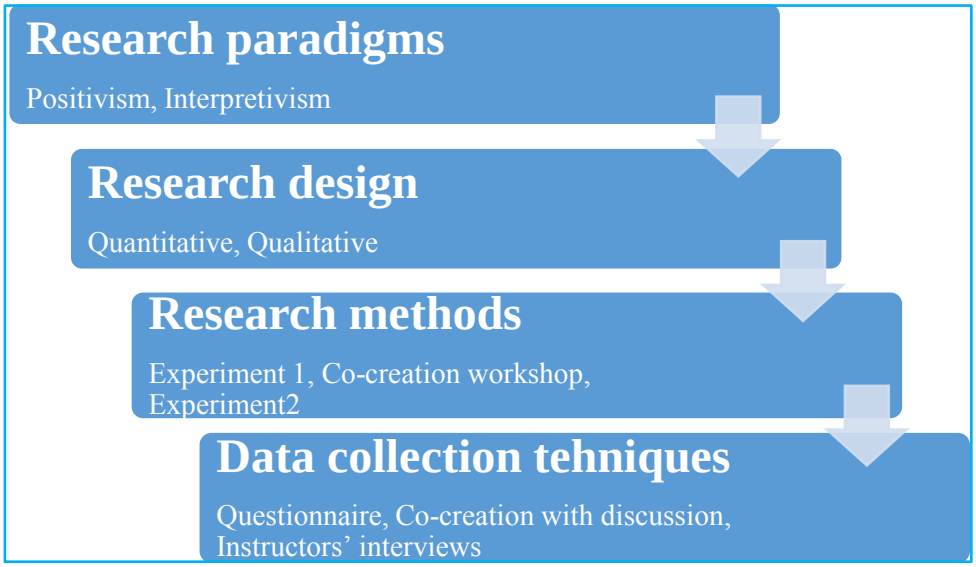


Figure 5 - 7 Research Framework for Conducting Research Studies

5.13 Chapter Summary

This research has adopted both *positivism* and *interpretivism* in a mixed methods approach, encompassing collection of both qualitative and quantitative data. Research was focussed on learning content via a range of different mobile interface avatars and students‟ engagements and performance with the learning materials was assessed according to a set of hypotheses developed from a theoretical model, MADE-ME (Multi Avatar Delivery Environment for Mobile Education) which is described in Chapter 6, and a MADE-ME delivery platform described in Chapter 7.

A pilot study with seven Saudi students at the University of Reading was undertaken to ensure the reliability, readability and clarity of the questions prior to administering the pre and post questionnaires to 156 undergraduate students in Saudi Arabia before and after they undertook a learning activity delivered on their mobile devices via each of the five different avatar types. In order to explore further student preferences and performance, four groups of seven students participated in a co-creation workshop enabling them to design their own mobile learning interface. The outcomes of these workshops together with the comprehensive analysis of the student responses to the questionnaire were then used to inform a second round of experiments with 103 participants. Results from study are documented in Chapter 8 and discussed in Chapter 9.

6 The Conceptual Research Model

6.1 Introduction

This chapter describes the construction of the MADE-ME research model, which is one of the key outputs of this research. MADE-ME, or „Multi Avatar Delivery Environment for Mobile Education", shows the relationship between learners" preferences for learning modality, engagement, enjoyment and the effectiveness (pedagogical performance). This model builds on a combination of several m-learning models and learning theories and extends the traditional technology acceptance model (TAM) by adding new variables to fulfil the objectives of this research. The purpose of MADE-ME is to determine the factors that affect higher educational students" intention to adopt m-learning and to mitigate obstacles that may affect the success or failure of this approach in Saudi Arabia. Thus, this research aims to investigate learners" intrinsic engagement factors on the behavioural intentions factor towards the use of m-learning technology, and to discover to what extent these factors influence the effectiveness/pedagogical performance of the student when learning is via mobile technologies. As a result of the proposed model, perceived performance expectancy and perceived engagement both contribute to the learners" behavioural intention to use the m-learning web-app (MADE-ME).

6.2 How the Model is Constructed

The delivery of effective m-learning content depends on various issues such as the technology acceptance model (TAM) and its extended models, theories of learning, human computer interaction (HCI), the local environment, and the learning being undertaken. Moreover, highlighting the learning interactivity element, engagement/preferences, benefits and barriers, and how these together affect the learning achievements/outcomes of students, have contributed to the construction of the MADE-ME web-app. In this research, the model and its hypotheses were developed based on the previous models described in the literatures. A series of case studies were conducted and the data collected and analysed statistically. Based on the results of the first case study which both qualitatively and qualitatively collected data and the co-creation workshop, the model has been adjusted and extended to incorporate additional factors. It also has been verified again through a second round of case study

experiments in order to validate the final version of the mode through testing its hypotheses based on the participants‟ responses and data. The flow stages of constructing and extending the MADE-ME research model is shown in Figure 6 - 1. The main findings behind constructing that model are summarised here as they have helped to answer the current research questions and objectives.

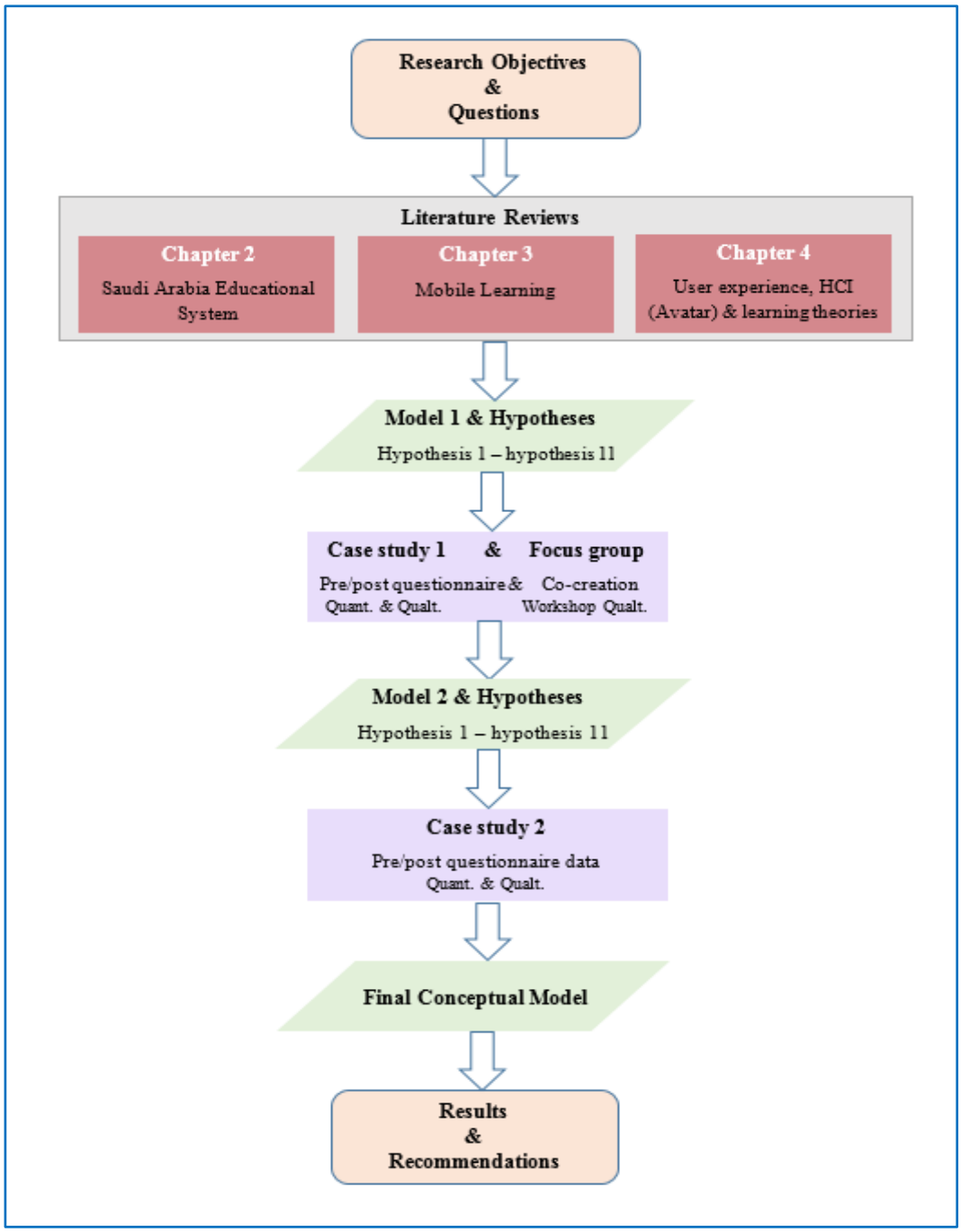


Figure 6 - 1 Stages of deriving MADE-ME model

Table 6 - 1 explains how the integrated factors of the MADE-ME model have been informed by the literature reviews and by the case studies in this research.

Table 6 - 1 Demonstration of the factor source

Key factor of model	Derived from/influenced by	Result
Intrinsic engagement or motivation	The proposed research model for the study of e-learning motivation and acceptance in developing countries based on extension the UTAUT by *(Maldonado et al, 2010).*	Inclusion in Model 1 & 2
Performance expectancy	The research framework which used UTAUT based upon TAM by *(Jairak et al., 2009; Lowenthal, 2010).*	Inclusion in Model 1 & 2
Gender	The research model of mobile entertainment adoption by *Leong et al., (2013);*and by *Lowenthal (2010)*who investigated the UTAUT	Inclusion in Model 1 & 2
Major/subject	Additional moderator based on the research context	Inclusion in Model 1 & 2
Enjoyment	The Research model of *Alenezi etal., (2010)* who empirically investigated the enjoyment and other factors to determine their influencing on students intention to use technology. Also, *Liu (2008)* extended the UTAUT model by adding perceived enjoyment.	Inclusion in Model 1
Multimedia instruction	A conceptual model of users' satisfaction, behavioural intention, and effectiveness toward e-learning by*Liaw (2008).*	Inclusion in Model 1 & 2
Convenience	Additional factor based on the research context	Inclusion in Model 1
Interactivity elements	Additional factor based on the first case study and focus group data.	Inclusion in Model 2
Behavioural intention	A conceptual model of users' satisfaction, behavioural intention, and effectiveness toward e-learning by*Liaw (2008); Alenezi etal., (2010)&(Lowenthal, 2010)*which based on UTAUT.	Inclusion in Model 1 & 2
Effectiveness or pedagogical performance	A conceptual model of users' satisfaction, behavioural intention, and effectiveness toward e-learning by*Liaw (2008).*	Inclusion in Model 1 & 2

6.3 The Conceptual Research Model and Hypotheses

This research, as mentioned earlier, uses qualitative and quantitative techniques to effectively answer the questions about the technology. In Saudi Arabia, where the higher education system currently depends on the instructor delivering the course directly to the students, the concept of assisted technology is quite new. Making it work alongside regular teaching approaches therefore requires a lot of change, with students needing to believe that the technology can bring potential benefits to the existing system. This knowledge also paves the way for understanding the expectations of users about the technology and for making improvements to make it more user friendly and acceptable. Hence, measuring the perceptions of engagement/preference and effectiveness/pedagogical performance of the users towards the use of new technology requires a deeper understanding of these perceptions and intentions to use the technology. To date little importance has been given to predicting the perceived performance expectations of the technology, thus leaving a gap in the research about how well such technologies can be used alongside regular pedagogical methods.

Among all acceptance models, there is a need to build a conceptual model based on the previous frameworks of mobile learning contexts and which in this case align with the Saudi Arabian educational context. The conceptual model is used to investigate the current research factors and find out how well, if m-learning was deployed, the users would be able to accept the changes and embrace the technology. Saudi Arabia has a unique culture, which in turn is reflected in its education environment. Government and the education ministry requires gender segregation in schools and universities classes. Therefore, there is a need to add the gender variable as moderator on all investigated factors to find out the differences between genders and what impact these differences have on intentions to use m-learning. Moreover, one of the higher education ministry rules is that female students are not allowed to carry their mobile phones into the university campus for religious purposes; therefore, the research suggests that this might affect their perception of convenience. As a consequence, „convenience“ was an added factor in the research model in order to investigate its influence on the performance expectancy and to identify any differences between gender.

In addition, within the context of the research objectives, the subject/major was added as another moderator on all investigated factors. Arts and Science faculties were

considered to be the main specializations of the students participating in this study because they are the main specializations in all Saudi higher education universities. In addition, there are several subject/majors that fall under these two faculties.

Based on the combination of models from prior studies of mobile learning, the researcher adopted factors that would assist this research, such as: Performance Expectancy, Intrinsic Engagement, Enjoyment, Multimedia Instructions Preference, Convenience, Effectiveness and Behavioural Intention to use m-learning, which together combine to create a new extension model to the TAM which includes these mentioned factors integrated together in the MADE-ME model. The MADE-ME model for Saudi Arabia used in this PhD is showed in Figure 6 - 2.

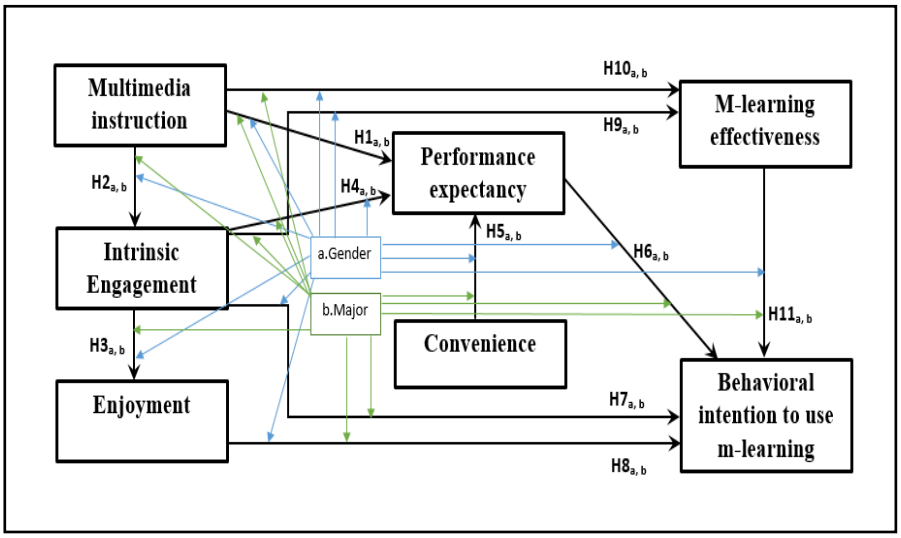


Figure 6 - 2 Conceptual Research Model for Multi Avatar Delivery Environment for Mobile Education (MADE-ME) In Saudi Arabia

These elements are the main factors/variables of the MADE-ME framework and they help to ensure that the implementation of the technology is successful and proves useful. As discussed in the section on the TAM in Chapter 3, acceptance of technology is based on being able to predict intentions of users based on their beliefs and prior actions. When cultural expectations are not met, the users do not feel comfortable with the environment and will not use the technology. Similarly, learning expectations, styles and outcomes determine the perceived usefulness/performance expectancy of the technology and so, when not met, would not entice the user to use the technology. If the design principles and the mobile context are not well thought out, this too leads to either the failure in the technology being appealing or the perception of motivation is not met, thereby leading to implementation failure.

6.3.1 **Variables**

According to Farsi (2016), when planning to conduct a scientific experiment, it is necessary to predetermine the dependent and independent variables of the study. Dependent variables are those variables affected by the independent variable and which can be called the outcome. With regard to this study, the various learning approaches for the English language (cartoon, video, audio, text, static image and face-to-face) are the independent variables. The aim is therefore to see how these variables influence the dependent variables, which are grouped into four main categories: engagement, enjoyment, effectiveness and the intention to use this approach of learning.

Based on the above explanation, the thesis proposes the following hypotheses:

H1. Preference for multimedia instruction will positively influence students' performance expectancy.

$H1_a$.Gender will positively moderate the effect of preferred multimedia instruction on the performance expectancy.

$H1_b$.Major/subject of study will positively moderate the effect of preferred multimedia instruction on the performance expectancy.

H2.Preference for multimedia instruction will positively influence students' intrinsic engagement

$H2_a$.Gender will positively moderate the effect of preferred multimedia instruction on students' intrinsic engagement.

$H2_b$.Major of study will positively moderate the effect of preferred multimedia instruction on students' intrinsic engagement.

H3. Intrinsic engagement will positively influence students' enjoyment.

$H3_a$.Gender will positively moderate the effect of intrinsic engagement on the students' enjoyment.

$H3_b$.Major/subject of study will positively moderate the effect of intrinsic engagement on the students' enjoyment.

H4.Intrinsic engagement will positively influence students' performance expectancy.

$H4_a$.Gender will positively moderate the effect of intrinsic engagement on the students' performance expectancy.

$H4_b$.Major/subject of study will positively moderate the effect of intrinsic engagement on the students' performance expectancy.

H5. The convenience of m-learning will positively influence students' performance expectancy.

$H5_a$.Gender will positively moderate the effect of the convenience of m-learning on students' performance expectancy.

$H5_b$.Major/subject of study will positively moderate the effect of the convenience of m-learning on students' performance expectancy.

H6. The performance expectancy will positively influence students' behavioural intention to use m-learning.

$H6_a$.Gender will positively moderate the effect of the performance expectancy on the behavioural intention to use m-learning.

$H6_b$.Major/subject of study will positively moderate the effect of the performance expectancy on the behavioural intention to use m-learning.

H7. Intrinsic engagement will positively influence students' behavioural intention to use m-learning.

$H7_a$.Gender will positively moderate the effect of intrinsic engagement on the students' behavioural intention to use m-learning.

$H7_b$.Major/subject of study will positively moderate the effect of intrinsic engagement on the students' behavioural intention to use m-learning.

H8. Enjoyment will positively influence students' behavioural intention to use m-learning.

$H8_a$.Gender will positively moderate the effect of enjoyment on the students' behavioural intention to use m-learning.

$H8_b$.Major/subject of study will positively moderate the effect of enjoyment on the students' behavioural intention to use m-learning.

H9.Intrinsic engagement will positively influence students' effectiveness.

$H9_a$.Gender will positively moderate the effect of intrinsic engagement on the students' effectiveness.

$H9_b$.Major/subject of study will positively moderate the effect of intrinsic engagement on the students' effectiveness.

H10. Preference for multimedia instruction will positively influence students' effectiveness.

$H10_a$.Gender will positively moderate the effect of preferred multimedia instruction on the effectiveness.

$H10_b$.Major/subject of study will positively moderate the effect of preferred multimedia instruction on the effectiveness.

H11. The effectiveness of m-learning will positively influence students' behavioural intention to use m-learning.

$H11_a$.Gender will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.

$H11_b$.Major/subject of study will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.

6.4 The Second Experiment Conceptual Research Model:

Based on the results from the first model that have been analysed for this research (see chapter 8 for details) a number of factors were highlighted that needed to be amended, either by adding them to or deleting them from the model. The findings confirmed the necessity of two factors, convenience and enjoyment being considered when adopting new way of learning. These factors should however not be included in the second research model because they were considered not to be treated separately and they were encompassed in the wider context of engagement and behavioural intention factors. In addition, participants identified that the use of multimedia with the intervention of interactive elements may affect their intrinsic engagement and performance expectations. Figure 6 - 3, presents the new version of the research model followed by the amended research hypotheses.

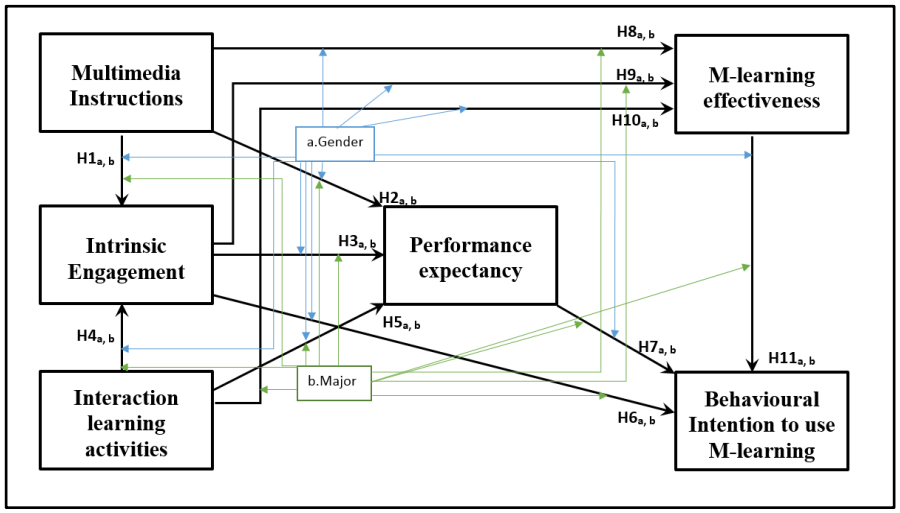


Figure 6 - 3 Conceptual Research Model (MADE-ME) Including Interaction Elements

This second MADE-ME model has been reconstructed and adjusted based on the first case study and the co-creation work shop that was undertaken in order to adjust some of the model hypotheses as well as testing and verifying them again. The second series of these proposed hypotheses is presented as follows:

H1. Preference for multimedia instruction will positively influence students' intrinsic engagement.

$H1_a$.Gender will positively moderate the effect of preferred multimedia instruction on the intrinsic engagement.

$H1_b$.Major/subject of study will positively moderate the effect of preferred multimedia instruction on the intrinsic engagement.

H2. Preference for multimedia instruction will positively influence students' performance expectancy.

$H2_a$. Gender will positively moderate the effect of preferred multimedia instruction on the performance expectancy.

$H2_b$. Major/subject of study will positively moderate the effect of preferred multimedia instruction on the performance expectancy.

H3. Intrinsic engagement will positively influence students' performance expectancy.

$H3_a$. Gender will positively moderate the effect of intrinsic engagement on the students' performance expectancy.

$H4_b$. Major/subject of study will positively moderate the effect of intrinsic engagement on the students' performance expectancy.

H4. The interaction activities in m-learning will positively influence students' intrinsic engagement.

$H4_a$. Gender will positively moderate the effect of interaction activities in m-learning on students' intrinsic engagement.

$H4_b$. Major/subject of study will positively moderate the effect of intrinsic engagement on the students' intrinsic engagement.

H5. The interaction activities in m-learning will positively influence students' performance expectancy.

$H5_a$. Gender will positively moderate the effect of interaction activities in m-learning on students' performance expectancy.

$H5_b$. Major/subject of study will positively moderate the effect of interaction activities in m-learning on students' performance expectancy.

H6. Intrinsic engagement will positively influence students' behavioural Intention to use m-learning.

$H6_a$. Gender will positively moderate the effect of intrinsic engagement on the behavioural Intention to use m-learning.

$H6_b$. Major/subject of study will positively moderate the effect of intrinsic engagement on the students' behavioural Intention to use m-learning.

H7. The performance expectancy will positively influence students' behavioural intention to use m-learning.

$H7_a$. Gender will positively moderate the effect of performance expectancy on the behavioural intention to use m-learning.

$H7_b$. Major/subject of study will positively moderate the effect of performance expectancy on the students' behavioural intention to use m-learning.

H8. Preference for multimedia instruction will positively influence students' effectiveness.

$H8_a$.Gender will positively moderate the effect of preferred multimedia instruction on the effectiveness.

$H8_b$.Major/subject of study will positively moderate the effect of preferred multimedia instruction on the effectiveness.

H9. Intrinsic engagement will positively influence students' effectiveness.

$H9_a$.Gender will positively moderate the effect of intrinsic engagement on the students' effectiveness.

$H9_b$.Major/subject of study will positively moderate the effect of intrinsic engagement on the students' effectiveness.

H10. The interaction activities in m-learning will positively influence students' effectiveness.

$H10_a$.Gender will positively moderate the effect of interaction activities in m-learning on students' effectiveness.

$H10_b$.Major/subject of study will positively moderate the effect of intrinsic engagement on the students' effectiveness.

H11. The effectiveness of m-learning will positively influence students' behavioural intention to use m-learning.

$H11_a$.Gender will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.

$H11_b$.Major/subject of study will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.

6.5 Chapter Summary

This chapter has shown how the MADE-ME research model has been derived from several previous models, the important factors of which were integrated into this research and were used to investigate the factors or variables set out earlier. Based on the different elements covered in this research (TAM, human computer interaction and the learning theories), this research has constructed two version of the MADE-ME model based on each other to meet the research objectives. The MADE-ME model is one of the research contributions of this thesis to the field of learning and engagement. The development of the MADE-ME web-app which enables the conceptual theory to be applied in practice through the delivery of learning content to students is presented in the next chapter.

7 System Implementation (MADE-ME Web-App)

7.1 Introduction

Chapter 6 described the educational research model which links delivery of learning content via mobile technologies with pedagogical performance. In order to validate and test its hypotheses empirically, the MADE-ME web-application was developed. This chapter presents the process of designing and creating the framework for the MADE-ME online web-app that can deliver m-learning content to a mobile device via different avatar representations of the teacher (audio, video, image, cartoon; text) and which can be used to test the pedagogical effectiveness of the content been delivered based on that model. Further, it will cover the development of the MADE-ME web-app system, including highlighting the environment of the two experiments set up to prove this web-app and get useful feedback on the model, the user interface design, and software used for development.

7.2 Multi Avatar Delivery Environment for Mobile Education (MADE-ME) Web-Application

One of the research objectives of this study is to find the most preferred/engaging avatar representation of a teacher for delivery of learning content via mobile technology in order to enhance learning through a variety of avatar interfaces and multimedia content delivered through a web based application. This research proposes and develops an application, Multi Avatar Delivery Environment for Mobile Education (MADE-ME) as the web-app platform for delivering mobile content to optimise learning outcomes via mobile assisted language learning. The development of the web-app framework is based on the feedback and perceptions of the participants. The MADE-ME application is used in this research to deliver English content, supported by some explanation in the Arabic language, for Saudi students. The most significant element of the platform is that it provides learners with the opportunity to learn through exercises and the feedback they received. The design of the app does not allow the learner to move forward unless they answer correctly. Further, the instructor can provide a number of different types of tests, such as multiple choice, true or false, drag and drop and/or open-ended questions.

In order to create this environment, a number of functional and non-functional requirements were identified. With regards to functional requirements the web-app has the ability to:

- Display screen avatars as representations of the teacher.
- Deliver learning content via a mobile phone.
- Enable content to be in varying multimedia formats.
- Allow multi-language delivery.
- Test students on what they have learnt.

Non-functional features include:

- The incorporation of good user interface design principles.
- The concept of usability with regards to how the app works.
- Its reliability with regard to availability and content delivery.
- The ease of use of the interface.
- The ease of learning of the apps‟ features.

Focusing on the requirements enables evaluation of how easily users can perform their goals on the web-app which influences their engagement/experience with the learning material and improved pedagogical performance for the English course being used as an example in this research context.
The novelty of this app is that it can be used to deliver any course material in any language to any organisation around the world in order to support the delivery of multimedia content to enhance learning and teaching.

7.3 Development

This section describes the software used, access to the internet and the location of the web-app server for the MADE-ME web-app.

7.3.1 **Software**

In order to develop the web-app for use in smartphones for this research, three software tools have been used in combination for the development phase. Firstly, the online website „PowToon‟ was used to create an animated cartoon avatar to be used as one of the avatar representations of the teacher for the purpose of drawing the learners‟

attention and engagement. Secondly, Camtasia software was used to record the voice over for the slides as presentation of the content. Thirdly, the Articulate Storyline 2 software was used to construct the lessons with the addition of the different type of avatars. Articulate also enabled the mobile web-app to embed interactive elements into its framework such as providing tests and immediately assessing learners‟ progress by providing feedback in both textual and verbal forms. Finally, the Articulate Storyline software enabled final version of the MADE-ME app to be published as HTML5 which is reliable and mobile friendly with regards to the app being made available and connected with the internet. Noteworthy, the Google form website was used for setting up the questionnaires questions in order to collect the respondents‟ data electronically.

7.3.2 Access to the Internet

The MADE-ME web-app can be accessed anytime and anywhere via an Internet connection. In this research, most of the male students in the experiment were running the learning app at the university campus. However, in terms of the internet facility, there was no access to the Wi-Fi Internet from the students‟ classrooms, so the researcher bought a high-speed internet modem from an STC (Saudi Telecom Company). The small modem device was portable and easy to use in any classrooms. In addition, students who had the service of the internet available on their mobile devices were encouraged to use and connect to their own internet networks. However, the female students preferred to learn through the use of the app within their home with their convenience.

7.3.3 Location of the MADE-ME web-app Server

The web-app system was hosted by the researcher's own server located in Europe. In order to publish the lessons of the experiments which can be accessed by any of the participants, the researcher subscribed and created a server for two years with a registered domain. The domain name was Saudielearning.org (see Figure 7 - 1). The mobile web-app enabled participants to access the system and learning materials through their own mobile phones and to achieve their learning requirements from their location in Saudi Arabia.

Figure 7 - 1 MADE-ME Web-App Server Location

7.4 User Interface Design

It is important to take on board the principles and practical elements associated with designing good mobile user interfaces. Interactive electronic systems can be successful when they combine a different number of factors such as usability, reliability, functionality and performance. These factors are equal in their level of importance and are linked with each other. In other words, any failure in any of these factors could cause failure of the whole system (Mayhew, 1999). The user interface design depends on adopting a structured process to the design incorporation of good user interface design principles and adherence to guidelines related to the design of web pages. Robbins (2007) and Mazlan (2012) set out different types of tasks which should be included in designing Web pages such as ensuring that the design of interface and easy to use has strong graphic and information design.

7.4.1 Graphic and Information Design.

The definition of „graphic design" is what the users see on the web page interface, such as texts and graphics (Noble & Bestley, 2016), with the information design being how the information is organised on the web page. Mazlan (2012) proposed a number of suggestions and guidelines when creating visual designs. For instance, the amount of information should be controlled and not presented all at one time. In addition, information need to be organised by presenting elements clearly at the centre of the screen while the colours of the text and background should be consistence across all aspects of the interface. It is also important to provide easy access to the system and hence the MADE-ME interface also included a navigation button in the appropriate

position on the screen. Figure 7 - 2, shows the integration of these elements into the design of the MADE-ME web-app.

Figure 7 - 2 Visual design and technique of the interface

7.5 Use of MADE-ME in Experiment – 1 (Case Study)

The purpose of this research was to design a number of different lessons using different types of multimedia avatars to represent the teacher and then to test learners to engage their level of success with each. The intent was to provide m-learning interfaces which allowed participants to access and learn from these lectures. All lecture materials and content were similar in terms of the difficulty level of the concept that is being learnt. Lessons were designed with the teacher having different types of interfaces such as text, audio, static image, video and cartoon and were accessed by all students as a web interface application for ease of use across all mobile platforms (iOS, Android, Microsoft etc.).

Within the context of this thesis and in order to prove this work and validate the proposed model hypotheses, two case studies and a co-creation work shop were conducted.

In the first case study, the participants were 75 male students and 75 female students who undertook the learning process via delivery on their mobile phones of a number of lessons with different multimedia content representative of the English module they undertake on their degree course.

In the first lesson, the interface was designed to have different multimedia such as text, voice over and animated cartoon characters as shown in Figure 7 - 3 and Figure 7 - 4. In addition, the interface had the control buttons for pause, go forward or back to the lesson.

Figure 7 - 3 Screenshot of cartoon mobile interface 1

Figure 7 - 4 Screenshot of cartoon mobile interface 2

Further, each of the lessons had their own structure and media inclusion, such as lessons using only text, text with audio and text with video.

The second lesson was a text lesson designed as a series of Camtasia slides using colour conventions for different constructs of English grammar. This lesson gave the participants the opportunity to download it as an e-book via the iBook (or equivalent) application on their mobile device. The main benefit with this approach is that learners only needed to connect to the internet at the beginning of the lesson to access and download it onto their mobile devices, after which they are able to access and continue learning from the lesson without requiring a continuous internet connection. See Figure 7 - 5 & Figure 7 - 6, for examples of these text based learning screens.

Figure 7 - 5 Screenshot of text mobile interface 1

Figure 7 - 6 Screenshot of text mobile interface 2

The third lesson developed as an audio lesson, again using the Camtasia software. The researcher has recorded his voice over each presented piece of text (see Figure 7 - 7. Thereby combining text and audio as the learning medium.

Figure 7 - 7 Screenshot of audio mobile interface

The fourth lesson included the instructors‟ static image. This lesson combined three features (text, voice over and instructor‟s image). To maintain the student motivation, the images different from slide to slide based on the presentation context, for example, left and right landside see (Figure 7 - 8 & Figure 7 - 9).

Figure 7 - 8 Screenshot of static image mobile interface 1

Figure 7 - 9 Screenshot of static image mobile interface 2

The fifth lesson was given as a video interface, which included both text and an animated video of a human character with a normal voice (Figure 7 - 10 to Figure 7 - 11). This representation of the learning process was designed to make the students feel like they were in a traditional face-to-face teaching setting, but with the added value of having navigation control buttons as in any normal video (Figure 7 - 12).

Figure 7 - 10 Screenshot of video mobile interface 1

Figure 7 - 11 Screenshot of video mobile interface 2

Figure 7 - 12 Control navigation of video mobile interface

As has been noted, in terms of the unique culture in Saudi Arabia, female students can be taught by both genders, however, male instructors can only teach them through the use of technology rather than via face-to-face settings. On the other hand, female instructors are *not* allowed to teach male students even through the use of technologies. In this research, students of both genders undertook all lessons one to five, but the female students took one extra lesson through the mobile web-app using a female instructor's voice (see Figure 7 - 13).

Figure 7 - 13 Screenshot of female mobile interface

All participants also had comparative lesson delivered via traditional class teaching. Once participants had undertaken each lesson they took post-test to assess their performance and measure the effectiveness of learning with regard to the content of the lesson. Finally, post-questionnaire was undertaken (quantitatively and qualitatively) by the participants to measure the extent of their engagement with the different ways of delivering course materials.

The purpose of Experiment - 1 was to get participants to use the mobile web-app in order to explore which approach/es they preferred and to takes their top preferences further into co-creation and development sessions in order to influence positively their pedagogical performance. Indeed, both case study 1, and co-creation workshop data were used as preliminary analysis to support the design and development of the second experiment even though the full analysis, results and discussion of the information for both of them are presented in detail in Chapters 8 and 9.

7.6 Use of MADE-ME in Experiment – 2 (Case Study)

After analysing the data of the first experiment, it was found that participants most preferred to learn from video, then the cartoon interface and lastly the audio interface. Conversely however, in relation to the participants retention and understanding of the information delivered and their performance in the test it was the audio highest interface that was found to be the most effective, then the cartoon interface, followed by the video at the lowest level of success as shown in (Figure 7 - 14). The text interface was at low level regarding both the preference and performance.

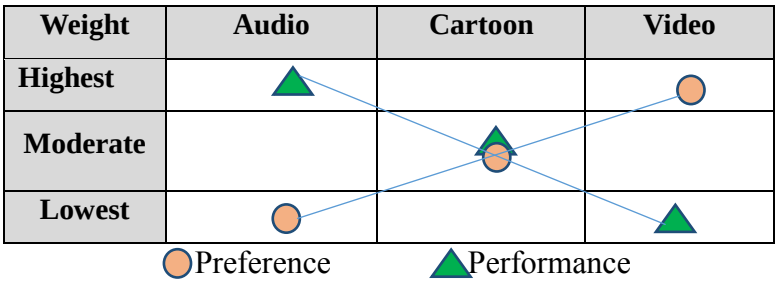


Figure 7 - 14 Diagram of the compensation between preference and performance

Based on the first analysis of the participants comments and those stemming from the co-design/creation workshop which allowed the participants to express and design their own mobile interface, the theory of Universal Design for Learning (UDL) was adopted,

which is an educational framework that can accommodate individual differences in learning styles and increase the flexibility and effectiveness of the learning environment. This also enables those students who have particular challenges to be given special assistance as it enables the implementation of specific multimedia types to meet and support all students‟ diverse learning needs. For this purpose, the three most popular types of learning (audio, video, cartoon) were taken forward and redesigned as a second experiment where by students again undertook lessons material where all was similar in terms of the difficulty of level concepts (see Figure 7 – 15 to Figure 7 - 17. The participants for Experiment - 2 comprised 103 students from Al-Baha University who received instructions about the experiment and mechanisms of delivery of course material via the MADE-ME application interfaces, allowing them to access and interact with content of the English module.

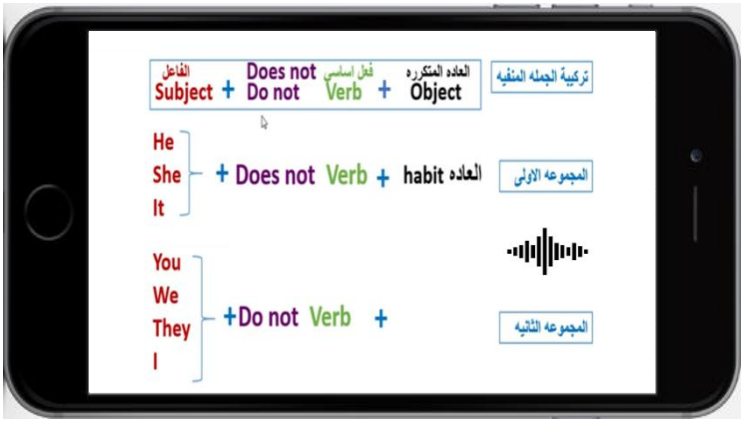


Figure 7 – 15 Screenshot of audio mobile interface

Figure 7 - 16 Screenshot of video mobile interface

Figure 7 - 17 Screenshot of cartoon mobile interface

The approach for Experiment - 2 delivering content with interactivity exercise using the mobile MADE-ME web-app can be summarised in the following flow chart (Figure 7 – 18).

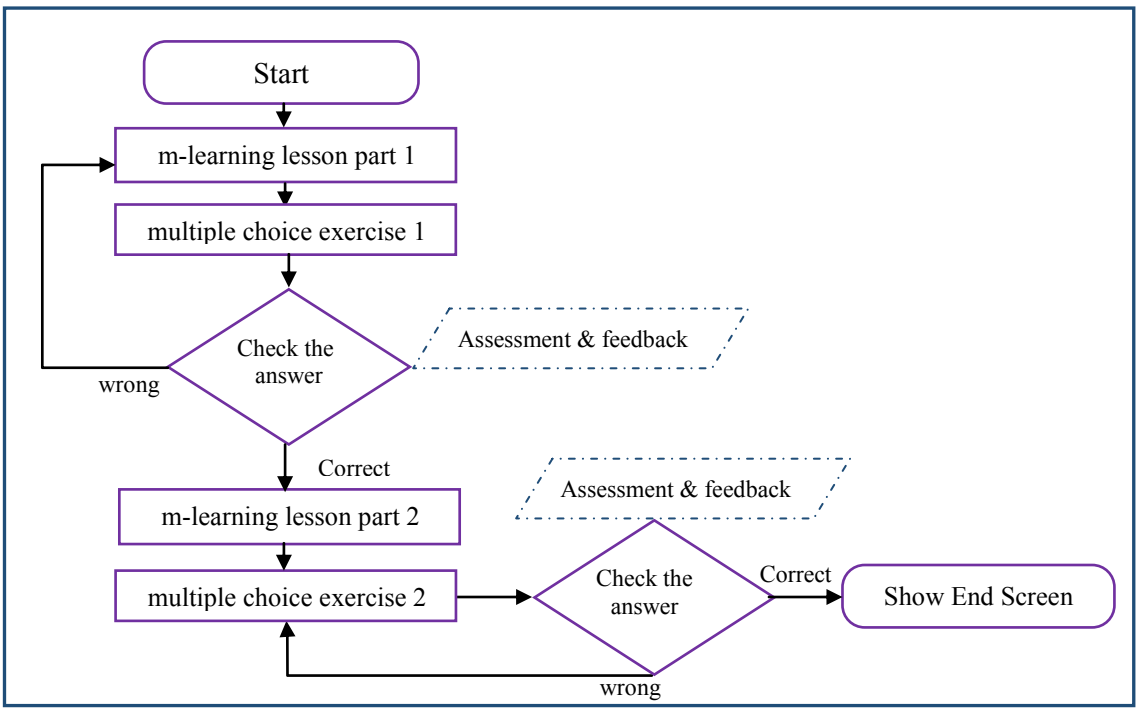


Figure 7 – 18 The flow-chart for MADE-ME web-app process

One of the main comments that was strongly highlighted by the participants was for the app to have a facility for assessing their progress during their learning. Responding to this, a self-assessment tool was developed and delivered through the MADE-ME mobile web-app system and was used for the English course, as shown in Figure 7 - 19.

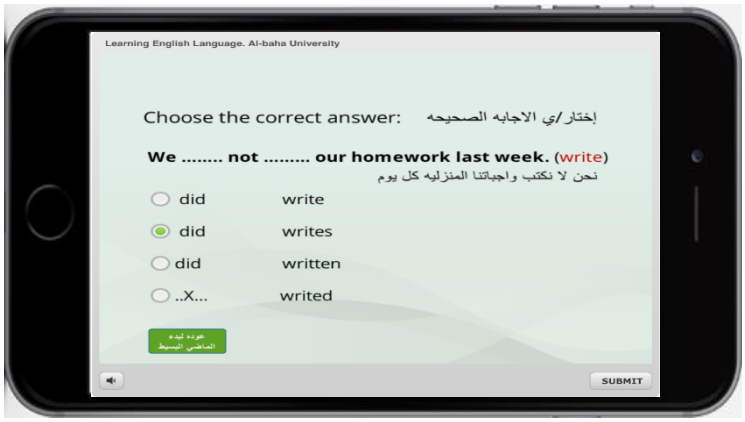


Figure 7 - 19 Screenshot of frequent exercise activities

This tool gave participants the opportunity to receive immediate feedback on the exercises they undertook following each concept to be learnt (Figure 7 - 20). In addition, another very useful and important tool, was added to MADE-ME for the learners, providing them with the opportunity to look back into any specific point in the lesson to learn how to get the answer right when the feedback message showed the answer they gave was incorrect (Figure 7 - 21). The Articulate Storyline 2 software was used to construct the lessons that integrated these tools.

Figure 7 - 20 Screenshot of instance feedback interface for incorrect answer

Figure 7 - 21 Directed to this part which explain how to answer the exercise

To ensure learners had understood the concept they could not move forward from the lesson until they had chosen the right answer. When they answered correctly, they received a direct feedback message to show their success and they were allowed to move to the next part of the lesson (see Figure 7 - 22).

Figure 7 - 22 Screenshot of the correct answer feedback

In order to assess student performance the next step in the process was the inclusion of an online mobile exam which was designed as a Google form. The design of the app took each student through all the mandatory lessons and materials until the final interface, which had the link to the test. In other words, the researcher tried to avoid any student bias which would affect their result of the performance; hence, students could not access the exam link until they had passed all lessons successfully and completed all the exercises to reach the final interface. Participants were able to access the exam via the given link and they were then required to fill-in their demographic information such as name, gender and subject discipline. There were three sections of the exam in terms of the English language content (1) present simple, (2) past simple, (3) present

continuous, based on the three delivery mechanisms (1) audio, (2) video, and (3) cartoon as shown in to Figure 7 - 23 to Figure 7 - 26.

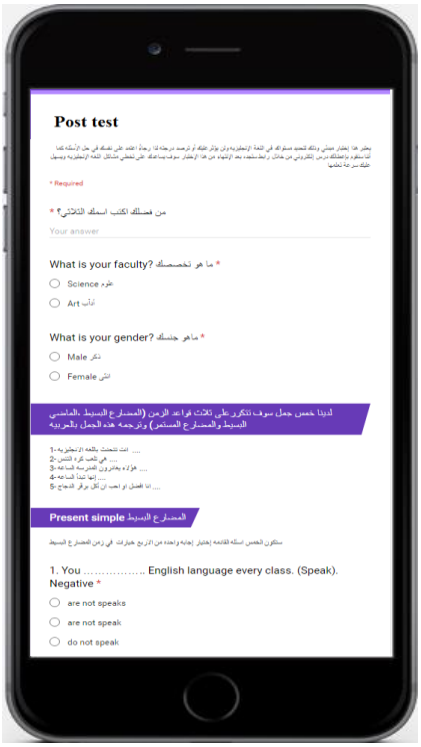


Figure 7 - 23 Screenshot of post-test part (1)

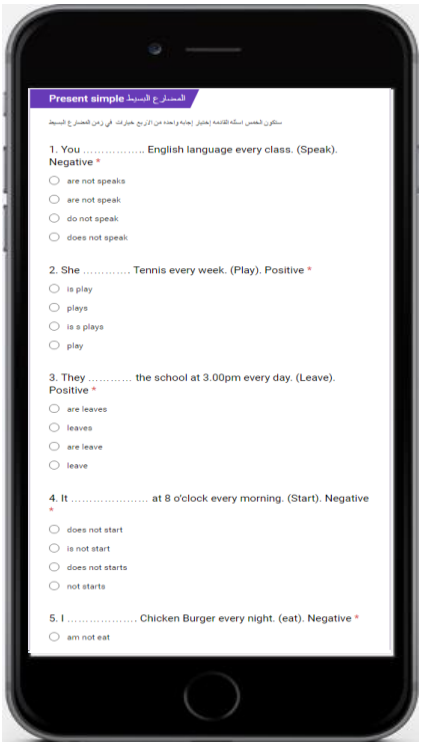


Figure 7 - 24 Screenshot of post-test part (2)

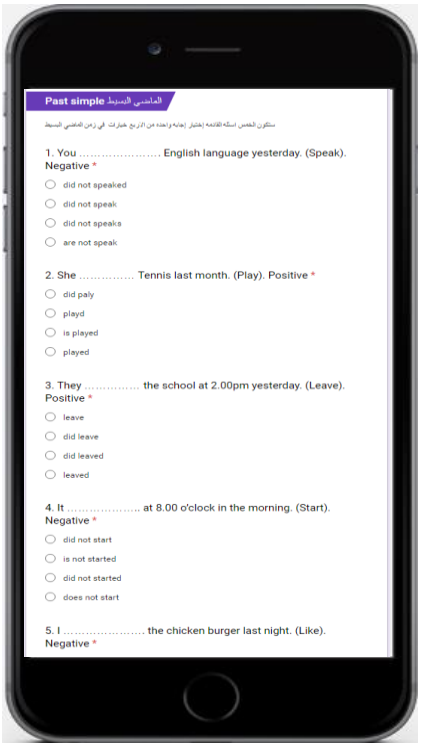


Figure 7 - 25 Screenshot of post-test part (3)

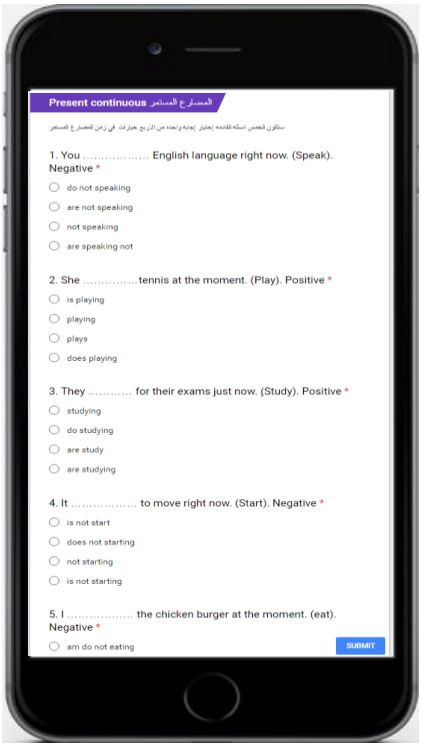


Figure 7 - 26 Screenshot of post-test part (4)

An online questionnaire tool was also developed to collect the participants‟ perceptions and views toward their engagement with each style of learning. Immediately after they had submitted their exam, the link to the questionnaire was shown. There was a short introduction at the beginning of the online questionnaire, which presented the objectives of the research and provided participants with some guidance of how to complete the questionnaire correctly (see Figure 7 – 28 to Figure 7 - 29), and the copy of the questionnaire as Appendix F. The respondents‟ data was collected and stored securely online for later analysis.

Figure 7 - 27 Screenshot of online questionnaire (1)

Figure 7 – 28 Screenshot of online questionnaire (2)

Figure 7 - 29 Screenshot of online questionnaire (3)

Initial analysis of the exam results revealed positive effectiveness of the MADE-ME app on students‟ learning English language concepts. The questionnaire also showed the participants‟ enthusiastic attitude toward using this app in their future learning. Detailed analysis and results will be presented in the next chapter.

7.7 Chapter Summary

This chapter began by describing the implementation of the MADE-ME web-app including an outline of the tools used for the development and hosting of the web-app. The chapter then described two experiments that were conducted with the students to assess their preference for different avatar representations of the teacher when learning content is being presented, and the means where by students‟ performance with each learning styles could be tested, and their feedback on their experience of using the web-app gathered. In summary, the MADE-ME app can teach, engage, assess and guide the learner towards a positive and effective approach to online learning of English language concepts. The result of the experiments will be presented in more detail in the next chapter which is based on the analysis of implemented experiment data.

8 Results of the Study

8.1 Introduction

The aim of this study is to investigate the ways in which engagement and performance in learning can be influenced by the type of avatar representation of the teacher on the mobile device which might be in the form of video, audio, image, cartoon or text. In particular, the purpose of the research is to investigate how m-learning can be used to assist the teaching of compulsory English modules within Higher Education courses in Saudi Arabia. Based on the research objectives and the methodology used, this research conducted two experiments and one co-creation workshop. The later experiment built upon the results of the previous experiment, the users‟ perceptions and views that they expressed in the open-ended questions of experiment one and a co-creation workshop. This chapter starts with presentation of the data obtained from the questionnaires described in Chapter 5, followed by an analysis of the proposed hypotheses which were presented in Chapter 6, in order to support or reject them. The MADE-ME model factors are analysed in terms of the relationships existing between them, their influence on students‟ intentions to use m-learning, and which avatar types are the most effective for the learning process. Accordingly, the full analysis of these hypotheses and the findings provided in this chapter address the main research questions of the study.

8.2 Recap of Experiments

In order to achieve the key aim of the research, a number of related objectives with associated research questions were identified and a number of experiments/case studies undertaken to resolve them. As a result of the research, the MADE-ME model has been constructed as well as the MADE-ME web-app designed and developed to deliver learning material. To evaluate the model through the use of the mobile web-app, students from Al-Baha University, Saudi Arabia were recruited to be involved in the study which comprised two case studies and a co-design workshop for data collection reasons. For the first case study, 156 participants learnt 5 lessons (audio, video, carton, image, and text) via their mobile phones, plus one further lesson which was delivered as traditional face-to-face teaching. Material was selected from their English module with the purpose offering the avatar type that the students found most engaging and most effective with regards to learning outcomes. Subset of these participants subsequently

took part in the co-creation workshop and redesigned their preferred m-learning avatar interface. The model and the mobile app were amended and redeveloped based on the students‟ feedback, and a second experiment was undertaken with a further 103 students from Al-Baha University, again in order to determine if the existing factors in the model could be used to improve the learning process. Detailed analysis of this data is presented in the coming sections.

8.3 Analysis Overview

This section addresses the techniques that have been used to analyse the data, as well as describing the specific approaches undertaken for both the quantitative and qualitative responses.

Statistical data analyses were performed on the data collected from the tests and participant questionnaires as quantitative analysis. In addition, the participants‟ perceptions and discussions of usability at the focus group workshop have been considered and analysed using the qualitative method of thematic analysis.

For the quantitative data, significant differences between Likert ratings are assessed. All analyses of the collected quantitative data have been carried out using the Statistical Package for the Social Science (SPSS), the results of the analysis being used later in the thesis to provide recommendations based on the statistical result to inform and perhaps even change the process of learning in the Saudi Higher Education. Based on these *potential* results, the researcher might find the best preference for learners is to learn through traditional classes (face to face). Alternatively, learning via mobile devices using favoured avatars might be shown to be the preferred option either outright or as blended learning whereby m-learning can assist the traditional teaching and learning process. Furthermore, the results of the analysis will confirm the extent to which the use of avatars affects students‟ learning and retention of information.

In order to assess the research hypotheses the following tests were used**:**

- **The UNIANOVA**: this type of analysis is used to analyse the interaction and relationship of one or more independent variables on a single dependent variable and to indicate the differences that are found (Liu et al. 2007). That is, the UNIANOVA procedure provides regression analysis and analysis of variance for one dependent variable by one or more factors and/or variables (SPSS 21, Help command). Within

the context of the current research, it is used to analyse the influences of a particular preferred method of learning delivery, motivation and engagement to learn via that method, as well as other factors related to the effectiveness and intention to use that type of m-learning. If the P significance value is less than or equal 0.05 ($P \leq 0.05$), the factor has a significant effect on the outcome variable; however, if the P significance value is greater than 0.05 ($P > 0.05$), the factor has no statistically significant relationship with the outcome factor (Frost, 2015).

- **Pairwise Comparisons**: this test was used for this research as a sub-test under the UNIANOVA test to compare the interaction between students‟ gender, faculty and other dimensions of factors such as motivation, performance expectancy, effectiveness and intention to use according to the learning delivery mechanisms.

- **LOGISTIC REGRESSION**: this type of analysis is the appropriate regression test to be used when the predicted outcome variable (dependent) is dichotomous (binary) on a set of independent variables. In this research, it analyses the differences and relationships between the different avatar types of learning delivery. Logistic regression results are represented by acronyms as shown in Table 8 - 1. The P-value is the significance value of the tested factor on the dependant factor. It is identical to the UNIANOVA technique whereby if the P-value is less than 0.05, this indicates the significance of the relationship and that it has statistical influence; however, if the P-value greater than 0.05, this indicates that the influence of that relationship does not have statistically significant differences between the two variables.

Table 8 - 1 Logistic Regression symbols

Symbols	Meaning
P	The significance value, if $P < 0.05$ is significant; and $P > 0.05$ is not significance.
Exp (B)	The expectation ratio/odds value.

- **Cronbach Alpha**: this test is a common measurement of research instrument reliability when using SPSS (Harris et al. 2008). As mentioned in section 5.6 to show reliability, the minimum value should generally be that of 0.7. In regard to this research, the Cronbach Alpha test showed all factors that have been used were highly

accepted, sufficiently reliable and that questionnaires were carefully designed to collect data regarding students‟ attitude toward m-learning (see Table 5 - 2).

These statistical techniques were chosen based on consultation with Statistical Advisors in the Statistical Services Centre at the University of Reading, from the beginning of designing the questionnaires through to the analysis stages. The advisors confirmed at each stage that these were common techniques to adopt in research such as this and that they were extremely suitable tools to use for this research to achieve its aim and objectives.

8.4 Results of Experiment (1) – Questionnaire

8.4.1 Demographic Results

This section of the results presents the analysis of the first experiment demographic information. This includes gender, age, faculty of study/major, year of study, average period of having a mobile device, average daily hours spent using mobile devices, the type of mobile device(s) and activities and services related to mobile devices. In this section, the researcher measured statistically the participants‟ frequency and percentages.

Gender Group

The participants in this experiment were split 50:50 according to gender, with 78 students from each sex. Table 8 - 2, illustrates the demographic data.

Table 8 - 2 Demographic result

Respondent's Profile	Classification	Frequency	%
Gender	Male	78	50
	Female	78	50
Age	18-20	145	92.9
	21-22	11	7.0
Faculty	Science	83	53.2
	Arts	73	46.7
Average daily hours usage of mobile phones	More than 3hrs	102	65.3
	2-3 hrs	37	23.7
	1-2 hrs	8	5.1
	Less than 1 hr	7	4.4
I know m-Learning	Yes, a lot	10	6.4
	Yes, a little	68	43.5
	Not sure	24	15.3
	No	54	34.6
I heard the term of Avatar/ Representative of the instructor	Yes	43	27.5
	No	51	32.6
	Not sure	62	39.7

Age Groups

From Figure 8 - 1, 93% of the participants were aged between 18-20 years old and the remaining participants aged between 21-22 years old were only 7%, which means that which means that the sample population was representative of the targeted population for the study. Data shows the 18-22 years old group having the highest usage of upcoming mobile technologies.

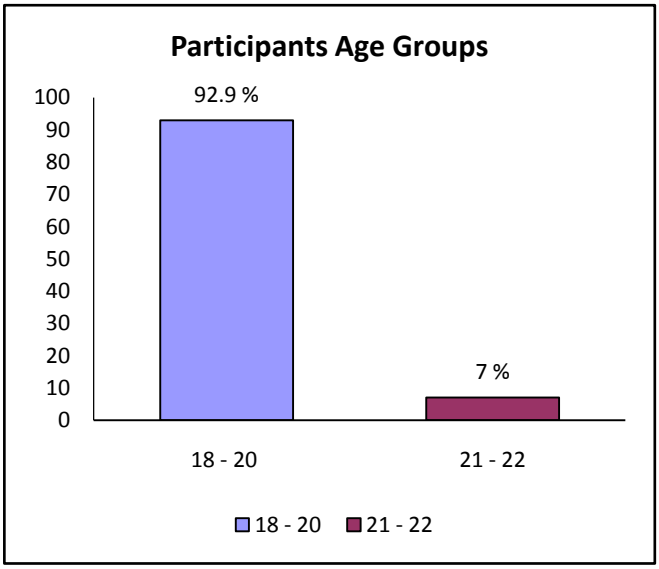


Figure 8 - 1 Bar Chart for Participants Age Groups

Faculty Groups

The participants‟ responses about their intended study disciplines after their foundation year are illustrated in Table 8 - 2 that 53% of the participants are currently classified in Science departments and 47% of the participants in Arts department.

Participants' mobile devices ownership

Students were asked about their ownership of mobile devices to determine if their devices possessed the smart features required to support m-learning. Figure 8 - 2 shows that the vast majority of the participants own at least one mobile phone and a few have two devices. 98% of students have or have owned a smartphone or tablet, while only 1.2% of the participants have basic phones. Accordingly, most of the higher education students in Saudi Arabia own smartphones, which they use for both learning and non-learning purposes (Alhassan, 2016). First, iPhones and then Samsung Galaxies were the

most popular brands of device. Ownership of these high-quality devices, which readily connect to the internet and wi-fi increases the likelihood of them being easily utilised in educational and learning environments.

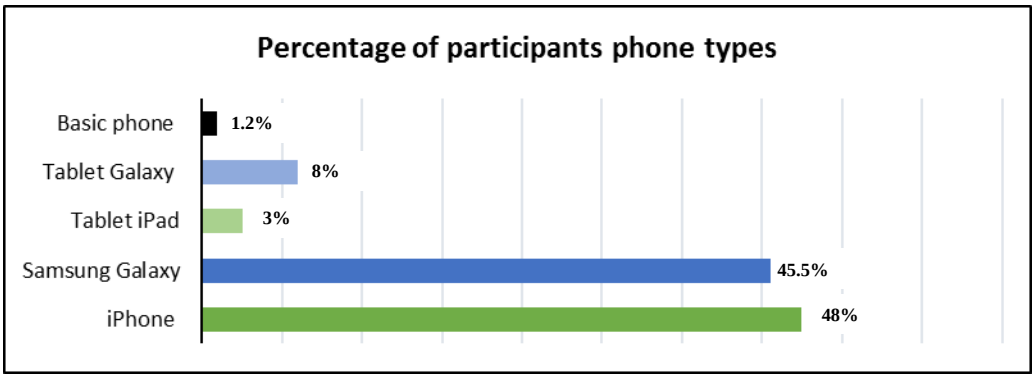


Figure 8 - 2 Participants' Mobile Types Ownership

Year of Study

All the participating students are fresh year students (foundational year) in one of the Saudi public universities.

Period of having Mobile Smart Devices

To ascertain their familiarity with the technology, participants were asked about how long they had been using their mobile devices, which in the majority of cases was between 1 and 3 years and frequently more (see Figure 8 - 3). This suggests that students are familiar with mobile technology and as such are well placed to use these technologies for educational purposes if they so wished and content is available.

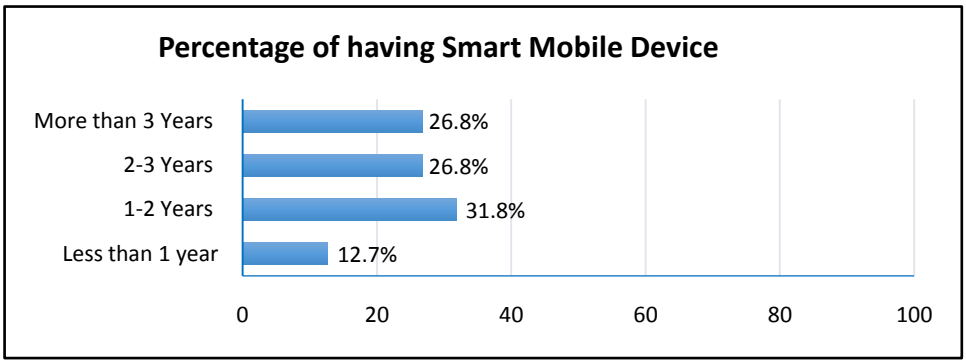


Figure 8 - 3 Average period of Having Smart Mobile Device

Hours Spent on the Mobile Phone (per day)

Participants were also asked for how long on average per day they used their mobile devices with the majority of responses (65%) being in excess of 3 hours per day and a

further 24% of participants using them for 2-3 hours per day (see Figure 8 - 4). Only 4% use them for less than an hour a day.

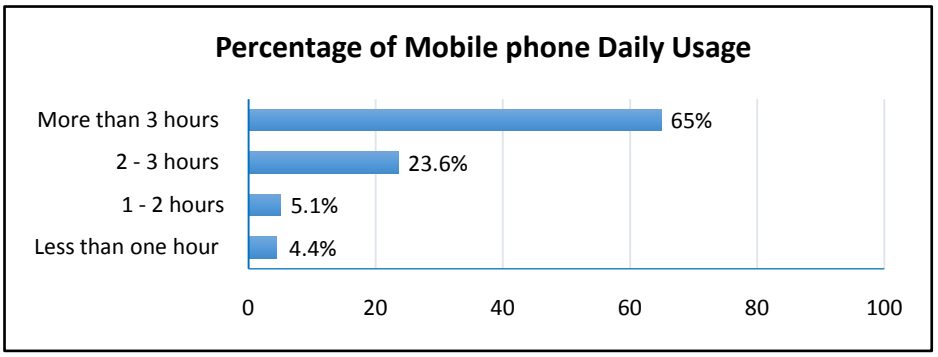


Figure 8 - 4 Percentage of Mobile device daily usage

General Activities and Services Used by the Mobile Device

Looking in more detail at the current use of mobile devices by the participants Table 8 - 3 - Figure 8 - 5, male and Table 8 - 4 - Figure 8 - 6, female), it can be seen that a variety of activities are undertaken related to communication, information gathering and media interaction. Male participants are seen to use their phones for communication activities more than female participants, with 65% of male students, for example, using their mobile devices often or regularly for phone calls, compared to only 32% of female students. The numbers using Facebook for fun was surprisingly small, but "WhatsApp" emerged with both males and females as the most popular way for chatting and exchanging media. Browsing the web for fun and watching videos for fun are other highly popular activities with both genders. The number of participants browsing the web for education were low compare to browsing the web for fun.

Table 8 - 3 Features used by male participants via mobile device

Activities via mobile device	Not at all %	Seldom %	Some %	Regularly %	Often %
Phone calls	1.3	9.0	24.4	41.0	24.4
Text message	11.5	32.1	12.8	26.9	16.7
Using Twitter	19.2	7.7	23.1	38.5	11.5
Using Facebook for fun	59.0	20.5	6.4	7.7	6.4
Using WhatsApp	3.8	7.7	5.1	50.0	29.5
Calendar	35.9	25.6	14.1	10.3	14.1
Reading articles books	20.5	23.1	23.1	15.4	16.7
Watching videos for fun	2.6	6.4	23.1	37.2	30.8
Playing games	14.1	10.3	21.8	37.2	16.7
Map facility	30.8	28.2	19.2	11.5	10.3
Taking, sending photos	7.7	12.8	21.8	42.3	15.4
Taking uploading videos	24.4	16.7	30.8	11.5	16.7
Browsing web for fun	2.6	9.0	15.4	47.4	21.8
Browsing web for education	48.7	17.9	11.5	9.0	11.5

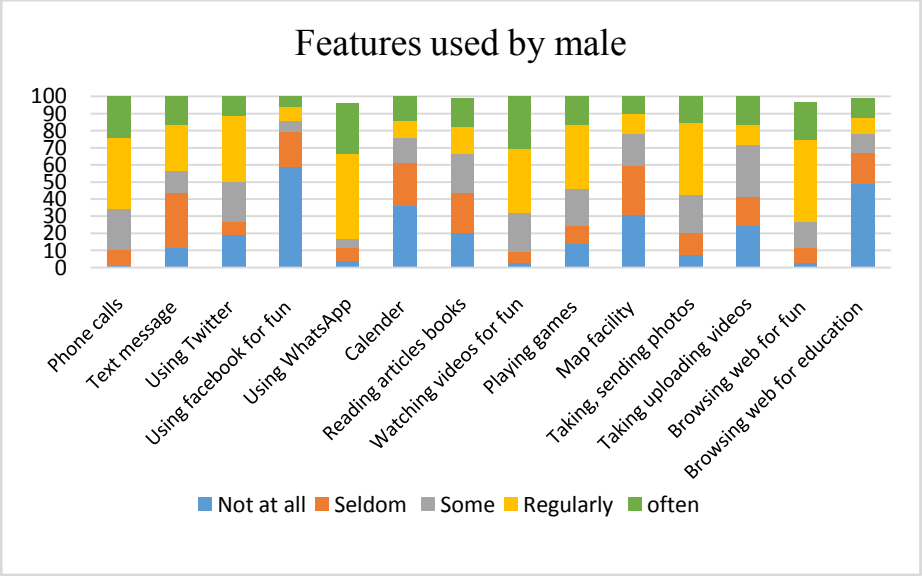


Figure 8 - 5 Features used by male participants via mobile device chart (n=78)

Table 8 - 4 Features used by female participants via mobile device

Activities via mobile device	Not at all %	Seldom %	Some %	Regularly %	Often %
Phone calls	3.8	30.8	33.3	11.5	20.5
Text message	14.1	47.4	12.8	6.4	19.2
Using Twitter	23.1	12.8	24.4	14.1	25.6
Using Facebook for fun	80.8	3.8	3.8	5.1	6.4
Using WhatsApp	3.8	5.1	7.7	50.0	33.3
Calendar	32.1	23.1	17.9	12.8	14.1
Reading articles books	17.9	28.2	21.8	12.8	19.2
Watching videos for fun	2.6	6.4	15.4	37.2	37.2
Playing games	11.5	21.8	29.5	15.4	21.8
Map facility	42.3	21.8	15.4	9.0	9.0
Taking, sending photos	2.6	5.1	11.5	39.7	41.0
Taking uploading videos	16.7	20.5	15.4	26.9	17.9
Browsing web for fun	1.3	9.0	10.3	44.9	32.1
Browsing web for education	38.5	35.9	16.7	5.1	3.8

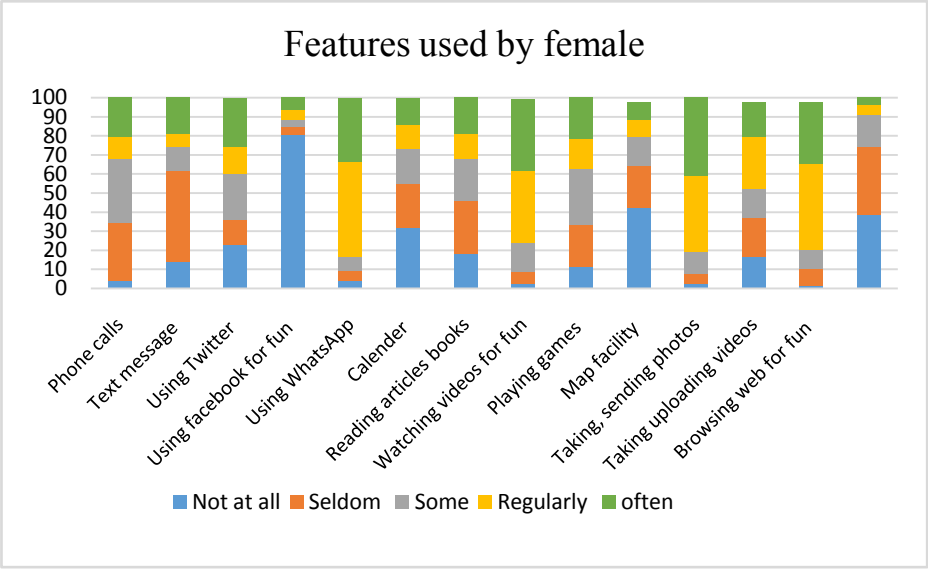


Figure 8 - 6 Features used by female participants via mobile device chart (n=78)

Activities Related to Learning

To explore the potential educational uses of mobile devices in more detail, participants were polled about what education-related activities they had undertaken or would consider undertaking via their mobile devices, with results presented in Table 8 – 5 - Figure 8 - 7 for male participants and Table 8 - 6 - Figure 8 - 8 for female participants. Again, a range of activities has been experienced with the most popular being „checking course timetables" (males and females), „viewing educational videos" (especially females) and „submitting coursework" (males), although viewing lectures as screencasts

appears to be a less popular activity. Whilst female participants frequently listed that they would not undertake educational activities via mobile devices, one popular option amongst the females (60.5%) was their willing to register for their courses via mobile devices. This might be due to faster access to the web via mobile devices than traditional computers, or it could possibly be attributed to the cultural norms and religious aspects of Saudi Arabia, whereby females are not allowed to go by themselves to internet services (e.g. Internet café) outside of the home.

Table 8 - 5 Activities related to learning - Male participants

Learning Activities	**Would not do %**	**Might do %**	**Would do %**	**Have done %**
Register For Courses	17.1	11.8	47.4	23.7
Check Course timetable	6.4	11.5	15.4	66.7
Check Course Syllabus	20.5	35.9	25.6	17.9
Listen to lectures as screencasts	32.4	25.7	17.6	24.3
View Educational Videos	27.3	39.0	14.3	19.5
Submit Course work	21.1	23.7	18.4	36.8
Access library account	51.3	25.6	15.4	7.7
Access library database	39.0	35.1	20.8	5.2
Use Social media for education	60.3	24.4	7.7	7.7
pay study fees	44.2	31.2	14.3	10.4
Take online tests	19.5	36.4	15.6	28.6

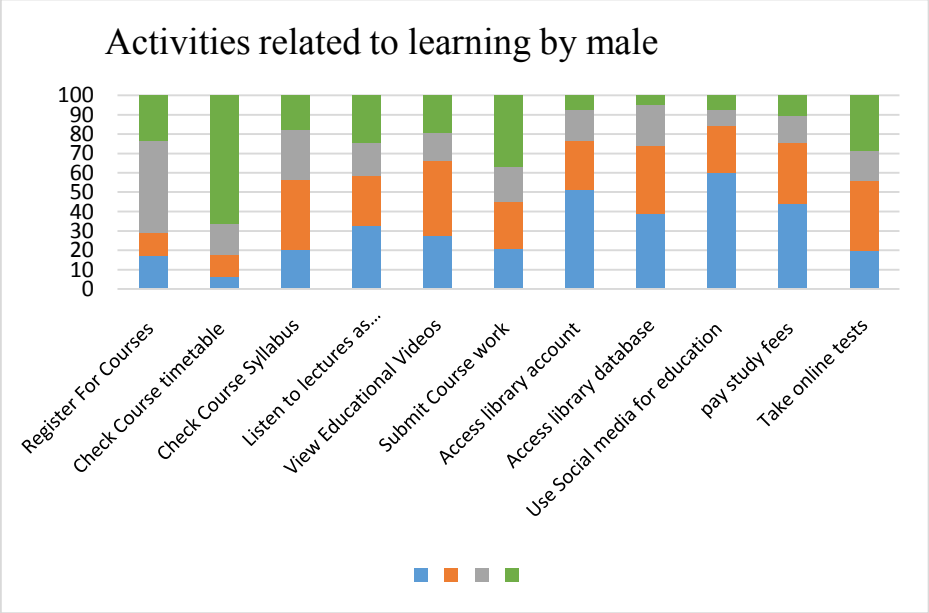


Figure 8 - 7 Activities related to learning - male participants chart (n=78)

Table 8 - 6 Activities related to learning - female participants

Learning Activities	Would not do %	Might do %	Would do %	Have done %
Register For Courses	10.5	17.1	60.5	11.8
Check Course timetable	7.8	18.2	20.8	53.2
Check Course Syllabus	30.7	26.7	20.0	22.7
Listen to lectures as screencasts	44.6	27.0	13.5	14.9
View Educational Videos	25.6	32.1	9.0	33.3
Submit Course work	24.7	33.8	15.6	26.0
Access library account	66.2	19.5	9.1	5.2
Access library database	54.5	24.7	16.9	3.9
Use Social media for education	59.7	16.9	6.5	16.9
Pay study fees	39.5	36.8	6.6	17.1
Take online tests	35.1	21.6	12.2	31.1

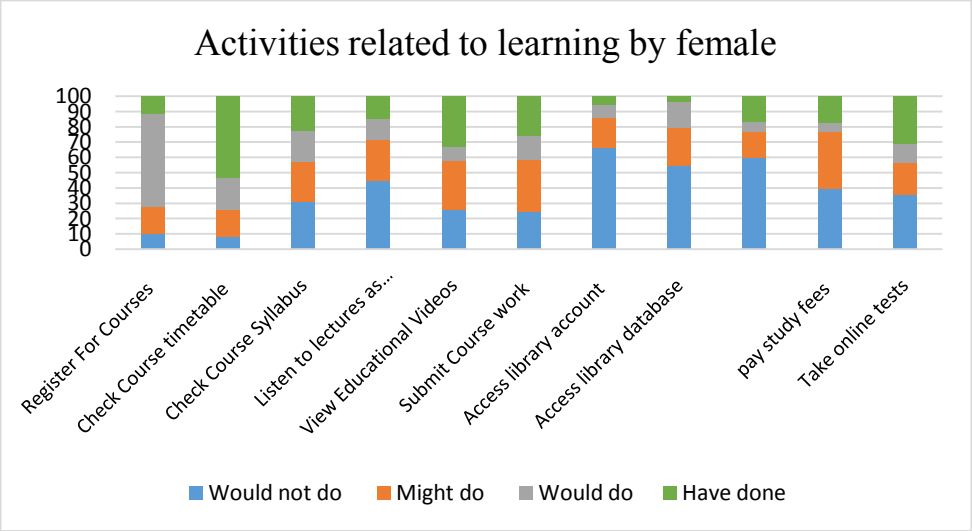


Figure 8 - 8 Activities related to learning - female participants chart (n=78)

Prior familiarity of m-learning functionality

80% of the male participants understood partially or totally what m-learning involved, whereas this figure was 75.4% for female participants. This means that approximately a quarter of the participants did not understand the meaning of m-learning prior to this study. This data is illustrated in Figure 8 - 9.

- Do you understand what m-learning involves?

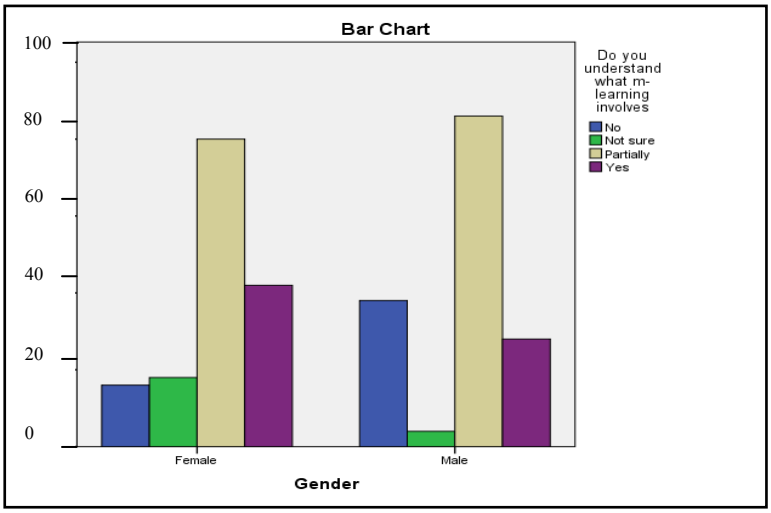


Figure 8 - 9 Understanding what does m-learning mean

Prior experience of using avatars

43% of participants reported that they had some prior knowledge of avatars, whilst 36% reported that they did not know about or had not seen avatars prior to this study, and a 20% of both genders reported that they were unsure. These results are illustrated in Figure 8 - 10.

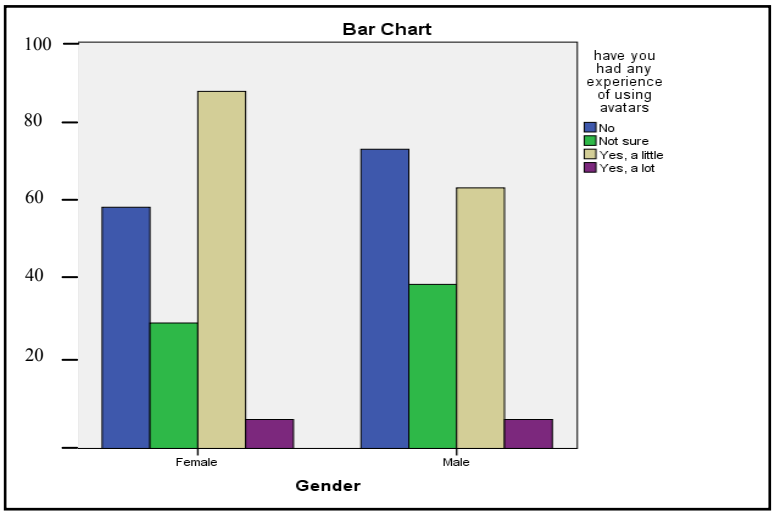


Figure 8 - 10 Experience of using avatars

It appears from Figure 8 - 10 that with female students were slightly more experienced in using avatars than male students. As with, 47.4% of female students having some experience of using avatars compared to only 34.6% of male students.

Participants' experience of learning types

Data relating to the experience of student learning modes (face-to-face; e-learning; m-learning; male or female on screen cast at the class), whether in their previous or current education, is presented in the following tables.

Table 8 - 7 Percentages of traditional learning experience

	How much have you experienced with face-to-face lectures (traditional course teaching)			
	Not at all	Seldom	Some	Regularly
Female	1.3%	1.3%	15.4%	82.1%
Male	0.0%	3.8%	6.4%	89.7%
	0.6%	2.6%	10.9%	85.9%

Table 8 - 8 Percentages of male face-to-face as a screen cast teaching experience

	How much have you experienced with face-to-face screen cast with male instructor at the class			
	Not at all	Seldom	Some	Regularly
Female	26.3%	14.5%	48.7%	10.5%
Male	51.3%	20.5%	23.1%	5.1%
	39.0%	17.5%	35.7%	7.8%

Table 8 - 9 Percentages of e-learning experience

	How much have you experienced with online learning (e-learning) via PCs or laptops			
	Not at all	Seldom	Some	Regularly
Female	49.4%	27.3%	19.5%	3.9%
Male	56.4%	19.2%	20.5%	3.8%
	52.9%	23.2%	20.0%	3.9%

Table 8 - 10 Percentages of m-learning experience

	How much have you experienced with mobile learning (m-learning) via phones or tablets			
	Not at all	Seldom	Some	Regularly
Female	60.5%	18.4%	13.2%	7.9%
Male	74.4%	11.5%	7.7%	6.4%
	67.5%	14.9%	10.4%	7.1%

Table 8 - 11 Percentages of female face-to-face as a screen cast teaching experience for female only

	How much have you experienced with face-to-face screen casts with female instructor at the class			
	Not at all	Seldom	Some	Regularly
Female	35.9%	20.5%	30.8%	12.8%

As illustrated in the above tables, the most common way of learning that the students have experienced is through the traditional face-to-face method, with learning occurring from listening to a male instructor presenting the lesson through a screen cast also being popular. The reason percentage of female students who have experienced screen casting

is due at least in part to the country‟s educational system including issues of culture and gender segregation. Students had least experience with m-learning with 67.5% of the participants having not practically experienced that method of learning. Even though the results in Table 8 - 10 show that they are highly informed and familiar with the term of m-learning (76%).These findings support the research objectives to investigate and explore the factors that engage and enhance learners to learn via m-learning effectively.

8.5 Results of Research Hypotheses – Experiment (1)

At the centre of the research is the MADE-ME model which includes a set of hypotheses that have been developed to answer the research questions. Table 8 - 12 illustrates the correlations between the questions from the questionnaires and each specific factor‟s hypothesis.

Table 8 - 12 Correlations between questions from the questionnaires and the specific factor's hypothesis

Statement	H_n	Hypothesis
Performance expectancy		
Do you think accessing course material on your mobile device with an avatar helped you to learn the material more efficiency than the same content presented in traditional formats (face-to-face)	$H1_{a,b}$	H1a. Gender will positively moderate the effect of preferred multimedia instruction on the performance expectancy. H1b. Major of study will positively moderate the effect of preferred multimedia instruction on the performance expectancy.
I think that the m-learning would be a more effective way to learn English language than learning face-to- face in classes		
I think m-learning would strengthen my participation when learning English language		
I think having an m-learning interface with an avatar would positively assist me to learn English		
I think having an avatar approach would increase my understanding of information that I have learnt		
I think having an avatar approach would increase my retention of information that I have learnt		
Intrinsic Engagement		
Did the content delivered to you by a mobile device engage you	$H2_{a,b}$	H2a. Gender will positively moderate the effect of preferred multimedia instruction on students‟ intrinsic engagement.
If you had more content delivered on your mobile device would you be more motivated to learn English than via traditional teaching (face-to-face)		

I think having access to the English materials on my mobile devices would enhance my motivation to learn English language		H2b. Major of study will positively moderate the effect of preferred multimedia instruction on students" intrinsic engagement.
I find a female face to face instructor more engaging to me than learning via screen cast of male instructor at the class		
Learning Enjoyment		
Did you enjoy having content delivered to you by a mobile device	$H3_{a,b}$	H3a. Gender will positively moderate the effect of intrinsic engagement on the students" enjoyment. H3b. Major of study will positively moderate the effect of intrinsic engagement on the students" enjoyment.
I think having access to materials on mobile devices would be a fun interaction between content-learner		
I think having an interface with an avatar will be fun to learn from		
Multimedia preferences (mode of delivery)		
I would prefer to learn in the normal traditional face-to-face class	$H4_{a,b}$	H4a. Gender will positively moderate the effect of intrinsic engagement on the students" performance expectancy. H4b. Major of study will positively moderate the effect of intrinsic engagement on the students" performance expectancy.
I would prefer having an m-learning interface without an avatar		
I would prefer to learn through mobile devices including text + voice via mobile device (but no image)		
I would prefer to learn with a static male avatar via mobile device with text + voice		
would prefer to learn with a talking head male avatar via mobile devices with text + video		
I would prefer to learn with a cartoon photo avatar via mobile devices with text + speech		
I would like to learn with a static female avatar via a mobile device with text + voice		
Convenience of m-learning		
I think the m-learning would be more convenient to me than learning face-to-face in class	$H5_{a,b}$	H5a. Gender will positively moderate the effect of the convenience of m-learning on students" performance expectancy. H5b. Major of study will positively moderate the effect of the convenience of m-learning on students" performance expectancy.
I think the repeatable and pause features of lessons on the mobile device would be more convenient to me than a traditional class.		
I think the portability of mobile device plays a strong factors in enabling me to learn anywhere and anytime		
Behavioural intention to use m-learning		

I plan to continue using my mobile device for receiving educational content (if available)	$H6_{a,b}$	H6a. Gender will positively moderate the effect of the performance expectancy on the behavioural intention to use m-learning.
I believe extending the concept of the avatar to other courses would be useful.		
Would you like to undertake future courses with integrated mobile learning for English language		H6b. Major of study will positively moderate the effect of the performance expectancy on the behavioural intention to use m-learning.
Would you like to undertake future courses with integrated mobile learning for other courses		
Would you recommend m-learning with an avatar interface to other students		

The results of the hypotheses based on the answers expressed in the questionnaires are as follow:

H1. Preferences and Performance Expectancy

The first hypothesis states that:

> *Preference for multimedia instruction through mobile device (or traditional F2F) will positively influence students' performance expectancy.*

In order to determine the relationship of these two factors, the Logistic regression test was used. This type of test shows statistically if any of these types of learning has a significant influence on the performance expectancy of the students. The results of this test are illustrated in the following table (see Table 8 - 13).

Table 8 - 13 Logistic Regression of preference modality of learning on performance expectancy

Preference for learning method Yes or No	B	Sig.	Exp(B)	95% C.I.for EXP(B)	
				Lower	Upper
I like the traditional F2F	-.948	.170	.388	.100	1.502
I like the m-learning with text interface	.382	.630	1.464	.310	6.910
I like the m-learning with audio interface	.188	.794	1.206	.295	4.928
I like the m-learning with M/Image interface	.074	.917	1.077	.269	4.317
I like the m-learning with video interface	2.197	.007	8.994	1.829	44.219
I like the m-learning with cartoon interface	.031	.968	1.031	.225	4.730
I like the m-learning with F/Image interface	.391	.603	1.479	.338	6.466
Age	-.504	.124	.604	.318	1.148
Faculty	-.982	.161	.375	.095	1.478
Constant	9.171	.134	9613.821		

Table 8 - 13 indicates the performance expectation of students with regards to their believe that accessing course materials in general on their mobile device with an avatar will help them learn the content better than if the same content was presented in a traditional format (face-to-face). The findings here highlight that there is a statistically significant relationship between the outcome and the preference of students to learn with when the „talking head male avatar" as a video (p = 0.007) on their mobile device.

The mean for each of the five statements about performance expectancy when learning English language materials was calculated, then a UNIANOVA test was conducted to find the relationship between the modality of learning and the students" perceived performance expectancy/usefulness. Table 8 - 14 show these statements and the means of the responses:

Table 8 - 14 Mean for performance expectancy statements

Question No	Statement	Mean
1	I think that the m-learning would be a more effective way to learn English language than learning face-to- face in classes.	3.37
2	I think m-learning would strengthen my participation when learning English language.	3.53
3	I think having an m-learning interface with an avatar would positively assist me to learn English.	3.51
4	I think having an avatar approach would increase my understanding of information that I have learnt.	3.64
5	I think having an avatar approach would increase my retention of information that I have learnt.	3.51

To demonstrate the potential of this approach and its suitability for the application, Table 8 - 15 show the results of these factors when applied learning materials specifically to English language.

Table 8 - 15 UNIANOVA of learning modality variables on English language performance expectancy

Source	Type III Sum of Squares	Mean Square	F	Sig.
I like the traditional F2F	.238	.238	.751	.390
I like the m-learning with text interface	.006	.006	.020	.887
I like the m-learning with audio interface	.059	.059	.185	.669
I like the m-learning with male Image interface	3.817	3.817	12.034	.001
I like the m-learning with video interface	7.196	7.196	22.689	.000
I like the m-learning with cartoon interface	.009	.009	.029	.865
I like the m-learning with female image	.499	.499	1.574	.215
Faculty	.324	.324	1.021	.317

What is interesting in this data is that, when the statements indicated English language as the main learning material, the results show that two modality had significant results. There is a statistically significant relationship between the outcome and students‟ modality preference of learning through a mobile device with a male static avatar ($p = 0.001$) and with the video interface ($p < 0.001$). This hypothesis is moderated by two factors (gender; major).

Gender:

$H1_a$. Gender will positively moderate the effect of preferred multimedia instruction on the performance expectancy.

Major/subject:

$H1_b$. Major of study will positively moderate the effect of preferred multimedia instruction on the performance expectancy.

With regards to $H1_a$, male students expectations that they would perform better when using mobile learning with a male static avatar was 0.3 points higher than female students, as shown in the following table.

Table 8 - 16 Performance expectancy when using m-learning with male static avatar for English content

(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Female	Male	-.326*	.119	.007	-.561	-.091
Male	Female	.326*	.119	.007	.091	.561

Table 8 - 17 Mean of gender for performance expectancy when using m-learning with male static avatar for English content

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	3.346[a]	.083	3.181	3.510
Male	3.672[a]	.085	3.504	3.839

In addition, when learning via mobile devices with animated avatars (video), similarly to the previous result, male students also expected to perform better by 0.3 points higher than female students see Table 8 - 18.

Table 8 - 18 Performance expectancy when using m-learning with animated avatar (video)

Pairwise Comparisons						
(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Female	Male	-.269*	.115	.021	-.496	-.042
Male	Female	.269*	.115	.021	.042	.496

Table 8 - 19 Mean of gender for performance expectancy when using m-learning with animated avatar (video)

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	3.375[a]	.082	3.214	3.537
Male	3.645[a]	.081	3.484	3.805

However, for H1b there was no significant difference between the two major groups Arts and Science when learning via mobile devices with static male avatars and also when learning via mobile devices with animated avatars with P-value = 0.31.

Table of summary 1 Hypothese 1 results

Hypothesis	Status
H1 with two modality (video, static image)	Supported
H1a. Gender	Supported
H1b. Major/subject	Rejected

H2. Preferences and Intrinsic Engagement

The second hypothesis states that

> *Preference for multimedia instruction will positively influence students' intrinsic engagement.*

This hypothesis was moderated by two factors (gender; major).

Gender:

> *$H2_a$.Gender will positively moderate the effect of preferred multimedia instruction on students' intrinsic engagement.*

Major/subject

> *$H2_b$.Major of study will positively moderate the effect of preferred multimedia instruction on students' intrinsic engagement.*

The UNIANOVA used to test the main hypothesis and the result are illustrated as follows in Table 8 - 20:

Table 8 - 20 Preference for multimedia on engagement

Source	Type III Sum of Squares	Mean Square	F	Sig.
I like the traditional F2F	2.701	2.701	3.239	.074
I like the m-learning with text interface	.463	.463	.555	.457
I like the m-learning with audio interface	2.219	2.219	2.661	.105
I like the m-learning with male Image interface	13.415	13.415	16.085	.000
I like the m-learning with video interface	4.669	4.669	5.599	.019
I like the m-learning with cartoon interface	9.251	9.251	11.093	.001

Table 8 - 20 shows that there is a clear trend of increasing preference for interfaces which contain an avatar. Results show that there is a statistically significant relationship between engagement and students‟ preference to learn via m-learning with the static male avatar ($p < 0.001$); m-learning with the video avatar ($p = 0.01$); and m-learning with a cartoon avatar (0.001).

With regard to $H2_{a,}$ there are statistically significant differences between genders. Male students‟ engagement was 0.5 points higher than female students‟ engagement when learning via mobile devices with content delivered by an avatar as shown in Table 8 - 21.

Table 8 - 21 Gender moderator for hypothesis 2

Pairwise Comparisons						
(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Female	Male	-.534*	.158	.001	-.847	-.221
Male	Female	.534*	.158	.001	.221	.847
*. The mean difference is significant at the .05 level.						

Table 8 - 22 Mean of gender moderating hypothesis 2

Dependent Variable: I think having access to the English materials on my mobile devices would enhance my motivation to learn English language				
Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	3.214a	.110	2.997	3.432
Male	3.749a	.111	3.528	3.969

In contrast, the result of the relationship between these factors and the major/subject as a moderator showed no significant differences between the two disciplines of Arts and Science.

Table of summary 2 Hypothesis 2 results

Hypothesis	Status
H2 with three modality (video, static image, cartoon)	Supported
H2a Gender	Supported
H2b Major	Rejected

Both male and female students participated in each of the different modalities of learning, and additionally females‟ students conducted further m-learning lesson with a static female avatar. The result indicated that there is a statistically significant relationship between female students engagement and m-learning with a static female avatar ($p = 0.001$), as illustrated in the Table8 - 23. The findings also showed no statistically significant differences between the Arts and Science on disciplines of study.

Table 8 - 23 Preference of female avatar on engagement (Only for female)

Tests of Between-Subjects Effects				
Source	Type III Sum of Squares	Mean Square	F	Sig.
I like the m-learning with female Image interface	15.115	15.115	12.146	.001
Major/subject	.105	.105	.084	.772

H3. Engagement and Enjoyment

In this hypothesis, the researcher was investigating the relationship between the engagement factors and how they can affect students‟ enjoyment when they have access to materials on mobile devices, and in particular whether or not that would be perceived as a fun interaction between the content and the learner. The hypotheses was stated as:

Intrinsic engagement will positively influence students' enjoyment.

The researcher conducted a UNIANOVA test to explore how the enjoyment of using m-learning can be predicted by intrinsic motivation to have positive correlations in the model. As illustrated earlier in the model, gender and major of study are both moderating this hypothesis as following:

Gender:

H3a. Gender will positively moderate the effect of intrinsic engagement on the students' enjoyment.

Major/subject:

H3b. Major of study will positively moderate the effect of intrinsic engagement on the students' enjoyment.

The tests results are shown in the following table:

Table 8 - 24 Enjoyment based on engagement

Tests of Between-Subjects Effects				
Source	Type III Sum of Squares	Mean Square	F	Sig.
Engagement 4748	131.120	131.120	53.512	.000
Gender	3.264	3.264	1.332	.250
Major/subject	.543	.543	.221	.639

The result revealed that there is a statistically significant relationship between perceived enjoyment and students‟ beliefs that having access to English materials on their mobile devices would enhance their motivation to learn English language ($p < 0.001$). Results showed that enjoyment of using m-learning was predicted by intrinsic motivation.

For the H3a and H3b, the result can be shown from Table8 - 24, that there were no significant differences between the groups, neither for gender or faculty/major of students as ($p = 0.12$) and ($p = 0.6$) respectively, with the P-values for both are > 0.05.

Table of summary 3 Hypothesis 3 results

Hypothesis	Status
H3. Engagement and Enjoyment	Supported
H3a. Gender	Rejected
H3b. Major/subject	Rejected

H4. Engagement and Performance Expectancy

The fourth hypothesis tested whether or not *the engagement factor influences the performance expectancy factor*. The gender and faculty used as moderators of this hypothesis were as follows:

Gender:

> *H4a. Gender will positively moderate the effect of intrinsic engagement on the students' performance expectancy.*

Major/subject

> *H4b. Major of study will positively moderate the effect of intrinsic engagement on the students' performance expectancy.*

At this point, the general statement of engagement was tested by the UNIANOVA test to predict its influence on the performance expectancy or usefulness of learning. With the result presented in Table 8 – 25:

Table 8 - 25 Engagement on performance expectancy

Tests of Between-Subjects Effects				
Source	Type III Sum of Squares	Mean Square	F	Sig.
Engagement q4748	28.247	28.247	35.767	.000
Gender	4.141	4.141	5.244	.023
major/subject	.533	.533	.675	.413

Table 8 - 26 Gender moderator for hypothesis 4

Pairwise Comparisons						
(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Female	Male	-.455*	.161	.005	-.774	-.136
Male	Female	.455*	.161	.005	.136	.774
*. The mean difference is significant at the .05 level.						

Table 8 - 27 Mean of gender moderating hypothesis 4

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	1.440a	.112	1.219	1.661
Male	1.895a	.116	1.666	2.125

Table 8 - 28 Mean of major moderating hypothesis 4

Faculty	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Science	1.727a	.105	1.520	1.935
Art	1.608a	.111	1.389	1.828

As illustrated from Table 8 - 25, there is a statistically significant relationship between the performance expectancy if learning was via mobile devices with an avatar for any course, and the intrinsic engagement ($p < 0.001$). In addition, there are significant differences between genders. Male students showed statistically that their expectation of performance was 0.5 higher than for female students, because they engaged with that way of learning. However, regarding the faculty, there was no statistical differences between groups of the two disciplines.

On the other hand, when the specific statement related to the engagement of the English language course was tested to predict its influence on the performance expectancy factor, the result presented in Table 8 - 29:

Table 8 - 29 Engagement on performance expectancy if the course is English

Source	Type III Sum of Squares	Mean Square	F	Sig.
Engagement q57	269.419	269.419	124.291	.000
Gender	.023	.023	.011	.917
Major/subject	7.029	7.029	3.243	.074

Table 8 - 30 Mean of gender for the engagement on performance expectancy if the course is English

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	6.928[a]	.173	6.585	7.270
Male	6.882[a]	.183	6.521	7.243

Table 8 - 31 Mean of major for the engagement on performance expectancy if the course is English

Faculty	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Science	7.126[a]	.163	6.803	7.449
Art	6.683[a]	.188	6.311	7.055

As Table 8 – 29 shows, there is a significant relationship between the students‟ performance expectancy when they were learning via English materials and their motivation to access the module materials through mobile phones to learn the English content ($p < 0.001$). However, for H4a and H4b, there were no significant differences between groups as shown in Table 8 - 30 and Table 8 - 31.

Table of summary 4 hypothesis 4 results

Hypothesis	Status
H4. Engagement and Performance Expectancy	Supported
H4a. Gender	Rejected
H4b. Major/subject	Rejected

H5. Convenience and Performance Expectancy

In this stage, the researcher tested the convenience factor of m-learning to find out whether or not that factor effects the performance expectancy. The hypothesis stated and the two moderators (gender, faculty) used are as follows:

H5. The convenience of m-learning will positively influence students' performance expectancy.

Gender:

H5a. Gender will positively moderate the effect of the convenience of m-learning on students' performance expectancy.

Major/subject:

> *H5b. Major of study will positively moderate the effect of the convenience of m-learning on students' performance expectancy.*

When the UNIANOVA was used to test these hypotheses, the results were presented as follows in Table 8 - 32:

Table 8 - 32 UNIANOVA for convenience on performance expectancy

Source	Type III Sum of Squares	Mean Square	F	Sig.
(convenient) Meanq53_54_55	26.834	26.834	33.138	.000
Gender	5.745	5.745	7.094	.009
Major/subject	.080	.080	.098	.754

Table 8 - 33 Mean of gender moderating hypothesis 5

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	1.338[a]	.105	1.131	1.545
Male	2.009[a]	.106	1.800	2.219

From Table 8 - 32, there is a significant relationship between the performance expectancy factor and the convenience factor ($p < 0.001$).

With regard to gender as a moderator, there are statistically significant differences between genders. The results show that male students perceived m-learning to be more convenient for them with a 0.7 point higher mean than female students. Therefore, male students expect m-learning will increase their usefulness and performance compared to female students. However, regarding the major factor when moderating the current hypothesis, there were no differences between the two discipline groups.

Table of summary 5 hypothesis 5 results

Hypothesis	Status
H5. Convenience and Performance Expectancy	Supported
H5a. Gender	Supported
H5b.Major/subject	Rejected

H6. Performance Expectancy and Behavioural Intention

Based on the research model, the hypotheses number 6 stated that:

> *The performance expectancy will positively influence students' behavioural intention to use m-learning.*

The two moderators added to be as following:

Gender:

H6a. Gender will positively moderate the effect of the performance expectancy on the behavioural intention to use m-learning.

Major/subject:

H6b. Major of study will positively moderate the effect of the performance expectancy on the behavioural intention to use m-learning.

The UNIANOVA test was conducted to investigate this hypothesis and the results are illustrated in Table 8 - 34:

Table 8 - 34 Performance expectancy on behavioural intention to use m-learning

Source	Dependent Variable Intention to use m-learning	Type III Sum of Squares	Mean Square	F	Sig.
(Expectancy) sumq56_58	q7172	289.643	289.643	137.732	.000
	q818283	443.615	443.615	101.350	.000
Gender	q7172	.048	.048	.023	.880
	q818283	4.689	4.689	1.071	.302
Major/subject	q7172	.031	.031	.015	.903
	q818283	.717	.717	.164	.686

* q7172 & q818283 are the intention to use m-learning statements

As the above table reveals, if there was a statistically significant relationship between the intention to use m-learning and students‟ performance expectations of learning via mobile devices, it would effectively strength their participation to learn English language compared to the traditional face-to-face learning ($p < 0.001$). However, regarding the H6a and H6b, there were no significant differences whether between the genders and the two faculties.

Table of summary 6 hypothesis 7 results

Hypothesis	Status
H6. Performance Expectancy and Behavioural Intention	Supported
H6a. Gender	Rejected
H6b.Major/subject	Rejected

H7. Intrinsic Engagement and Behavioural intention

Similarly, another important factor, „intrinsic engagement‟, was used as a predictor to influence the behavioural intention to use m-learning. Based on the research model, the

two moderators‟ factors (genders and faculty) were added into this hypothesis as following:

Gender:

H7a. Gender will positively moderate the effect of intrinsic engagement on the students' behavioural intention to use m-learning.

Major/subject:

H7b. Major of study will positively moderate the effect of intrinsic engagement on the students' behavioural intention to use m-learning.

The result of the hypothesis test is presented in the Table 8 - 35:

Table 8 - 35 Engagement on behavioural intention to use m-learning

Source	Dependent Variable: Intention to use m-le.	Type III Sum of Squares	Mean Square	F	Sig.
Engaged when used m-learning	q7172	141.748	141.748	45.234	.000
	q818283	306.959	306.959	57.163	.000
Gender	q7172	10.395	10.395	3.317	.071
	q818283	.954	.954	.178	.674
Major/subject	q7172	.158	.158	.050	.823
	q818283	2.629	2.629	.490	.485

Table 8 - 36 Mean of gender moderating hypothesis 7

Dependent Variable Intention to use m-learning	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
q71-72	Female	7.301[a]	.226	6.853	7.748
	Male	6.939[a]	.241	6.464	7.414
q81-83	Female	5.244[a]	.296	4.658	5.830
	Male	5.148[a]	.315	4.526	5.771
a. Covariates appearing in the model are evaluated at the following values: q4748 = 2.8733, Age = 19.07.					

* q71-72 & q81-82-83 are the intention to use m-learning statements

As shown in Table 8 - 35, there is a statistically significant relationship between the dependent variable (intention to use m-learning) and the students‟ engagement to learn via mobile devices ($p < 0.001$). In addition, there is a statistically significant relationship between the dependent variable and the students‟ beliefs that having access to the English materials on their mobile devices would enhance their motivation to learn English language ($p < 0.001$). However, there were no significant differences between gender and faculty.

Although the gender is not statistically significant ($p = 0.07$), the interesting findings from the second table is that the mean of female students (7.3) was higher than the mean

of male students (6.9). In other words, those female students who were intending and planning to use the m-learning in future were slightly more engaged with the approach of m-learning compared to the male students.

Table of summary 7 hypothesis 7 results

Hypothesis	Status
H7.Intrinsic Engagement and Behavioural intention	Supported
H7a. Gender	Rejected
H7b. Major/subject	Rejected

H8. Enjoyment and Behavioural Intention

Further to these predictor factors and based on the research model, there was another important factor (Enjoyment of learning) as an independent variable which might have an influence on the behavioural intention to use m-learning. The hypothesis was stated as:

> *Enjoyment will positively influence students' behavioural intention to use m-learning.*

The researcher conducted a UNIANOVA test to explore how the students‟ intention to use m-learning can be predicted by enjoyment to have positive correlations in the model. As illustrated earlier in the model, the gender and major of the study are moderating this hypothesis to be as following:

Gender:

> *H8a. Gender will positively moderate the effect of enjoyment on the students' behavioural intention to use m-learning.*

Major/subject:

> *H8b. Major of study will positively moderate the effect of enjoyment on the students' behavioural intention to use m-learning.*

The tests findings are presented in the following table.

Table 8 - 37 Enjoyment on behavioural intention to use m-learning

Source	Dependent Variable Intention to use m-learning	Type III Sum of Squares	Mean Square	F	Sig.
(Enjoyment) q46	q7172	167.927	167.927	57.593	.000
	q818283	245.821	245.821	42.599	.000
Gender	q7172	6.811	6.811	2.336	.129
	q818283	.437	.437	.076	.783
Faculty	q7172	.500	.500	.171	.679
	q818283	4.374	4.374	.758	.385

The above table revealed that there is a statistically significant relationship between the intention to use m-learning and the students‟ enjoyment in which they believed accessing the materials on mobile devices was a fun interaction between content and learner ($p < 0.001$). Results showed that the intention of using m-learning was significantly predicted by enjoyment. For the two moderators, the results indicate no significant difference between the males and females groups or the Arts and Science students.

Table 1 Hypotheses 8 results summery

Hypothesis	Status
H8. Enjoyment and Behavioural Intention	Supported
H8a. Gender	Rejected
H8b. Major/subject	Rejected

H9. The Engagement and Pedagogical Performance

As the research objective is aiming to increase and improve the students‟ pedagogical performance and outcome, the research model assumed in (H9)as follows:

> *The intrinsic engagement positively influence the students' effectiveness.*

As illustrated earlier in the model, the gender and major of the study are moderating this hypothesis to be as following:

Gender:

> *H9a. Gender will positively moderate the effect of intrinsic engagement on the students' effectiveness.*

Major/subject:

> *H9b. Major of study will positively moderate the effect of intrinsic engagement on the students' effectiveness.*

After running the test of these hypotheses, the results were as follows in Table 8 - 38:

Table 8 - 38 Engagement on effectiveness (actual test performance)

Source	Post-test of each method as	Mean Square	Sig.
Engagement	m-learning with text	58.277	.062
	m-learning with static male avatar	55.810	.043
	m-learning with cartoon avatar	31.497	.025
	m-learning with audio avatar	22.747	.064
	m-learning with video avatar	66.826	.028
	face-to-face teaching	2.529	.492
Gender	m-learning with text	142.852	.001
	m-learning with static male avatar	27.332	.155
	m-learning with cartoon avatar	39.098	.013
	m-learning with audio avatar	51.468	.006
	m-learning with video avatar	138.794	.002
	face-to-face teaching	4.611	.354
Faculty	m-learning with text	14.329	.266
	m-learning with static male avatar	7.553	.454
	m-learning with cartoon avatar	26.997	.038
	m-learning with audio avatar	25.201	.052
	m-learning with video avatar	1.335	.754
	face-to-face teaching	.388	.788

The Table 8 - 38 indicates that there are statistically significant relationships between the performance outcome and the students‟ engagements to learn through m-learning when the interface was: a static male image avatar ($p = 0.04$), a cartoon avatar ($p = 0.02$) and a video interfaces avatar ($p = 0.02$). This means that students performed well in these three ways of learning because they had engaged with them while learning the English lessons. Moreover, regarding the hypothesis when moderated by gender, there were significant differences between genders in their test scores. Female students outperformed male students by 2 points than in m-learning with a textual interface, by 0.9 points higher in m-learning with cartoon interface, by 1.5 points higher in m-learning with audio, and by 2.5 points higher in m-learning with videos, as shown in Table 8 - 39.

Table 8 - 39 Mean of gender moderating hypothesis 9

Pairwise Comparisons					
Learning method ** Through mobile device	(I) Gender	(J) Gender	Mean Difference (I-J)	95% Confidence Interval for Difference	
				Lower Bound	Upper Bound
Text **	Female	Male	2.069*	.834	3.303
	Male	Female	-2.069*	-3.303	-.834
static male avatar **	Female	Male	1.480	.148	2.813
	Male	Female	-1.480	-2.813	-.148
cartoon avatar **	Female	Male	.987*	.084	1.889
	Male	Female	-.987*	-1.889	-.084
audio avatar **	Female	Male	1.512*	.580	2.444
	Male	Female	-1.512*	-2.444	-.580
video avatar **	Female	Male	2.507*	1.165	3.849
	Male	Female	-2.507*	-3.849	-1.165
face-to-face teaching	Female	Male	.673	-.168	1.513
	Male	Female	-.673	-1.513	.168

Based on estimated marginal means
*. The mean difference is significant at the .05 level.

The second sub-hypothesis concerns weather the moderator is the major/subject. The result showed that there were statistically significant differences between the two groups, with Science students engaging and outperforming Arts students by 0.9 points in m-learning with a cartoon interface (avatar).

Because the female students undertook an additional lesson through the mobile device as a static female avatar, the test was done for this type of learning separately and the results presented in Table 8 - 40.

Table 8 - 40 Engagement on effectiveness of female avatar (actual test performance, only for female)

Source	Type III Sum of Squares	Mean Square	F	Sig.
Engagement 57	3.170	3.170	.270	.605
Major/subject	61.400	61.400	5.232	.025

The results indicate that there was no statistically significant relationship between the results (test scores) of that type of learning and the engagement ($p = 0.6$); however, there were significant differences between the two major groups. Science students engaged and performed by 1.7 points higher than Arts students in m-learning with a static female avatar. See the mean differences of this findings in this table.

Table 8 - 41 Mean of major for Engagement on effectiveness of female avatar (actual test performance, only for female)

Pairwise Comparisons						
(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Science	Art	1.662*	.727	.025	.214	3.110
Arts	Science	-1.662*	.727	.025	-3.110	-.214
*. The mean difference is significant at the .05 level.						

H10. Preference and Pedagogical Performance.

This hypothesis investigated whether or not the preference of face-to-face or any multimedia instruction has an influence on the pedagogical performance (effectiveness). The hypothesis (H10) was stated as follows:

> *Preference for multimedia instruction will positively influence students' effectiveness.*

The following moderators added:

Gender:

> *$H10_a$. Gender will positively moderate the effect of preferred multimedia instruction on the effectiveness.*

Major/subject:

> *$H10_b$. Major of study will positively moderate the effect of preferred multimedia instruction on the effectiveness.*

The results of these hypotheses presented in Table 8 - 42, reveal that there is a statistically significant relationship between the students‟ preference for using m-learning video interface and the result of face-to-face test ($p = 0.001$). There is also a statistically significant relationship between gender and the outcomes which is the result of using face-to-face learning ($p = 0.001$). Female students preferred and outperformed male students by 0.7 points in face-to-face learning method compared to the m-learning. The results presented as in the follows Table 8 - 42:

Table 8 - 42 Preference of mode of learning on effectiveness (actual test performance)

Source Way of learning preferred	Dependent Variable	Mean Square	F	Sig.
Face-to-face method	m-learning with text	.110	.010	.922
	m-learning with static male avatar	.023	.002	.968
	m-learning with cartoon avatar	1.206	.175	.676
	m-learning with audio avatar	2.529	.362	.549
	m-learning with video avatar	1.890	.144	.705
	face-to-face teaching	5.867	1.242	.267
m-learning with text	m-learning with text	.105	.009	.924
	m-learning with static male avatar	16.308	1.152	.285
	m-learning with cartoon avatar	1.314	.191	.663
	m-learning with audio avatar	9.766	1.396	.240
	m-learning with video avatar	6.991	.533	.467
	face-to-face teaching	.164	.035	.853
m-learning with audio avatar	m-learning with text	4.390	.386	.536
	m-learning with static male avatar	41.237	2.912	.090
	m-learning with cartoon avatar	.037	.005	.942
	m-learning with audio avatar	1.536	.220	.640
	m-learning with video avatar	17.686	1.349	.248
	face-to-face teaching	.028	.006	.939
m-learning with static male avatar	m-learning with text	10.614	.933	.336
	m-learning with static male avatar	11.503	.812	.369
	m-learning with cartoon avatar	2.091	.304	.582
	m-learning with audio avatar	11.872	1.697	.195
	m-learning with video avatar	.214	.016	.899
	face-to-face teaching	14.341	3.036	.084
m-learning with video avatar	m-learning with text	1.147	.101	.751
	m-learning with static male avatar	45.176	3.190	.076
	m-learning with cartoon avatar	4.829	.702	.404
	m-learning with audio avatar	1.592	.228	.634
	m-learning with video avatar	4.620	.352	.554
	face-to-face teaching	58.327	12.349	.001
m-learning with cartoon avatar	m-learning with text	6.171	.542	.463
	m-learning with static male avatar	1.057	.075	.785
	m-learning with cartoon avatar	.470	.068	.794
	m-learning with audio avatar	11.825	1.691	.196
	m-learning with video avatar	27.997	2.135	.146
	face-to-face teaching	4.356	.922	.339
Gender	m-learning with text	.596	.052	.819
	m-learning with static male avatar	5.782	.408	.524
	m-learning with cartoon avatar	2.109	.307	.581
	m-learning with audio avatar	2.287	.327	.568
	m-learning with video avatar	20.055	1.530	.218
	face-to-face teaching	54.069	11.447	.001
Faculty/ Major	m-learning with text	33.076	2.908	.091
	m-learning with static male avatar	26.710	1.886	.172
	m-learning with cartoon avatar	35.482	5.158	.025
	m-learning with audio avatar	14.694	2.101	.150
	m-learning with video avatar	13.487	1.029	.312
	face-to-face teaching	.369	.078	.780

In addition, from Table 8 - 42, there are statistically significant differences between the groups of major toward the outcomes when the learning was by using m-learning as a cartoon interface ($p = 0.02$). Science students preferred and outperformed Art students by 1.1 points in m-learning with cartoon avatars compared to the other ways of learning.

Table of summary 8 hypothesis 10 results

Independent (preference)	Dependant (outperformed)	Status
M-learning with video avatar	Face-to-face leaning	Supported
Female gender	Face-to-face leaning	Supported
Science faculty	M-learning with Cartoon avatar	Supported

H11. Pedagogical Performance and Behavioural Intention

The last hypothesis from that research model states that:

> *The effectiveness of m-learning will positively influence students' behavioural intention to use m-learning.*

The moderators have been added to this hypothesis. The sub-hypotheses will be as the following:

Gender:

> *H11a. Gender will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.*

Major/subject:

> *H11b. Major of study will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.*

The results of these hypotheses are presented in Table 8 - 43.

Table 8 - 43 Effectiveness (actual test performance) on behavioural intention to use m-learning

Source (post-test for)	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.
m-learning with text	q7172	11.904	11.904	2.816	.096
	q818283	.491	.491	.065	.800
m-learning with static male avatar	q7172	.643	.643	.152	.697
	q818283	3.093	3.093	.407	.525
m-learning with cartoon avatar	q7172	.987	.987	.233	.630
	q818283	29.726	29.726	3.911	.050
m-learning with audio avatar	q7172	1.152	1.152	.273	.602
	q818283	1.200	1.200	.158	.692
m-learning with video avatar	q7172	11.201	11.201	2.650	.106
	q818283	1.488	1.488	.196	.659
face-to-face teaching	q7172	1.467	1.467	.347	.557
	q818283	4.259	4.259	.560	.455
m-learning with static female avatar	q7172	3.699	3.699	.8002	.373
	q818283	2.584	2.584	.308	.580
Gender	q7172	.114	.114	.027	.870
	q818283	20.452	20.452	2.691	.103
Major/subject	q7172	.076	.076	.018	.894
	q818283	.000	.000	.000	.995

Q7172 & q818283= intention to use factor.

Even though the results of (H10) show that the students‟ preference to perform well using m-learning with video, and the cartoon avatar was not significant in term of performance, the results did not agree with this. When the actual post-test results were tested as a direct predictor on the behavioural intention to use (H11), the result revealed that the preference of cartoon avatars has an influence on the intention to use m-learning, with ($p = 0.05$). However, for those students who preferred video avatars, their video test results did not show evidence of the influence of that way of learning on the intention to use, with ($p = 0.1$).

For the $H11_{a\&b}$, because learning through the cartoon avatar was statistically significant, the gender and faculty have been investigated further. The result showed that there is statistically a significant difference between genders towards their preference for cartoon avatars, which influenced their intention to use m-leaning ($p = 0.001$). Table 8 - 44 shows that male students intended to use m-learning with cartoon avatars by 1.6 points higher than female students. However, in the second sub-hypothesis, which is about the major/subject, the results show that no significant difference between groups.

Table 8 - 44 Gender moderator for hypothesis 11

Pairwise Comparisons						
(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Female	Male	-1.550*	.442	.001	-2.423	-.677
Male	Female	1.550*	.442	.001	.677	2.423
*. The mean difference is significant at the .05 level.						

Table 8 - 45 Mean of gender for effectiveness (actual test performance) on behavioural intention to use m-learning

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	4.446a	.311	3.830	5.061
Male	5.995a	.313	5.376	6.615

Table of summary 9 hypothesis 11 results

Independent (effectiveness)	Dependant (outperformed)	Status
M-learning with cartoon avatar	Intention to use m-learning	Supported
Male gender (for cartoon)	Intention to use m-learning	Supported
Major/subject	Intention to use m-learning	Rejected

Up to this stage, the analysis and results of the first case study ended even though the discussion and interpretations of these data will be presented in details in Chapter 9. The following table 10, provides a summary of the research hypotheses results.

Table of summary 10 for the significant research hypotheses

H_n	Hypothesis Statement	Main H. Sig. P_value		Sig. moder. Gender		Sig. moder. major	
H_1	Preference for multimedia instruction will positively influence students‟ performance expectancy.	I	0.001	0.007		N/S	
		V	<0.001	0.02			
H_2	Preference for multimedia instruction will positively influence students‟ intrinsic engagement	I	<0.001	0.001		N/S	
		V	0.01				
		C	0.001				
H_3	Intrinsic engagement will positively influence students‟ enjoyment.	<0.001		N/S		N/S	
H_4	Intrinsic engagement will positively influence students‟ performance expectancy.	<0.001		N/S		N/S	
H_5	The convenience of m-learning will positively influence students‟ performance expectancy.	<0.001		0.009		N/S	
H_6	The performance expectancy will positively influence students‟ behavioural intention to use m-learning.	<0.001		N/S		N/S	
H_7	Intrinsic engagement will positively influence students‟ behavioural intention to use m-learning.	<0.001		N/S		N/S	
H_8	Enjoyment will positively influence students‟ behavioural intention to use m-learning.	<0.001		N/S		N/S	
H_9	Intrinsic engagement will positively influence students‟ effectiveness.	I	0.04	T	0.001	C	0.03
		C	0.02	C	0.01		
		V	0.02	A	0.006		
				V	0.002		
H_{10}	Preference for multimedia instruction will positively influence students‟ effectiveness.	V	0.001	F	0.001	C	0.02
H_{11}	The effectiveness of m-learning will positively influence students‟ behavioural intention to use m-learning.	C	0.05	C	0.001	N/S	

Moder. = Moderator (gender, subject); V= video; A= audio; C= cartoon; I= image; T= text; F= face-to-face.
N/S= Not Significant

The results and analysis of the second case study will be illustrated in section 8.6.

8.6 Results of Experiment (2) – Questionnaire

8.6.1 **Demographic Results**

This section presents the analysis of the second experiment on demographic information. This includes gender, age, faculty of study/major, average period of having mobile devices, average hours spent on mobile daily usage and the type of mobile

device and some activities related to mobile devices. For this part of the research, the researcher measured statistically the participants‟ frequency and percentages.

Gender

The participants in these experiments were 38:62 according to the gender, with 39 male students and 64 female students. Figure 8 - 11 illustrates the gender data.

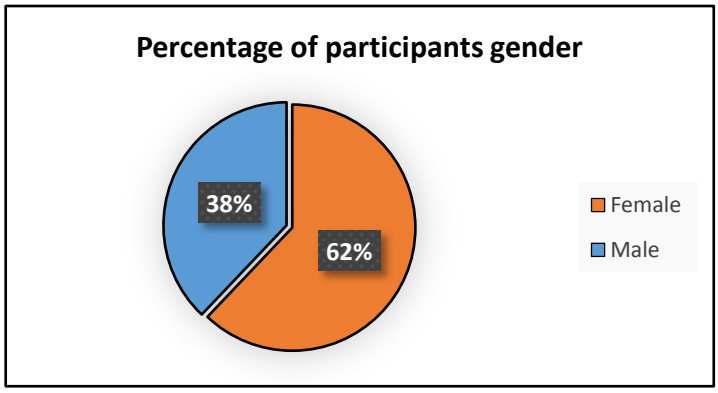


Figure 8 - 11 percentage of participants' gender

Faculty Groups

Participants responses to the choices of which faculty they were willing to continue their studies is illustrated in Figure 8 - 12. 53% of the participants currently classified in the Science departments and 47% of the participants were from the Arts department foundational year. It should be mentioned the percentages included both genders.

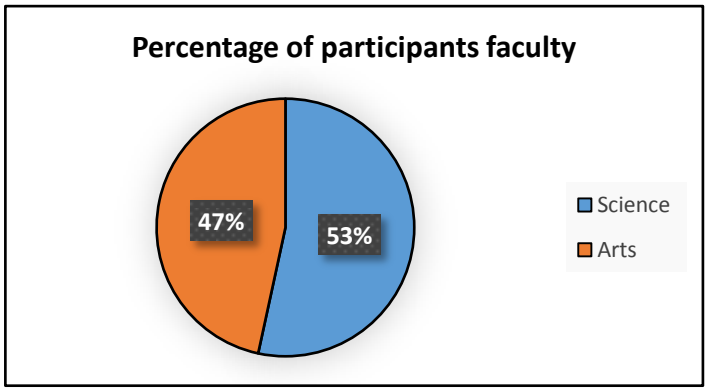


Figure 8 - 12 percentage of participants' faculty

8.6.2 Participants' Post Questionnaire

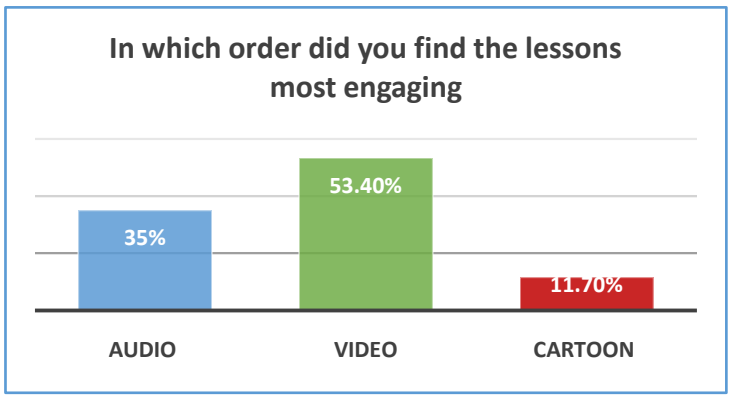
Students have been asked the following questions:

In your previous and/or current education, have you experienced m-learning:

Options	Frequency	Percentage
No	55	53.4
Maybe	21	20.4
Yes	27	26.2
Total	103	100.0

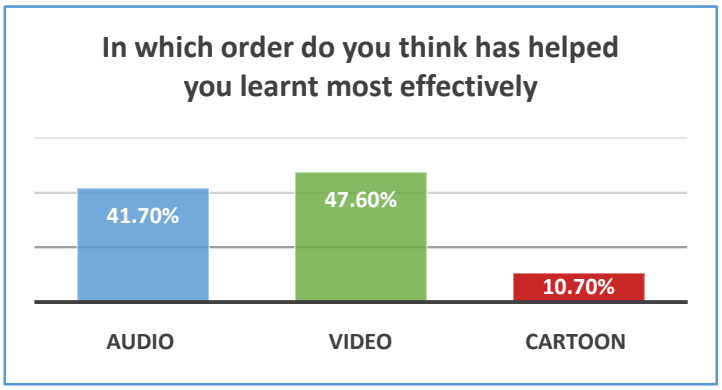
In which order did you find the lessons most engaging:

	Audio	Video	Cartoon
Female	37.5%	48.4%	14.1%
Male	30.8%	61.5%	7.7%
Total	35.0%	53.4%	11.7%



In which order do you think has helped you learnt most effectively:

	Audio	Video	Cartoon
Female	40.6%	43.8%	15.6%
Male	43.6%	53.8%	2.6%
Total	41.7%	47.6%	10.7%



Cronbach's Alpha was calculated in this experiment again by using SPSS software version 21 (see Table 8 - 46).

Table 8 - 46 The Cronbach's Alpha for the second experiment

No	Sections	Number of Questions	Cronbach's Alpha
If delivery was via mobile device as an audio mode			
1	Engagement	2	0.70
2	performance expectation	3	0.77
If delivery was via mobile device as an video mode			
3	Engagements	2	0.79
4	performance expectation	5	0.86
If delivery was via mobile device as an cartoon mode			
5	Engagement	2	0.85
6	performance expectation	3	0.89
Behavioural intention			
7	Intention to use m-learning	3	0.88

Table 8 - 46, indicates that the reliability coefficients are acceptable for conducting the research procedures.

8.6.3 Results of Research Hypotheses - Experiment (2)

H1. Preferences and Engagement

The first hypothesis states as follows:

> *Preference for multimedia instruction will positively influence students' intrinsic engagement.*

In order to determine the relationship of these two factors, the UNIANOVA test was used. This type of test shows statistically whether or not these types of learning have a significant influence on the interface engagement. The result of testing this hypothesis is illustrated in Table 8 - 46.

Table 8 - 47 Preference for multimedia on engagement

I like having an m-learning interface with:	Type III Sum of Squares	Mean Square	F	Sig.
Voice (audio) media instruction	.224	.224	.372	.543
Video media instruction	2.326	2.326	3.868	.051
Cartoon media instruction	14.900	14.900	18.994	.000

The Table 8 - 47 shows that there were statistically significant relationships between the engagement factor of learning when the mode of delivery as a cartoon and video media instructions with ($p < 0.001$; $p = 0.05$) respectively.

Gender:

In order to know whether or not gender shows differences between those two factors (preference for the multimedia type) and (engagement), the hypothesis states the:

> *Gender will positively moderate the effect of preferred multimedia instruction on the intrinsic engagement*.

The result of analysing this hypothesis is illustrated in Table 8- 48:

Table 8 - 48 Gender moderator for hypothesis 1

Mode of delivery	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
Audio	Male	Female	.045	.158	.775	-.269	.359
Video	Male	Female	-.066	.158	.676	-.379	.247
Cartoon	Male	Female	-.237	.183	.198	-.600	.126

The findings from Table 8 - 48 shows that there were no significant difference between genders in the three types (audio; video; cartoon) of delivery (p = 0.7; 0.6; 0.1).

When the current hypothesis moderated with the major, the statement of the hypothesis would be as follows:

Major/subject:

> *$H1_b$. Major of study will positively moderate the effect of preferred multimedia instruction on the intrinsic engagement.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 49:

Table 8 - 49 Major moderator for hypothesis 1

Mode of delivery	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
Audio	Science	Arts	.300	.154	.054	-.006	.606
Video	Science	Arts	.198	.156	.207	-.111	.506
Cartoon	Science	Arts	.534*	.178	.003	.181	.887

From Table 8 - 49, the findings indicate that there is only a statistically significant difference between the engagement of students when the hypothesis is moderated by the faculty if learning was by cartoon multimedia (p = 0.003). The science students were higher than Arts student by 0.5 points when the learning was undertaken through a mobile device with a cartoon avatar interface, as shown in the following table:

Table 8 - 50 Mean of major moderating hypothesis 1

Faculty	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Science	3.806[a]	.121	3.567	4.046
Arts	3.272[a]	.134	3.005	3.539
a. Covariates appearing in the model are evaluated at the following values: I liked having an m-learning interface with Cartoon media instruction = 3.019.				

H2. Preferences and Performance Expectancy

The second hypothesis states that:

> *Preference for multimedia instruction will positively influence students' performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 51:

Table 8 - 51 Preference for multimedia on performance expectancy

I like having an m-learning interface with:	Type III Sum of Squares	Mean Square	F	Sig.
Voice (audio) media instruction	1.438	1.438	2.413	.124
Video media instruction	.860	.860	1.425	.235
Cartoon media instruction	10.459	10.459	14.815	.000

The result from Table 8 – 51 indicates that there was a statistical significant relationship between students" performance expectancy and their preferred multimedia when learning was via mobile device only with the cartoon avatar ($p < 0.001$). However, for the other modes of delivery (audio and video), no there were statistically significant differences between the types of learning and the performance expectancy.

This hypothesis is moderated by two factors (gender and faculty). The test of this hypothesis was conducted to investigate the relationship and differences between participants.

Gender:

> *$H2_a$. Gender will positively moderate the effect of preferred multimedia instruction on the performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 52:

Table 8 - 52 Gender moderator for hypothesis 2

Mode of delivery	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
Audio	Male	Female	.008	.157	.961	-.305	.320
Video	Male	Female	.141	.158	.375	-.454	.173
Cartoon	Male	Female	.301	.173	.086	-.645	.043

Table 8 – 52 shows that there were no significant differences between participants‟ gender for the three types of learning (audio; video; cartoon).

Major/subject:

> *$H2_b$. Major of study will positively moderate the effect of preferred multimedia instruction on the performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 – 53:

Table 8 - 53 Major moderator for hypothesis 2

Mode of delivery	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
Audio	Science	Arts	.262	.153	.091	-.043	.566
Video	Science	Arts	.094	.156	.548	-.215	.403
Cartoon	Science	Arts	.395*	.169	.021	.060	.730

From the above table, the result indicates that there is only a statistically significant difference between the engagement of students when that hypothesis was moderated by the major if learning was by cartoon multimedia (p = 0.02). The Science students were higher than Arts student by 0.4 points when learning through m-learning with a cartoon interface, as shown in the following table:

Table 8 - 54 Mean of major moderating for hypothesis 2

Faculty	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Science	3.855a	.115	3.628	4.083
Arts	3.461a	.128	3.208	3.714
a. Covariates appearing in the model are evaluated at the following values: I liked having an m-learning interface with Cartoon media instruction = 3.019.				

H3. Engagement and Performance Expectancy

The third hypothesis states that:

> *Intrinsic engagement will positively influence students' performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 55:

Table 8 - 55 Engagement on performance expectancy

Source	Dependent Variable: Performance expectancy if learning via	Type III Sum of Squares	Mean Square	F	Sig.
Engagement	Audio	1.915	1.915	5.627	.020
	Video	10.389	10.389	28.073	.000
	Cartoon	43.488	43.488	171.908	.000

From Table 8 - 55, the results shows that there were statistically significant relationships between engagement and performance expectancy when learning via audio, video, and cartoon ($p = 0.02$; $p < 0.001$; $p < 0.001$). However, in terms of that hypothesis being moderated by gender, the hypothesis was stated and is presented as follows:

Gender:

> *$H3_a$. Gender will positively moderate the effect of intrinsic engagement on the students' performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 56:

Table 8 - 56 Gender moderator for hypothesis 3

Performance expectancy if learning via	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Male	Female	.036	.122	.766	-.205	.278
video	Male	Female	.133	.127	.297	-.119	.385
cartoon	Male	Female	.134	.105	.204	-.342	.074

The findings of the above table show that there were no significant differences between participants in terms of gender in the three ways of learning: p-value = 0.7 for audio; p-value = 0.2 for video; p-value = 0.2 for cartoon. Furthermore, if the current hypothesis is moderated by major, the statement of the hypothesis and its findings can be illustrated as follows:

Major/subject:

> *$H3_b$. Major of study will positively moderate the effect of intrinsic engagement on the students' performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 – 57:

Table 8 - 57 Major moderator for hypothesis 3

Performance expectancy if learning via	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
audio	Science	Arts	-.016	.121	.898	-.256	.225
video	Science	Arts	-.076	.126	.550	-.327	.175
cartoon	Science	Arts	-.012	.105	.910	-.219	.196

The above table shows that there were no any significant differences between participants in term of two different faculties in the three ways of learning.

H4. Interactivity and Engagement

The fourth hypothesis states that:

> *The interaction activities in m-learning will positively influence students' intrinsic engagement*.

This hypothesis has been tested using the UNIANOVA technique. The results appear in the following Table 8 - 58:

Table 8 - 58 Interactivity elements on engagement

Source	Dependent Variable: Engagement if learning via	Type III Sum of Squares	Mean Square	F	Sig.
Self-assessment and feedback interaction	audio	8.088	8.088	15.590	.000
	video	9.622	9.622	17.975	.000
	cartoon	12.902	12.902	15.947	.000

The above table shows there were statistically significant relationships between the engagement of students and their interactions, which was by the self-assessment and feedback elements while learning via the three ways of delivery: audio with $p < 0.001$, video with $p < 0.001$, and cartoon with $p < 0.001$.

When the $H_{4a.}$ was moderated by the gender, the statement of the hypothesis illustrated as follows:

Gender:

> *Gender will positively moderate the effect of interaction activities in m-learning on students' intrinsic engagement*.

The results of that investigation indicate that there were no significant differences between participants in term of gender (p-value = 0.8; 0.3; 0.1) for the three ways of delivery. The table 8 - 59, provides the evidence of that:

Table 8 - 59 Gender moderator for hypothesis 4

Performance Engagement if learning via	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Male	Female	.031	.148	.832	-.262	.325
video	Male	Female	.138	.150	.360	-.160	.436
cartoon	Male	Female	-.276	.185	.138	-.642	.091

In addition, for the second sub-hypothesis, which under the fourth hypothesis is moderated by the faculty, stated as follows:

Major/subject:

> *Major of study will positively moderate the effect of interaction activities through m-learning on the students' intrinsic engagement.*

The statistical test has been undertaken and the result appears in the following Table 8 - 60:

Table 8 - 60 Major moderator for hypothesis 4

Dependent Variable: Engagement if learning via	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Science	Arts	.030	.154	.847	-.275	.334
video	Science	Arts	-.008	.156	.960	-.317	.302
cartoon	Science	Arts	.343	.192	.076	-.037	.724

The result indicates that there were no significant differences between participants in terms of different faculties when that factor used as a moderator between interaction activities through m-learning on the students" intrinsic engagement. The p-value of the audio mode of delivery is 0.8; for video avatar is 0.9 and lastly for the cartoon avatar is 0.1.

H5. Interactivity and Performance Expectancy

The fifth hypothesis states that:

> *The interaction activities in m-learning will positively influence students' performance expectancy.*

The UNIANOVA test has been conducted on this hypothesis and the result illustrated in the following table:

The result of analysing this hypothesis is illustrated in the following Table 8 - 61:

Table 8 - 61 Interactivity elements on performance expectancy

Source	Dependent Variable: Performance expectancy if learning via	Type III Sum of Squares	Mean Square	F	Sig.
Self-assessment and feedback interaction	audio	7.116	7.116	13.336	.000
	video	3.682	3.682	6.424	.013
	cartoon	8.792	8.792	12.341	.001

The Table 8 - 61 presents the significant evidence of the three ways of delivery if they have interaction activities elements which would positively influence students‟ performance expectancy. The P-value for the mean square of learning via audio is statistically significant with ($p < 0.001$); via video is significant with ($p = 0.01$) and via cartoon is significant with ($p = 0.001$). When this hypothesis is moderated by gender, the result clearly show no statistically significant differences between participants among the three ways of delivery with $p = 0.62$ for audio; $p = 0.23$ for video and $p = 0.057$ for the cartoon, as shown in Table 8 - 62.

Gender:

> *$H5_a$.Gender will positively moderate the effect of interaction activities in m-learning on students' performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 62:

Table 8 - 62 Gender moderator for hypothesis 5

Dependent Variable: is the performance expectancy if learning via:	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Male	Female	.074	.150	.623	-.224	.371
video	Male	Female	.185	.155	.238	-.124	.493
cartoon	Male	Female	.334	.173	.057	-.678	.010

The results from Table 8 - 62 show that there were no significant differences between gender in the three types of learning. Further to that moderator, the other moderator, *faculty*, provides no significant differences between participants in term of the two different faculties as shown in the Table 8 - 63.

Major/subject:

> *Major of study will positively moderate the effect of interaction activities in m-learning on students' performance expectancy.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 63:

Table 8 - 63 Major moderator for hypothesis 5

Dependent Variable: is the performance expectancy if learning via:	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Science	Arts	-.004	.156	.980	-.313	.305
video	Science	Arts	-.039	.161	.811	-.359	.282
cartoon	Science	Arts	.263	.180	.147	-.094	.620

H6. The Engagement and Behavioural Intention

The sixth hypothesis states that:

> *Intrinsic engagement will positively influence students' behavioural intention to use m-learning.*

In order to test the above hypotheses, the UNIANOVA was used to check statistically the influence of students‟ engagement of any delivery ways and whether it might affect the behavioural intention to use m-learning or not. The results are shown as follows in Table 8 - 64:

Table 8 - 64 Engagement on behavioural intention to use m-learning

Source: Engagement if learning via	Type III Sum of Squares	Mean Square	F	Sig.
audio	.657	.657	1.799	.183
video	14.652	14.652	40.093	.000
cartoon	.834	.834	2.281	.134

From Table 8 - 64, the data clearly shows a statistically significant positive influence on the behavioural intention to use m-learning only if the learning was undertaken using a video avatar, since it was the most engaging way with $p < 0.001$. This hypothesis moderated with the gender factor and the sub-hypothesis stated and presented its result as following:

Gender:

> *$H6_a$. Gender will positively moderate the effect of intrinsic engagement on the behavioural Intention to use m-learning.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 65:

Table 8 - 65 Gender moderator for hypothesis 6

Dependent Variable: Engagement if learning via	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Male	Female	.088	.148	.556	-.382	.207
video	Male	Female	.134	.122	.277	-.109	.377
cartoon	Male	Female	.016	.160	.921	-.301	.333

The Table 8 – 65 provides the statistical evidence that there were no significant differences between participants in term of gender. The p-value for the audio is 0.55; for the video is 0.27, and for the cartoon avatar is 0.92. On the other hand, the faculty moderated the same hypothesis. The sub-hypothesis which moderated by the faculty stated and the results are presented as follows:

Major/subject:

> *$H6_b$. Major of study will positively moderate the effect of intrinsic engagement on the students' behavioural intention to use m-learning.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 66:

Table 8 - 66 Major moderator for hypothesis 6

Dependent Variable is Performance expectancy if learning via:	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Science	Arts	.063	.147	.668	-.228	.355
video	Science	Arts	.038	.123	.757	-.207	.283
cartoon	Science	Arts	.039	.161	.810	-.280	.358

Table 8 – 66 demonstrates that there were no significant differences between participants in terms of the different majors for the intention to use m-learning, even for the three different ways of delivery audio with p = 0.66; video with p = 0.75; and cartoon with p = 0.81.

H7. Performance Expectancy and Behavioural Intention

Furthermore, another factor which may influence the students" behavioural intention to use was the performance expectancy. The statement of hypothesis seven is presented as follows:

The performance expectancy will positively influence students' behavioural intention to use m-learning.

In order to test the above hypothesis, UNIANOVA was used to check which ways of learning they expected would increase their usefulness, improve their performance and statistically influences students intentions to use m-learning in future Table 8 - 67.

Table 8 - 67 performance expectancy on intention to use m-learning

Source: Performance expectancy if learning via	Type III Sum of Squares	Mean Square	F	Sig.
audio	5.486	5.486	12.675	.001
video	3.431	3.431	7.926	.006
cartoon	1.245	1.245	2.877	.093

Table 8 – 67 shows that, from a statistical point of view, the result of that hypothesis. Students show their intention to use m-learning specifically when the interface includes audio and video, because they perceived their performance if taught by these ways would be higher with P-value = 0.001 for audio; and with P-value = 0.006 for video. Students show their unwillingness statistically to use m-learning if delivered via a cartoon avatar with p-value = 0.09; hence, they did not expect to perform better while learning by that way.

The sub-hypothesis of the current hypothesis statement and testing analysis presented as follows:

Gender:

Gender will positively moderate the effect of performance expectancy on the behavioural Intention to use m-learning.

The result of analysing this hypothesis is illustrated in the following Table 8 – 68:

Table 8 - 68 Gender moderator for hypothesis 7

Dependent Variable is Performance expectancy if learning via	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Male	Female	.118	.141	.407	-.163	.398
video	Male	Female	.139	.144	.335	-.146	.424
cartoon	Male	Female	.061	.158	.698	-.252	.375

From Table8 - 68, the analysis indicates no significant differences between participants in term of gender. In order to know the differences between participants in term of majors, the same test was conducted for the sub-hypothesis, with the following results:

Major/subject:

> *$H7_b$. Major of study will positively moderate the effect of performance expectancy on the students' behavioural Intention to use m-learning*.

The result of analysing this hypothesis is illustrated in the following table:

Table 8 - 69 Major moderator for hypothesis 7

Dependent Variable is Performance expectancy if learning via	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
audio	Science	Arts	.084	.140	.548	-.193	.361
video	Science	Arts	.152	.143	.293	-.133	.437
cartoon	Science	Arts	.080	.156	.610	-.230	.390

Table 8 – 69 shows the result clearly that there were no significant differences between participants in term of the two different majors.

H8. Preferences and Pedagogical Performance

In addition, based on the research model, other two factors illustrated to be tested to find whether or not is there a relationship between the preference for multimedia and the effectiveness (actual test performance).The statement of hypothesis eight is presented as follows:

> *Preference for multimedia instruction will positively influence students' effectiveness*.

In order to test the above hypothesis, the UNIANOVA test was used to check which preferred way of multimedia instruction would positively increase students‟ effectiveness and improve their test outcomes/performance. The following Table 8 - 70 illustrates the result.

Table 8 - 70 Preference for multimedia on effectiveness (actual test performance)

Source Preferring m-learning with	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.
audio avatar	Post Audio	.159	.159	.055	.815
video avatar	Post-Video	.730	.730	.282	.597
cartoon avatar	Post-Cartoon	5.151	5.151	2.054	.155

The result of Table 8 – 70 indicates there was no statistically significant evidence to support that hypothesis with p-value = 0.81 for the audio; p-value = 0.59 for the video; and p-value = 0.15 for the cartoon avatar.

The current hypothesis was then moderated with the gender factor:

Gender:

> *$H8_a$. Gender will positively moderate the effect of preferred multimedia instruction on the effectiveness.*

The results were as follows:

Table 8 - 71 Gender moderator for hypothesis 8

Dependent Variable	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Male	Female	-.828*	.372	.029	-1.567	-.088
Post-Video	Male	Female	-.883*	.352	.014	-1.582	-.184
Post-Cartoon	Male	Female	-1.056*	.346	.003	-1.744	-.369
*. The mean difference is significant at the .05 level.							

In terms of using gender as a moderator for the current hypothesis, the students‟ preference for the three ways showed statistical differences between participants based on their post-tests results. The result of analysing the variable of audio avatar preference on its actual test outcome was statistically significant, with p-value = 0.02. In addition, the analysis of the second variable, *learning via video avatar preference*, on its actual test outcome is showing significant with p-value = 0.01. Finally, the analysis of the third variable, *learning via cartoon avatar preference* on the actual test outcome is statistically significant, with p-value = 0.003.

Female students scored higher than male students with 0.8 points for the audio test, with 0.9 points for the video test, and for 1 point for the cartoon test:

Table 8 - 72 Mean of gender moderating hypothesis 8

Dependent Variable	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Post-Audio	Female	2.050a	.222	1.609	2.492
	Male	1.223a	.298	.630	1.816
Post-Video	Female	2.290a	.210	1.872	2.708
	Male	1.407a	.282	.846	1.968
Post-Cartoon	Female	3.606a	.207	3.196	4.017
	Male	2.550a	.278	1.998	3.102

In order to know the differences between participants in term of majors, the same test was conducted for the sub-hypothesis:

Major/subject:

> *$H8_b$. Major of study will positively moderate the effect of preferred multimedia instruction on the effectiveness.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 73:

Table 8 - 73 Major moderator for hypothesis 8

Dependent Variable	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Science	Arts	.452	.361	.213	-.265	1.169
Post-Video	Science	Arts	.442	.341	.198	-.236	1.121
Post-Cartoon	Science	Arts	.745*	.336	.029	.078	1.412
*. The mean difference is significant at the .05 level.							

The Table 8 - 73 indicates there were significant differences between the two majors‟ participants in their final test result of the cartoon avatar, with p-value = 0.02. The Science students are higher with 0.7 points than Arts students in their final test of the cartoon avatar lesson:

Table 8 - 74 Mean of major moderating hypothesis 8

Dependent Variable	Faculty	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Post-Audio	Science	1.863	.246	1.373	2.352
	Arts	1.410	.271	.871	1.949
Post-Video	Science	2.070	.233	1.606	2.533
	Arts	1.627	.257	1.117	2.137
Post-Cartoon	Science	3.450	.229	2.995	3.906
	Arts	2.706	.252	2.204	3.207

H9. The Engagement and Pedagogical Performance

Furthermore, another factor which may influence the students‟ effectiveness (actual test performance) was the intrinsic engagement. The statement of hypothesis nine is presented as follows:

> *Intrinsic engagement will positively influence students' effectiveness.*

In order to test the above hypothesis, the UNIANOVA test was used to check which way engagement positively influenced students‟ effectiveness and improved their test outcomes/performance and the results presented in Table 8 - 75:

Table 8 - 75 Engagement on effectiveness (actual test performance)

Source: Engagement if learning via	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.
audio	Post-Audio	3.730	3.730	1.325	.253
video	Post-Video	3.276	3.276	1.252	.266
cartoon	Post-Cartoon	.761	.761	.298	.587

It appears from the above table that there was no statistically significant evidence supporting that hypothesis with p-value = 0.25 for the audio; p-value = 0.26 for the video; and p-value = 0.58 for the cartoon avatar. In order to add the gender factor as a moderator for the current hypothesis, the statement and its analysis is presented as follows.

Gender:

> *$H9_a$. Gender will positively moderate the effect of intrinsic engagement on the students' effectiveness.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 76:

Table 8 - 76 Gender moderator for hypothesis 9

Dependent Variable	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Male	Female	-.916*	.374	.016	-1.659	-.173
Post-Video	Male	Female	-.955*	.360	.010	-1.671	-.239
Post-Cartoon	Male	Female	-1.032*	.356	.005	-1.739	-.325
*. The mean difference is significant at the .05 level.							

As illustrated in Table 8 - 76, there were statistically significant differences between participants in term of gender in the three ways of delivery. The p-value of the audio post-test is 0.01; for the video post-test is 0.01; and for the cartoon post-test is 0.005. The mean of the female students is higher with 0.9 points in the audio score test; with

1.0 point in the video score test; and 1.0 point as well in the cartoon score test than male students:

Table 8 - 77 Mean of gender moderating hypothesis 9

Dependent Variable	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Post-Audio	Female	2.081a	.220	1.644	2.519
	Male	1.165a	.298	.572	1.758
Post-Video	Female	2.314a	.212	1.892	2.735
	Male	1.358a	.288	.787	1.930
Post-Cartoon	Female	3.603a	.210	3.186	4.019
	Male	2.571a	.284	2.006	3.135

The second sub-hypothesis of the current hypothesis was to use *major/faculty* used as a moderator:

Major/subject:

> *$H9_b$. Major of study will positively moderate the effect of intrinsic engagement on the students' effectiveness.*

The result of analysing this hypothesis is illustrated in the following Table 8 – 78:

Table 8 - 78 Major moderator for hypothesis 8

Dependent Variable	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.a	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Science	Arts	.444	.367	.230	-.287	1.174
Post-Video	Science	Arts	.433	.354	.225	-.271	1.137
Post-Cartoon	Science	Arts	.667	.350	.060	-.029	1.362

The above analysis indicates no statistically significant differences between participants in term of different majors/faculties among the three different ways of the delivery. The p-value of the students in the audio score test is 0.28; for the video score test is 0.22; and for the cartoon score test is 0.06.

Table 8 - 79 Mean of major moderating hypothesis 9

Dependent Variable	Faculty	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Post-Audio	Science	1.845a	.245	1.359	2.331
	Arts	1.401a	.274	.855	1.947
Post-Video	Science	2.053a	.236	1.584	2.521
	Arts	1.620a	.265	1.094	2.146
Post-Cartoon	Science	3.420a	.233	2.957	3.883
	Arts	2.753a	.261	2.234	3.273

H10. Interactivity and Pedagogical Performance

Again, another factor which may influence the students‟ effectiveness (actual test performance) was the interactivity element. The statement of hypothesis nine is presented as follows:

> *The interaction activities in m-learning will positively influence students' effectiveness.*

The tenth hypothesis was proposed to determine that the intervention of the interaction activities would positively influence and increase students‟ effectiveness/outcome performance. The UNIANOVA test was conducted and the results presented as follows in Table 8 – 80:

Table 8 - 80 Interactivity elements on effectiveness (actual test performance)

Source	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.
The interaction activities (self-assessment and feedback elements)	Post-Audio	17.237	17.237	6.598	.012
	Post-Video	12.936	12.936	5.351	.023
	Post-Cartoon	9.115	9.115	3.683	.058

As illustrated in Table 8 – 80, there were statistically significant relationships and influence of the interactive activities (quick exercise, feedback and self-assessment) on the students‟ pedagogical performance and effectiveness if the learning was undertaken via m-learning with audio avatar with p = 0.01; and via m-learning with video avatar with p = 0.02. However, the result indicates no significant influence of that interactivity elements on students‟ performance when they learnt via cartoon avatars, with p = 0.058. The gender variable moderated the current hypothesis which stated:

Gender:

> *$H10_a$. Gender will positively moderate the effect of interaction activities in m-learning on students' effectiveness.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 81:

Table 8 - 81 Gender moderator for hypothesis 10

Dependent Variable	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Male	Female	-.769*	.353	.032	-1.471	-.066
Post-Video	Male	Female	-.785*	.340	.023	-1.461	-.110
Post-Cartoon	Male	Female	-.947*	.344	.007	-1.631	-.263
*. The mean difference is significant at the .05 level.							

There were statistically significant differences between participants among the three delivery ways in term of the two different genders. The p-value of the audio post-test score is 0.03; for the video post-test score is 0.02; and for the cartoon post-test score is 0.007.

The female students were higher than male students, with 0.8 points in the audio and video post-test score; and with 0.9 point in the cartoon test score as shown in Table 8 - *82*:

Table 8 - 82 Mean of gender moderating hypothesis 10

Dependent Variable	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Post-Audio	Female	2.034a	.211	1.615	2.453
	Male	1.265a	.284	.700	1.830
Post-Video	Female	2.256a	.203	1.853	2.659
	Male	1.471a	.273	.927	2.015
Post-Cartoon	Female	3.583a	.205	3.175	3.991
	Male	2.636a	.277	2.086	3.186

The second sub-hypothesis of the current hypothesis is when the major/faculty factor used as a moderator. The hypothesis would be stated and presented its analysis as following.

Major/subject:

$H10_b$. Major of study will positively moderate the effect of intrinsic engagement on the students' effectiveness.

The result of analysing this hypothesis is illustrated in the following Table 8 - 83:

Table 8 - 83 Major moderator for hypothesis 10

Dependent Variable	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Science	Arts	.093	.361	.797	-.625	.812
Post-Video	Science	Arts	.047	.348	.893	-.644	.738
Post-Cartoon	Science	Arts	.475	.352	.180	-.224	1.174

As the above table indicates no any statistically significant differences between participants in relation to the major/faculty moderator.

H11. The Pedagogical Performance and Behavioural Intention

The last hypothesis in the proposed model aimed to find out statistically any one of the delivery ways based on its test score has the influence on students‟ intention to use that way on the m-learning. The hypothesis statement and analysis is presented thus:

> *The effectiveness of m-learning will positively influence students' behavioural intention to use m-learning.*

The result of analysing this hypothesis is illustrated in the following Table 8 - 84:

Table 8 - 84 The effectiveness (actual test performance) on intention to use m-learning

Source	Type III Sum of Squares	Mean Square	F	Sig.
Post-Audio	2.792	2.792	3.920	.051
Post-Video	2.999	2.999	4.230	.043
Post-Cartoon	1.021	1.021	1.361	.247

From Table 8 - 84, the result clearly indicates there is a statistically significant influence between the video test score and the intention to use that way via mobile devices in future.

With regard to the sub-hypotheses of the current hypothesis, which moderated the *gender* and *faculty/major*, the following statements and results are presented:

Gender:

> *$H11_a$. Gender will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning.*

Major/subject:

> *$H11_b$. Major of study will positively moderate the effect of effectiveness on the students' behavioural intention to use m-learning*.

The result of analysing this hypotheses is illustrated in the following Table 8 – 85:

Table 8 - 85 Gender moderator for hypothesis 11

Dependent Variable	(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Male	Female	.079	.192	.681	-.302	.460
Post-Video	Male	Female	-.035	.170	.838	-.372	.303
Post-Cartoon	Male	Female	-.096	.198	.629	-.491	.298
*. The mean difference is significant at the .05 level.							

Table 8 - 86 Major moderator for hypothesis 11

Dependent Variable	(I) Faculty	(J) Faculty	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Post-Audio	Science	Arts	.147	.183	.425	-.217	.511
Post-Video	Science	Arts	-.178	.177	.318	-.530	.174
Post-Cartoon	Science	Arts	.187	.186	.319	-.183	.557

From Table 8 - 85 and Table 8 - 86, it can be seen that the moderators of *gender* and *major* showed no significant differences between participants among the three delivery ways (audio, video, and cartoon) avatars lessons.

The following table 11, provides a summary of the research hypotheses results for the second case study.

Table of summary 11 for the second case study hypotheses results

H_n	Hypothesis Statement	Main H. Sig. P_value		Sig. moder. Gender		Sig. moder. major	
H_1	Preference for multimedia instruction will positively influence students‟ intrinsic engagement.	V	0.05	N/S		C	0.003
		C	<0.001				
H_2	Preference for multimedia instruction will positively influence students‟ performance expectancy.	C	<0.001	N/S		C	0.02
H_3	Intrinsic engagement will positively influence students‟ performance expectancy.	A	0.02	N/S		N/S	
		V	<0.001				
		C	<0.001				
H_4	The interaction activities in m-learning will positively influence students‟ intrinsic engagement.	A	<0.001	N/S		N/S	
		V	<0.001				
		C	<0.001				
H_5	The interaction activities in m-learning will positively influence students‟ performance expectancy.	A	<0.001	N/S		N/S	
		V	0.01				
		C	0.001				
H_6	Intrinsic engagement will positively influence students‟ behavioural Intention to use m-learning.	V	<0.001	N/S		N/S	
H_7	The performance expectancy will positively influence students‟ behavioural intention to use m-learning.	A	0.001	N/S		N/S	
		V	0.006				
H_8	Preference for multimedia instruction will positively influence students‟ effectiveness.	N/S		A	0.02	C	0.02
				V	0.01		
				C	0.003		
H_9	Intrinsic engagement will positively influence students‟ effectiveness.	N/S		A	0.01	N/S	
				V	0.01		
				C	0.005		
H_{10}	The interaction activities in m-learning will positively influence students‟ effectiveness.	A	0.01	A	0.03	N/S	
				V	0.02		
		V	0.02	C	0.007		
H_{11}	The effectiveness of m-learning will positively influence students‟ behavioural intention to use m-learning.	V	0.04	N/S		N/S	

Moder. = Moderator (gender, subject); V= video; A= audio; C= cartoon; I= image; T= text; F= face-to-face; N/S=Not Significant.

Up to this stage, the quantitative analysis and results of the second case study ended even though the discussion and interpretations of these data will be presented in details in chapter 9.

The results of qualitative data will be described in details in the coming section.

8.7 Qualitative Results

8.7.1 Responses from an Open-Ended Question of Experiment - 1

To learn more about the factors that influence the MADE-ME web application effectiveness and to enrich the quantitative data, the questionnaire concluded with open-ended questions to collect respondents‟ opinions. The first two questions asked the students about what they saw as the potential benefits to them from m-learning, and what the challenges and barriers they thought they face. In fact, 90 questionnaires out of the completed 156 were returned with comments on the benefits and advantages and 83 questionnaires were returned with comments regarding the challenges of m-learning. The participants‟ comments were various, so they were coded and analysed by the following themes:

Table 8 - 87 Benefits and barriers of implementing m-learning

Themes	**Number of students responded**	
Advantages and benefits of adopting m-learning	**(n=90)**	**%**
Pause and repeatable features of the lesson	47	52
Easy and fast to search and get the information	20	22
Freedom to decide when and where each lesson will be learned (convenience)	33	37
Fast to get, digest and understand the content	18	20
Engage and motivate leaner to learn	6	7
Provide concentrations and focus on the content	5	6
Challenges and barriers of adopting m-learning	**(n=83)**	**%**
Low internet connection	15	18
Lack of communications with other peers and instructors to ask about things not understood	12	13
Screen size may not display proper content	8	10
Escape from learning to other entertainments or social media	13	15
Lack of attention, interaction and motivation of the content	20	24
Limited batteries capacity	4	5
High internet subscription fees	3	4

Benefits and Advantages

From Table 8 - 87, some students identified particular benefits and advantages of using m-learning. More than half of the respondents commented that the features of „pause‟ and „repeat the lesson‟ was one of the significant advantages of using mobile device for learning. 33 of the respondents felt there was a freedom to learn when it suited them. Others agreed that the use of m-learning is “Easy and fast to search and get the

information". About 18 students clearly stated: "The use of mobile device is fast to get, digest and understand the content". Lastly, some of students mentioned that learning through the mobile device may engage and enhance their motivation to learn and that this approach to learning would increase their concentration and ability to focus on the learning materials.

Challenges and Barriers

On the other hand, the respondents on the other question, regarding the challenges of using m-learning, provided invaluable insights for this research. About 20 of the respondents expressed that lack of attention, interaction and motivation with/for the learning materials was the highest barrier of using mobile phones in learning. Another fifteen students noted the low level of internet connections was an obstacle for them. Moreover, the lack of communications with other peers and instructors to enable clarification was commented by 12 students. Nevertheless, some respondents (13 students) highlighted the problem of being distracted from learning by other entertainments or by social media is a common issue. 12 respondents mentioned the issues regarding the poor display on the mobile screen, the limited battery capacity and lastly, high internet subscriptions limited the use of mobiles in learning.

Liking and Disliking

The participants were asked a series of open-ended questions to reflect their perceptions and analyse their views toward their usage of m-learning with avatars. The questions included asking them what did they like most about m-learning using avatars; what did they dislike; what did they feel that was engaging about m-learning using avatars; how could the avatars they have used be improved; and whether they had other comments they wished to make about their experiences of receiving course content using an avatar.

The open-ended comments in relation to what students liked about m-learning with avatars were varied. Some participants identified particular points such as "The use of m-learning with avatar provided me the concentrations and it's attracted my attention into the presented lesson". Many learners showed their attraction about the learning by writing it was: "Attractive". Others agreed that "It makes the learning easier and quicker to understand the content". One student clearly stated "The use of animated avatar is a new engaging way of learning and it's interesting to watch. I hoped that, it could apply

on the rest of my course materials". Thus, many of the participants advocated the method of using avatar through video and they described it as the best way to increase their motivation to learn.

On the other hand, some students stated that they disliked using the text interface only for learning. Another also wrote, "It‟s not engaging to learn from the text interface". The majority of the students commented on this type of question with the statement: "Nothing we can mention". A few of students complained about the long timeline of the lessons.

Feeling of Motivation

The above comments related to the learners‟ likes and dislikes toward using m-learning with avatars, but they also described their feeling about how their engaging about m-learning. Many of the participants praised their feeling of engaging with m-learning with avatars, with enormous number of positive characteristics, such as that approach provided "Understanding and comfort", or "Motivated and attracted"; "I got benefits from this app which I did not expected"; "I felt happiness"; "It‟s excellent and attracted the attention"; "I enjoyed a lot"; "It helped to enhance the learning empower the understanding"; "It is very nice and interesting"; "The method of learning through the current app helped me a lot to understand English grammar". Other statements as "The features of pausing and repeating the lesson at anytime and anywhere made the m-learning is engaging, comfortable, interesting, convenience, and effective" showed the effect of m-learning to engage students to be independent learners.

8.7.2 Responses from an Open-Ended Question of Experiment - 2

The second experiment questionnaires design was based on the earlier experiments‟ results to investigate further perceptions and to understand in more detail participants‟ views toward the use of m-learning with avatars through open-ended questions. Participants were asked direct questions such as: "The earlier findings showed more male students than female students preferred m-learning to traditional face-to-face lecturing. Why do you think this might be the case?". "Both male and female students particularly liked learning with a video interface. Why do you think this might be the case?". "Audio was the least preferred but was found to enable the students to perform best. Why do you think this might be the case?". "Female students preferred female

rather than male audio. Why do you think this might be the case?" and "Do you think it would be the same for a video presentation (for female students only)". "Science students liked using m-learning more than Arts students, however, Arts students intended to continue using m-learning after the experiment more than Science students. Why do you think this might be the case?". Lastly, "Is there anything else would like to add about m-learning interfaces or m-learning in comparison to face-to-face teaching in general".

- **Open-ended Comments in Relation to the Above Questions**

The earlier case study results showed:

Male versus Female:

> *More male students than female students preferred m-learning to traditional face-to-face lecturing. Why do you think this might be the case?*

With regard to the first question which asked about reasons behind these findings which showed male students preferred m-learning to traditional face-to-face learning compared to female students, participants commented different views. The most commonly stated comment by the female students was: "Because we are liking to learn in real learning environment or similar to that via online learning, which we can see it's difficult for us to have, due to the culture aspects where the female instructor could not uncover her face while presenting the lesson in an open access source". Other female students supported that case by claiming that "Female students prefer to learn via the learning method that provides full connection to the lecturer in order to collaborate and ask questions with any difficulties during the lesson". One anticipated comment by female participant was that "Not all female students are preferring face-to-face lectures over m-learning, hence I'm one of those who prefers m-learning a lot". Other learners expressed some issues that they thought are the reasons behind that case; for instance: "Maybe some female students could not afford to own electronic devices (smartphones) or if they have them, maybe they find them difficult to connect to the internet".

Student preferences video:

> *Both male and female students particularly liked learning with a video interface. Why do you think this might be the case?*

Furthermore, this question had been asked in order to investigate the reasons behind why almost all of the participants liked to learn through the video avatar compared to the other modes of delivery. The main comments were written as a response to questions, such as this response: "The Preference for the video avatar was that it includes mixture of multimedia like (real human character, sound, text and animated instructor) which makes the lesson attracting and interesting... and that in turn lasts in the mind for a while". This previous comments can combine two objectives of the current research together for the video avatar type of delivery which are the engagement and effectiveness. Another student justified their preference by saying that: "The video avatar is the closest type of learning to the traditional face-to-face lesson and so is similar to the real environment . . . the body language of the teacher is important for English language learning". The main objective of the animated avatar is to grab learners" attention, a point supported by participant comments such as "The video avatar is grabs our attention and helps us to focus which make it easy to retention . . . also, the nicest and most effective thing in that teaching method is the use of exercises and activities with the immediate feedback, which is the reason we feel comfortable during learning because we can learn and check our knowledge, but not in front of people". Hence, the majority of students enjoyed the video avatar and activities used in that mode of delivery through the MADE-ME web-app. The reality of interaction with the content affects the quality of m-learning.

Performance better by audio but not preferred

> *Audio was the least preferred but was found to enable the students to perform best. Why do you think this might be the case?*

The responses on this question were very few and the vast majority of comments can be summarised by this response: maybe because the concentrations were on the learning materials only with the sound and not distracted by other things.

Female student preferred female avatar

> *Female students preferred female rather than male audio. Why do you think this might be the case?*

Regarding this question, some students agreed that females find it easier to learn from the same gender instructor due to the culture norms and traditions in Saudi Arabia. Many participants wrote that, because female teachers are close to female students, they

can understand our needs and the best way to engage and teach us. However, other female students‟ comments can be summarised by this student: “We do not mind and we have no preference of gender”.

Science versus Arts

> *Science students liked using m-learning more than Arts students, however, Arts students intended to continue using m-learning after the experiment more than Science students. Why do you think this might be the case?*

Regarding the findings that showed Science students preferred using m-learning more than Arts students, more Arts students intended to continue using m-learning after the experiment than Science students. One participant commented:

> *“Maybe that kind of learning through that application helps to memorise information that been presented which can meet the Arts students styles for their future learning, however, this application may not be suitable for Science students for their future modules which based on brainstorming and learning by practice in labs”.*

Additional comments

> *Is there anything else you would like to add about m-learning interfaces or m-learning in comparison to face-to-face teaching in general?*

In this final open-ended question, participants expressed their views of their overall perceptions on the study. Students showed their acceptance and happiness toward their usage of m-learning with avatar. The following examples illustrate the students‟ responses: “This type of learning is interesting”; “This study is excellent and we hope to use the proposed application identically in our future studies”; “The study is fruitful and interesting... I really understand the whole content”; “The learning through m-learning is motivated and enhanced the learning”; “We got a lot of benefits from this study and hoped to continue use for our learning”, and lastly, some students wished to use this mobile application for other courses to be distance or blended learning.

8.8 Chapter Summary

This chapter provided the results that were extracted (quantitatively and qualitatively) from the experiments (1 & 2) that were conducted with the learners‟ participants from Al-Baha University in Saudi Arabia. The chapter outlined students‟ opinions and perceptions toward the most preferred way of learning and the most effective in terms of pedagogical performance. It covered the analysis techniques used to analyse the data.

The results revealed that the students (both male and female) who owned smartphones devices, used them for many activities in both social and educational aspects, and they were highly motivated to use them further if study opportunities arise. It also investigated the research hypotheses based on the proposed model and revealed the relationships between the factors. Key findings of logistic regression and UNIANOVA analyses revealed that there was a strong support for the use of m-learning as part of a blended learning process. It also revealed that whilst students has have a preferred avatar type through which to receive static content, they did not always correspond with their most effective learning outcomes until interactive interface elements were added to the interface mode of delivery. The results indicated that, m-learning within animated avatar (video) was regarded as a better method of learning in terms of preference and effectiveness, and it‟s only the mode which had significant influence on students intention to use in future with $p = 0.04$.

Interestingly findings, in terms of the moderators, the preference of science students to learn via the cartoon avatar had statistically significant influence on performance expectancy and on actual pedagogical performance (effectiveness) with $p = 0.02$, and on intrinsic engagement with $p = 0.003$. On the other hand, in terms of the gender as a moderator, female students were higher than male students according to engagement, pedagogical performance, and intention to use m-learning.

Lastly, the chapter concluded by presenting the qualitative data and views that been grouped from the open-ended questions which presented the benefits and challenges of implementing m-learning in higher education in Saudi Arabia.

In summary, this research focuses specifically on the mode of learning content delivery and engagements via the interfaces, therefore, findings and results for using MADE-ME

web applications in education were showing positive attitude towards adopting that approach.

A more detailed interpretation and discussion of these results will be given in the next Chapter 9.

9 Discussion of the Results

9.1 Introduction

This chapter aims to interpret the results of the first and second experiments described in Chapter 8. It provides a discussion of the quantitative findings and supports them with the qualitative perceptions of the participants. The overall objective of this chapter is to answer the research questions and determine whether or not providing different teaching delivery modalities via mobile devices can influence learning outcomes and optimise the learning process for students on the English language module at Al-Baha University in Saudi Arabia. Regarding the main research question of this study, it is important for the study to determine whether there is "*a connection between student engagement and/preference for particular avatar types and their pedagogic performance*", and whether an m-learning app with an avatar interface can be developed for use in higher education in Saudi Arabia with specific application to the teaching of English language?

The chapter discusses the findings from experiments 1 and 2 with a particular focus on the hypotheses developed as part of the MADE-ME whether or not the use of interactive and engaged avatar elements through the m-learning interface affects the students‟ intention to use that type of learning.

9.2 Discussion of the Research Hypotheses:

9.2.1 **Discussion of Results Related to Experiment 1 (H1) & Experiment 2 (H2)**

The first hypothesis in Experiment 1 and the second hypothesis in Experiment 2 stated that, "*The preference for one of the learning modalities will positively influence the performance expectancy/usefulness of students*". This hypothesis tested whether or not the adoption of avatars in mobile technology was helpful for learning the content compared to the same content presented in a traditional face-to-face format. The results were in favour of m-learning. The findings provide evidence that there is a statistically significant relationship between the performance expectancy/usefulness and preference of students to learn with a mobile interface, which included a „talking head‟ male avatar as a video. Adham et al. (2016) confirmed the need for an avatar tool which can be

effective and supportive to Saudi learners during their online learning. These results further support the idea of preferences for learning through online technologies rather than via traditional learning formats. Artino (2010, p275) found that:

> *"Students who preferred to take future courses in an online format (as opposed to face-to-face) also reported greater confidence in their ability to learn online (self-efficacy) and greater satisfaction with their recent online learning experience".*

This finding is consistent with that of Chen & Wu (2015) who investigated the effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance and found that "the voice-over presentation type generates the highest sustained attention and enhanced students‟ learning performance". "Mazlan (Doctoral thesis, 2012), reported that participants expressed their readiness and desire to use avatars in their future learning materials".

Interestingly, there were also differences in responses related to the preferred mode of delivery and its potential impact on performance expectations, particularly when the materials of learning are for an English lesson. The findings indicate that there was a statistically significant relationship between the outcome and students‟ modality preference for learning through mobiles with static male avatars, and mobiles with animated video avatar interfaces. This is in line with the statement made by Peterson (2006, p79), who stated the use of "avatars enhanced the subjects‟ sense of telepresence and that the learners made use of their communicative features during the interaction".

In addition, when the current hypothesis was investigated in the second experiment, the result showed that there was a statistically significant relationship between students‟ performance expectancy and the preferred multimedia, if learning was through mobile devices with the cartoon avatars. The lack of a standardised outcome measure makes it difficult to interpret these results with confidence. The common denominator between the results of the first and second study is the presence of the avatar in the three approaches of learning (video, static male, cartoon) on the mobile interface, which may have enhanced the learners‟ motivations.

When this hypothesis was moderated by gender, the results showed that there were statistically significant differences between the two gender groups in favour of male students. Male students expected to perform better when they used mobile learning with static male avatars and animated video avatars by 0.3 points higher than females. However, in the second study, the findings indicate no statistically significant differences between genders in the three types of learning. This result may be explained by the fact that female students are starting to accept the approach of mobile learning combined with avatars when the interactive elements are integrated into the lessons.

A possible explanation for this might be that the positive responses toward having human avatar characteristics on mobile interfaces while learning online from the male point of view is based on the feeling of the instructor being „present". One of the participants claimed that "the person interacts with the animated avatar because of the feeling of being in a real class environment". A number of participants commented that, because of the cultural aspect and social norm, the female instructor could not present her face on the online learning interface, which of course is beneficial if English language learners can focus on body language, and that it was therefore easier for the male instructor.

When the current hypothesis was moderated in Experiment - 1 with the major/subject of study, the results show that there were no significant differences between the two groups. These results are different from the second study results, where the findings show that Science students gained higher rates than Arts students when the learning through mobile devices with cartoon avatar interfaces. These results support the findings of Hong et al., (2003) who found statistical differences between students in term of major/subject which was in favour of science students compared to those in the humanities. The reason for this may because the cartoon characters increased the imaginary world of Science students and consequently their performance expectations.

Key Findings:

The preference for a cartoon mode of delivery was the only one to have a significant relationship with the student perceptions with regard to their increasing performance with $p = 0.02$. Science student showed significantly higher rates than the Arts students in terms of that mode.

9.2.2 **Discussion of Results Related to Experiment 1 (H2) & Experiment 2 (H1)**

The second hypothesis in Experiment 1 and the first hypothesis in Experiment 2 stated that "*preference for multimedia instruction will positively influence students' intrinsic engagement*". Testing of this hypothesis indicates that there is a statistically significant relationship between engagement and students" preference to learn via m-learning with static male avatars, m-learning with video avatars, and m-learning with cartoon avatars. Interestingly, the correlation between the two factors of this hypothesis is related to the presence of the three avatars on the mobile interface. This supports the findings of Mazlan (2012), where the use of an avatar in comparison with a text avatar and non-avatar in the online learning environment was the factor that engaged students to learn. It is anticipated that this approach of adopting avatars on the m-learning interface will engage learners to be motivated and more active in the learning process. This finding is also consistent with findings by González et al. (2013) who stated the role of the avatar in learning as

> *"The digital representation of the individuals within the virtual world. It has an ability to perform actions and to simulate human-to-human interactions to increase engagement and hence learning" as reported in (Adham* et al. *2016, p87).*

The result of this hypothesis can be supported by the findings of the second experiment which showed that there was a statistically significant relationship between the engagement factor of learning if the mode of delivery was a video with cartoon media instructions. These results were similar to the findings of the first experiment, in that when the lesson was delivered as a video with cartoon avatar interfaces via the mobile device, both approaches significantly increased students" engagement. Again, interestingly, the correlation between the two factors of this hypothesis is related to the presence of avatars on the mobile interface giving the sense of a human presence.

When this hypothesis was moderated by gender, the result indicates that there were statistically significant differences between genders. Male students engaged more than female students when the content was delivered via mobiles with an avatar representation of the teacher. This result reflects Wang & Yeh, (2013, p408), who

reported that "students preferentially chose a pedagogical agent of the same gender". Some participants expressed the belief that male students are always seeking to find the easiest way to learn the information but female students like to learn through the traditional face-to-face teaching in order to discuss and clarify any ambiguous points. One such female student presented her motivations and continued her comments by adding:

> *"Now, I think after this current study …, many of the female participants desire this approach of m-learning for their future studies and they will change their minds to use m-learning besides traditional learning".*

As a consequence, when the gender is moderated in the current hypothesis in the second experiment, the results showed no significant differences between genders in the three types of learning, which contradicts the first experiment's findings.

Furthermore, when this hypothesis was moderated by the major/subject in the first experiment, the results revealed no significant differences between the Arts and Science groups. The researcher attributed this result to the enthusiasm of both major/subject groups to find out a new way of learning which could help them to improve their learning in this core module. However, there were importance differences between the two groups in terms of different majors/subject in the second experiment. Science students were higher than Arts students in terms of motivation and engagement when learning through m-learning with cartoon avatar interfaces. The reason for this may be because the cartoon characters increased the imaginary world of Science students and consequently their motivation. These results support the findings of Turan (2014), who recommended that the need for visual and audio cartoon characters for education is necessary for increasing student achievement in math lessons. In addition, in terms of the effectiveness of engagement elements on science students, Alabdulaziz & Higgins, also found that the motivation of students for learning mathematics increased with the use of technology (Alabdulaziz & Higgins, 2017).

There were extra modalities of learning which were tested separately because they were particularly for female students only. That last mode of delivery was hence through m-

learning with static female avatars. The results indicate a statistically significant relationship between female student engagement and m-learning with static female avatars. This result tallies with Kim and Baylor (2007) who stated "The majority of female students chose female avatars as their learning partners and were likely to choose a female … as "most like themselves".

Key Findings:
The preference for mode of delivery and students‟ perceptions has the largest impact on engagement. In terms of the moderators, the major/subject of Science students shows significantly higher values than the Arts students with p = 0.003.

9.2.3 Discussion of Results Related to the Experiment 1 (H3) hypothesis

This hypothesis stated that "*intrinsic engagement will positively influence students' enjoyment"*. The results from the third hypothesis show that there is a statistically significant relationship between perceived enjoyment and students‟ beliefs that having access to English materials on their mobile devices have enhanced their motivation to learn English language. In fact, the results showed that learners who were more intrinsically motivated to learn via m-learning experienced higher levels of enjoyment in learning than those who were less motivated. These results are in agreement with researchers who suggested that engagement with the learning method, would increase the level of enjoyment (Baek & Touati, 2017; Hodhod, 2010), and this in turn would lead to acceptance and intention to reuse the same learning approach. Leong et al. (2013) confirmed the association between perceived enjoyment, which was an important factor, and enhancement of users‟ intentions towards adopting mobile entertainment. Furthermore, İşman et al. (2015) claimed that, when using the perceived enjoyment as an external variable integrated into TAM, the findings of the study revealed a positive influence on the perceived usefulness, which ultimately increased students‟ attitudes toward m-learning. Concerning the possible link between enjoyment and intrinsic engagement, the findings suggest a direct relationship between these two variables.

These factors may explain the relatively strong correlation between the intrinsic engagement of the learning approach and that directly reflection on the enjoyment of

using that way of learning. This hypothesis was one of the main objectives of the current study and it is supported statistically.

The current hypothesis was tested again to find out if there were differences between groups of gender, as well as between groups of majors/subject. The analysis results indicate no significant differences between groups for either gender and/or major/subject. The findings are in line with Leong et al. (2013), who concluded there were no significant gender differences in the adoption of mobile entertainment. Leong et al. (2013) suggested justification of this was the equal opportunities which is given to both genders from the government‟s policy to gain expertise and knowledge.

These results, though, differ from Wang & Yeh (2013, p408) who claimed that "students who learned with a male pedagogical agent showed more interest in the learning materials than students with a female pedagogical agent".

Key Findings:
The level of enjoyment experienced in a mobile learning is influenced by the learner‟s level of intrinsic engagement.

9.2.4 **Discussion of Results Related to Experiment 1 (H4) & Experiment 2 (H3)**

The fourth hypothesis in Experiment 1 and third hypothesis in Experiment 2 was stated as "*the intrinsic engagement will positively influence students' performance expectancy*". This hypothesis has been tested for two purposes. Firstly, it used the mean of responses for a number of statements which regard to learning being for a general course across all modules and whether or not the perceived engagement of learning content influenced the performance expectancy/usefulness. The second usage of the hypothesis was to test the result for when the course material was for teaching English language. The results of both tests revealed that there was a statistically significant relationship between the performance expectancy if learning was via a mobile device with an avatar for any course and the intrinsic engagement, as well as if the course was for teaching language English. Accordingly, the motivation or the engagement of e-learning was construed to affect the performance expectancy, which has a direct influence on intention to use the technology (Maldonado et al. 2010). Lee et al. (2005)

reported the performance expectancy of online learning is an outcome of the intrinsic motivation. The study concluded that performance expectancy is the key driver of usage behaviour and intentions. To support the above findings, the same hypothesis was tested again in the second experiment and the results revealed the same results. Findings illustrated there were statistically significant relationships between the engagement and performance expectancy regardless of the learning delivery method used (audio, video, cartoon).

With regard to *gender* as a moderator, the result of the first test of the hypothesis showed that there were significant differences between genders; however, the second test revealed no significant differences between males and females when the students were engaged in learning English language. The male students engaged more than the female students, which reflected positively on their performance expectation. It is difficult to explain this result, but it might be related to the preference of female students to learn via traditional face-to-face methods, as opposed to the male students preferred to learn via mobile phones. The findings when the learning materials are for English language teaching were in line with Maldonado et al. (2010) who used the gender factor as a moderator in their model and found no significant differences between males and females. Both genders can be equally motivated toward using e-learning. The results from the same hypothesis in the second experiment revealed the same findings, which showed no significant differences between groups of genders.

Further investigation was conducted into the current hypothesis with the major/subject as the moderator. The findings suggest no significant differences between major/subject groups. Arts and Science can be equally engaged and motivated toward the use of m-learning which was consistent with the findings of Leong et al. (2013). The possible explanation for this result may be that both Arts and Science have the same level of English teaching in higher education, and both are seeking to enrich their English information as a core module in higher education, the new learning approach encouraged their motivation to interact with its environment. It is also worth noting that the major/subject moderation in the second experiment did not show significant differences between groups.

Key Findings:
Engaged students perceived that they were learning and improving.

9.2.5 **Discussion of Results Related to Experiment 1 (H5)**

The hypothesis stated "*the convenience of m-learning will positively influence students' performance expectancy"*. The results from the fifth hypothesis show that there was a statistically significant positive relationship between the performance expectancy factor and the convenience factor. Perrin et al. (2006) explained the differences between traditional face-to-face teaching and online teaching, then concluded with findings in favour of online learning in terms of convenience and time. They mentioned that students can access the information for learning at their own convenient time and that is a key advantage to m-learning. Furthermore, the authors claimed that "Learners are not restricted to a specific physical environment, a particular delivery channel, or a fixed set of times for undertaking training and education" (p32). Their results corroborated the ideas of Singh & Reed (2001), who suggested that the convenience of technologies in blended learning improved the effectiveness and learning experiences. According to Al-Fahad (2009), mobile learning in pedagogic aspects is seen as the learning process that is considered outside of the conventional classroom setting and with the help of learning devices such as smartphones and tablets etc., specifically in educational activities, individuals tend to keep their learning activities in continuous form. Considering the mobile learning system, the learner obtains educational and informational opportunities quickly, since it minimises the physical presence or distance (Huang et al. 2010).

However, the findings of the current study do not support research by Artino (2010), who found the learners perceived the course contents were useful and interesting when the learning was in a face-to-face format. In addition, Moor & Kearsley (2005, p275) likewise has stated: "While students often appreciate the convenience of online learning, if given the choice, many would rather complete courses in a traditional, classroom-based format". Artino (2010), assumed that the findings are not entirely clear and need further investigations. However, Alfarani (2016) considered the convenience factor to be the key predictor of m-learning adoption in Saudi Arabia universities.

With regard to the interventions of gender and major/subject, the results revealed there was statistical evidence showing the difference between the two gender groups. Male students perceived that the use of mobile phones in education was more convenient than female students and that would impact positively on their usefulness. The possible explanation for this may be related to Saudi female students not being allowed to carry mobile devices onto the campus. Males, by contrast, who responded to the use of mobile technologies as not being important were minimal at only 5.7%, since there were able to carry their devices even in classes at the universities. The researcher investigated this point more by conducting direct open-ended question for the female students. The majority of responses from the participants stated something similar to this student who said, that:

> *"Girls' behaviours in learning is to ask the instructor questions directly and collaborate with others when there is an ambiguity... Sometimes you need an immediate answer for your question to construct the upcoming knowledge and that would be difficult when learning via m-learning".*

On the other hand, when the moderator was the major/subject, the results revealed no significant differences between the Arts and Science. Again, the research investigated modules in a core course for all disciplines" students, therefore, with the connectivity to the internet and the small weight of mobile devices, all students felt that m-learning would allow them to be used at their convenience, regardless the place and time. An instructor of those participants proposed a reason for this factor:

> *"M-learning seems to be convenient to our world days, as you know, most of the students spend a lot of time in their phones". Furthermore, the instructor stated "It's a great idea. Simply, because most of them spend their whole time on their cell phones".*

9.2.6 **Discussion of Results Related to Experiment 1 (H6) & Experiment 2 (H7)**

The sixth hypothesis in Experiment 1 and the seventh hypothesis in Experiment 2 was "*The performance expectancy will positively influence students' behavioural intention to use m-learning"*. The results from this hypothesis show that there was a statistically

significant relationship between the intention to use m-learning and students‟ performance expectations if they were learning via mobile devices with them believing, it would effectively strengthen their participation in learning of the English language, compared to traditional face-to-face learning. That is, those with high performance expectancy toward using m-learning had a higher intention to use m-learning than those with lower performance expectancy. This result is in line with Alfarani's (2016, p180) findings which were from teachers rather than students‟ perceptions. The study concluded that:

> *"The faculty members responded with high performance expectancies (i.e. those who believe that using m-learning in their teaching will be beneficial to them) have a tendency to accept m-learning more than faculty members with lower performance expectancies and willing to adopt m-learning in the present and in the future".*

In the main, the current results supports many other researches who found a positive relationship between performance expectancy and the user‟s behavioural intention to use m-learning from the students‟ point of views (Al-Gahtani et al. 2007; Iqbal & Bhatti, 2015; Kim et al. 2013; Nassuora, 2013; Wang et al. 2009; Osakwe et al., 2017). However, Jairak et al. (2009) did not find a significant influence between these factors. In researching the factors that determine learners‟ acceptance of mobile technology, Jairak et al. found that the perceived performance expectancy was one of the important factors which impact on the intention to use m-learning.

It is worth noting that in the second experiment, the hypothesis test aimed to find out the specific way(s) of mobile interface delivery that the students intended to use caused by their perceptions to perform better. The findings show that there were statistically significant relationships between the intention to use m-learning and the performance expectancy when the interface included audio and video modes of delivery. These results were consistent with Wang et al., (2009) who found the performance expectancy was shown to be the strongest predictor of behavioural intention to use m-learning.

When the research model hypothesised the current hypothesis with gender and major/subject as moderators, the result of these analyses revealed that no significant differences between groups in term of gender or major/subject. The results are

consistent with Al-Gahtani et al.'s (2007) findings that “Performance expectancy had a positive effect on intention, but found no interacting effect with performance expectancy and either gender or age on intention to use the technology”. One of the female participants of the current study believed that she derived benefits from the MADE-ME app, then commented in the open-ended questions that:

> *“Now, I think after this current study ... many of the female participants desire this approach of m-learning for their future studies and they will change their minds to use m-learning besides traditional learning”.*

Moreover, from a number of studies, for example, Alfarani (2016); Leong et al. (2013); Wang et al., 2009; Osakwe et al., 2017) it has been found that there are no statistical significant differences between the above factors when moderated by gender. The possible justification for this might be that male and female students in Saudi Arabia have become more experienced and skilled in using advanced m-learning methods; therefore, they become more equal in terms of their perception toward the new learning approach, irrespective of gender. So, when the current hypothesis was moderated with the external factors of *gender* and *major*/*subject* in the second hypothesis the results were consistent with the earlier results which indicate there were no significant differences between groups in terms of gender or major/subject among the three ways of learning (video, audio, cartoon).

These results are in contrast to earlier findings from Ong and Lai (2006); Shashaani and Khalili (2001); Koohang (1989); Venkatesh & Morris (2000), and (Leong et al., 2013), who found male students‟ expectations regarding the benefits and usefulness factors were greater than female students, for example, Venkatesh & Morris, (2000) found that “Males were greatly affected by attitude towards the adoption of a new technology”.

In term of the major/subject, the results are in agreement with Algahtani's (2011) findings which showed no significant differences between sciences and arts students which he proposed may be due to popularity of the new technologies and high rate of usage among all majors/subject of studies.

9.2.7 **Discussion of Results Related to Experiment 1 (H7) & Experiment 2 (H6)**

The seventh hypothesis in Experiment 1 and the sixth hypothesis in Experiment 2 stated "*intrinsic engagement will positively influence students' behavioural intention to use m-learning"*. The results from this hypothesis show that there is a statistically significant relationship between the intention to use m-learning and the students‟ belief that having access to the English materials on their mobile devices would enhance their motivation to learn English language. The study confirms that the students‟ intrinsic engagement is associated with their behavioural intention to use m-learning. Consistent with the literature, this research found that participants who reported using mobile phones for learning English language engaged with them and this reflected on their intention to use the approach in their future learning (Maldonado et al., 2010). Maldonado et al. (2010, p76) concluded their study by stating that "student e-learning motivation plays a significant role in e-educational portal use and adoption in developing countries". These findings are in line with those of previous studies (Lee et al., 2005; Leong, 2013) who found that motivation factor impacts on students‟ attitude and intention toward using the technology. Furthermore, Kim et al. (2013) found a strong positive relationship between the users‟ engagement and the intention to continue using their smartphones.

There is notable evidence based on analysis of the second experiment for the same hypothesis describing the impact of engagement factor on the intention to use the technology factor. More specifically, the researcher was aiming to determine which one of these approaches has a statistically significant relationship. The previous experiment showed a significant relationship between the intention to use m-learning and the students‟ engagement to learn via mobile devices in general. The results from the second experiment for the same hypothesis showed that there was only one of the three ways of learning (video, audio, cartoon) that the students‟ engaged with and intended to use in future learning. The results showed a statistically significant positive relationship between the students‟ behavioural intention to use m-learning only if the learning was a video avatar on their mobile device. It is clear from the results that, after adopting the interactive elements and receiving immediate feedbacks provided by the app, that learners appreciated the video learning approach and were not so keen to use the other approaches. It may be that the reason behind this difference is because that mode of

learning delivery requires body movement. One of the research objectives was to find the most engaging and effective method of learning; therefore, by obtaining the results, the researcher anticipated these findings prior to conducting the study, after which were supported statistically. The results are in line with Baek & Touati (2017) who showed the intention to use mobile games is significantly predicted by intrinsic motivation. According to Boutsika (2014, p125) "The pedagogical strategies should encourage student participation in interaction". Osunkoya & Chern (2013) confirmed that realistic movements by the avatar are now becoming the natural interaction for the HCI. This mode of delivery, with its interaction elements, is creating a strong bridge between humans and graphical interfaces.

When moderated with gender and major/subject, the results indicate no statistically significant differences between the two groups in terms of *gender* or *major*. These results were supported by the results of the second experiment which presented the exact same results. These findings are consistent with Maldonado et al. (2010, p78), who reported that:

> *"We did not find gender as a moderator in our model. These findings suggest that, in Peru, male and female students can be equally motivated toward use of e-learning portals and similar polices can be used to motivate both genders toward e-learning".*

These results further demonstrate the importance of m-learning motivation in higher educational use among learners and confirm their intention to use that approach of learning.

Key Findings:
Students who have more positive attitudes towards using mobile learning are more intrinsically motivated to learn. Students who have positive intentions to use m-learning with animated avatar (video) were more motivated.

9.2.8 **Discussion of Results Related to the Experiment 1 (H8) hypothesis**

This hypothesis stated "*enjoyment will positively influence students' behavioural intention to use m-learning*". Perceived enjoyment is quite related to perceived intrinsic

motivations. Therefore, some researchers included the enjoyment factor in the research model as an important structure, for example Baek & Touati (2017). The results from this hypothesis show that there was a statistically significant relationship between the intention to use m-learning and the students‟ enjoyment, in which they believed accessing into the materials on mobile devices was a fun interaction between content and learner. Liu (2008) and Baek & Touati (2017), adopted a framework for mobile learning for future research and integrated the perceived enjoyment as a critical structure. This finding broadly supports the work of other studies in this area linking the enjoyment variables with the students‟ intention to use the e-learning. Alenezi et al. (2010) and Leong et al.(2013) found that "perceived enjoyment has a significant relationship on the students' intention of online learning and directly influences their intention". In consequence, this research assumed the enjoyment factor is a very important factor in creating positive intentions to use e-learning in the higher education environment. Furthermore, a study conducted to investigate the students‟ intention of use for web-based learning systems concluded that the results demonstrate that the enjoyment of students toward using that system has a significant impact on students‟ intention to use the system (Saadé et al. 2008). The results are also consistent with previous findings which revealed a direct link between enjoyment and the intention towards using the technology (Lee, 2009; Wu & Liu, 2007). To sum up, there is a positive relationship between learners‟ enjoyment of the learning approach with the adoption of/the intention to use that way of learning. In fact, results showed that learners who were keener to use m-learning in future learning experienced higher levels of enjoyment in their learning than those students who were less enthusiastic to use m-learning. Concerning the possible link between enjoyment and intention to use that technology, the current findings suggest a direct relationship between these two variables.

When the two moderators of *gender* and *major/subject* are used with the current hypothesis, the results revealed that there were no significant differences between the groups. This finding is consistent with that of Leong et al. (2013) who conducted a study on behavioural intention to use mobile entertainment, who found there were no significant moderating effects of gender when they asked "Does gender really matter?".

Key Findings:
The level of enjoyment can predict the behavioural intention to use m-learning.

9.2.9 Discussion of Results Related to Experiment 1 (H9) & Experiment 2 (H9)

The ninth hypothesis in both Experiment 1 and Experiment 2 stated "*intrinsic engagement will positively influence students' effectiveness"*. The result for this hypothesis show that there was a significant relationship between performance outcomes and the students‟ engagement to learn through m-learning when the interface was a static male, cartoon, and video avatar. This result may be explained by the fact that the pictorial representation of the human character on the mobile interfaces draw learners‟ attention, which help them to memorise what they have learnt and which leads to more effective learning. The results support Rebolledo-Mendez et al. (2008), who conducted a study of using avatars in Computer-Aided Instruction and found that intrinsic motivation/engagement helped students to achieve greater degrees of learning. Another study on avatars and how they may be used effectively in e-learning also confirmed these findings, stating "...avatars seem to have a beneficial effect on learner motivation and concentration during learning" (Wang et al. 2005). Students were motivated and had increased learning potential when the avatar was used in the classroom (Mazlan, 2012). Other studies agreed that, if the learner was fully motivated and engaged with the learning environment, the outcome was likely to be better performance and achievement in learning (Baek et al. 2015; Logan et al. 2011).

In contrast to earlier findings, however, no evidence of the relationships between the engagement factor and the real performance effectiveness was detected in the second experiment. The result of analysing this hypothesis showed no statistically significant relationship between these two factors. These results concur with Baek & Touati, (2017), who found no direct link between motivation and game achievement. However, this finding is in contrast with previous studies (Unrau & Schlackman, 2006; Jurisevic et al. 2008; Baek et al. 2015), which found a direct link between motivation and game achievement. The findings of the current research suggest that a learner‟s motivation level did not determine how well they achieved in the learning. One possible explanation is that there may be other considerations, such as the lack of

competitiveness that impacted learners‟ motivation to perform in the exam. The researcher suggests future investigations on the competitiveness elements in education and whether it influences learners‟ motivations and pedagogical performance.
When the current hypothesis was moderated by *gender* the results show that female students significantly engaged with and then performed higher than male students when the learning was as a text, cartoon, audio, and video avatar on the mobile interfaces. Ghaith (2013) also showed a significant impact for female students when they used the blended learning methods, which led them to better academic achievement compared to traditional face-to-face learning alone. To confirm those findings, the results from the second hypothesis revealed the same evidence of showing the differences between groups in term of gender. The mean of the female students was higher than the mean of male students in the three modes of deliveries (audio; video; cartoon) in terms of performance in exam results.

On the other hand, when this hypothesis was moderated with students‟ major/subject of study, the findings showed that Science students engaged and outperformed their Arts student counterparts in m-learning with a cartoon interface (avatar).These results are consistent with those found by Hong et al., (2003). The possible suggestion of these findings may due to the familiarities and experiences of science students with the use of technologies such as in labs more than arts students. However, the findings of the second study highlighted no significant differences between groups in term of *major/subject.*

9.2.10 **Discussion results related to Experiment 1 (H10) & Experiment 2 (H8)**

The tenth hypothesis in Experiment 1 and the eighth hypothesis in Experiment 2 stated "*preference for multimedia instruction will positively influence students' effectiveness"*. The result of this hypothesis showed that there is a statistically significant relationship between the students‟ preference for using m-learning video interface only and the result of the face-to-face test. These factors may explain the relatively strong correlation between the face-to-face learning and the mobile learning as a video lesson. Wu (2015, p119) reported that:

"the video of a lecturer may give learners a sense of interacting with an actual person while watching a video lecture. In other words, the video of a lecturer may foster a sense of social presence".

Some researchers Church (2004); Valenzeno (2003) suggest that the lecturer video might improve learners learning in other ways. Another study by Baylor & Ryu (2003) can confirm the findings of this hypothesis which investigated the effectiveness of using avatars in online learning for building communities and presence in educational environments. Therefore, the results suggested that the avatar provided "a sense of presence that is the catalyst for community and learning". The animated avatar (video) provides learners with the feeling of an instructor-like figure and that students perceived a strong positive effect (Baylor & Ryu, 2003). Other studies have suggested a strong correlation between the learning performance outcomes and the method of learning preference (Allert, 2004; Thomas et al., 2002). Multimedia instruction is an important predictor enhancing e-learning effectiveness (Liaw, 2008) and therefore, the quality of multimedia enhances students" positive attitudes toward e-learning.

However, this outcome is contrary to the second study findings which demonstrates no evidence for learning style preference to predict learner achievement. The results of analysing this hypothesis showed no statistically significant evidence to support the hypothesis. Regardless of the learners" mode of delivery preference, the mean scores were very similar in the three ways of learning (video, audio, cartoon). This outcomes are consistent with Al-azaweiet al. (2016) who found and suggested that preference for learning styles had no correlation with students" academic performance. These results suggest that even though learners prefer a particular mode of delivery, they do not necessarily improve their knowledge and remember the information at the exam. These findings are in line with prior literature see, for example, (Gomes & Mendes, 2010; Prajapati et al. 2011). The level of pedagogical performance or achievement is not significantly predicted by learners" mode of delivery preferences (learning styles) (Baek & Touati, 2017). To sum up, whilst students have a preferred avatar type through which to receive static content, this preference did not always correspond with their most effective learning outcomes until interactive interface elements were added to the interface mode of delivery.

When the current hypothesis was moderated with *gender*, the result shows that female students preferred and outperformed male students in face-to-face learning methods compared to the m-learning. Artino (2010) reported that, although many students were satisfied with the convenience of online learning, many of them would rather continue their courses in traditional face-to-face in classrooms. However, the findings of the second experiment showed that there were also significant differences between groups in terms of gender. Female students scored higher than male students in the three modes of delivery (audio; video; cartoon) in term of performances and exam results.

When moderated with *major/subject* the results show that Science students preferred and outperformed Arts students in m-learning with cartoon avatars compared to the other ways of learning. The second experiment results support these findings and revealed identical results. Interestingly, the second hypothesis in the second experiment was to investigate whether or not the preference for multimedia has an influence on performance expectancy which was moderated by the major/subject, with the result revealing that the cartoon mode of delivery was only the one found that has a significant relationship according to the major/subject. Science students showed significantly higher scores than the Arts students with $p = 0.02$. Here, in the current hypothesis which aimed to investigate whether or not the preference for multimedia has an influence on the actual pedagogical performance according to the major, the results indicated that the Science students scored higher than Arts students in their final test of the cartoon avatar lesson with $p = 0.02$. In contrast, the study by Al-Fahad (2009) indicated that there were no significant differences between learners in terms of their major of study for Arts and Medicine students when they were offered mobile learning to improve their retention.

Key Findings:

Students‟ preferences for a learning mode of delivery is not linked to pedagogical performance (effectiveness).In terms of the moderators, the preference for cartoon avatar mode of delivery had statistically significant differences between majors according to the influence on performance expectancy. Science students showed significantly higher scores than the Arts students with $p = 0.02$. Interestingly, when testing the same hypothesis on the actual performance, the results are identical with $p = 0.02$.

9.2.11 **Discussion of Results Related to Experiment 1 (H11) & Experiment 2 (H11)**

The eleventh hypothesis in both Experiment 1 and Experiment 2 stated "*the effectiveness of m-learning will positively influence students' behavioural intention to use m-learning*". The result of this hypothesis shows that there is a statistically significant relationship between the intentions to use m-learning with a cartoon avatar. The possible explanation for this might be that learners constructed their knowledge in this mode of learning from the previous modes which, in turn, helped them to enrich their information and after which they performed better in the exam. This study confirms that the effectiveness of m-learning is associated with the intention to use that approach of learning. These results reflect those of Liaw (2008, p873) who also found that "there was a significantly high correlation (r = 0.70) between learners" behavioural intention to participate in e-learning and e-learning effectiveness". The use of mobile technologies in combination with multimedia and wireless infrastructures in educational environments increases the effectiveness of these technologies as learning tools which in turn improves mobile learning adoptions in future (Alfarani, 2016).

However, the same hypothesis used again in the second experiment and the result indicates that there is a statistically significant influence between the video test score and the intention to use that way via mobile devices in future, a result anticipated by the researcher and then ultimately found. The researcher"s assumptions were based on the co-creation workshop findings and the participants" perceptions. The video mode of delivery was found to be the most engaging approach but was not the most effective; therefore, in the second study, integration of these interactive elements included self-assessments and immediate feedback, with the conclusions showing that their approach can be the most engaging and effective way of learning via mobile devices. This results support the findings of Zhang et al.(2006, p15) who found that "students in the e-learning environment who are provided with interactive video achieved significantly better learning performance and a higher level of learner satisfaction than those in other settings". Interestingly, there were no significant relationships between the students" results and intention to use m-learning with cartoon avatars and the test result of that way of learning.

When moderated with *gender*, the results showed that male students intended to use m-learning with cartoon avatars more than female students in the first experiment. However, the second experiment results indicated that no were significant differences between groups in term of gender among the three ways of learning. When moderated with *major/subject*, the result show that no significant difference between groups which is the same results of the second experiment.

Key Findings:
Students intend to use m-learning with a video avatar because they found it to be the best performed way of learning.

9.2.12 **Discussion of Results Related to the (H4) Experiment 2:**

Hypothesis four in Experiment 2 stated that "*the interaction activities in m-learning will positively influence students' intrinsic engagement*". The findings showed that there were statistically significant relationships between the engagement of students with the interactivity elements, which was assessed by the self-assessment and feedback elements while learning was via the three ways of delivery: audio, video and cartoon. It has been proven that feedback in education is a powerful tool which enhances learning (Economides, 2006). In accordance with the present results, a previous study by Perrin et al. (2006) demonstrated that immediate feedback supports learners immediately after an activity. In order to deliver and control feedback to a very large number of students allowing them to learn at the same time despite their differences, the learning should be given through technology. According to Alabdulaziz & Higgins (2017, p586) "Individualized learning through a computer can allow a student to observe the speed at which they achieve their targets, providing feedback on current performance, and maybe motivating students to continue with their tasks". For instance, it might bring reassurance to the learner after the exam starts, may reduce the learners‟ susceptibility to panic when he/she answers incorrectly and may also encourage and congratulate the learner on his/her effort. While feedback was not provided in the previous experiment, participating students suggested it would be a beneficial feature in the mobile app as learners wanted to see how well they are doing at the same time. Eppard et al. (2016) reported that, according to the data collected for their research which was about making suggestions for choosing Apps for a foundational level English program in the United

Arab Emirates, participants expressed their requirements to have some features in apps, such as instant feedback. Based on this finding, the researcher used that function in the current study, with the MADE-ME App incorporating a process of error correction and presenting instant feedback to guide the learner to do more learning reviews on the information belonging to a question that has been answered incorrectly, which in turn increased learners‟ knowledge, completing a loop of learning that could drive the achievement of learning objectives. As reported in Bahrin's (2011) thesis, one of the engaging elements in game-based learning is outcomes and feedback. Algahtani (2011) claimed that the use of multimedia and interactive modes of learning contributed in the evaluation of the effectiveness of e-learning in Saudi universities, and by providing instant feedback that significantly reflected immediate benefits, including high motivation and more enjoyment of learning. The results of this hypothesis is consistent with human computer interaction research which proved the use of technology has the ability to improve student interaction (Lee at al, 2012).

When the current hypothesis was moderated with *gender* and *major/subject*, the results indicated that there were no significant differences between groups in term of gender or major among the three ways of learning. The aspect of feedback interactions observed by the researcher was an interesting function that been used in the web app and was appreciated by the majority of the students regardless their genders or majors.

Key Findings:
Students‟ perceptions of the importance of learning interactivities had a strong influence on engagement.

9.2.13 **Discussion of Results Related to the (H5) Experiment 2:**

Hypothesis five in Experiment 2 stated that "*the interaction activities in m-learning will positively influence students' performance expectancy*". Interestingly, the results of this hypothesis showed that there were positive significant correlations between the feedback activities and the students‟ performance expectancy, regardless of the mode of delivery. According to Economides(2006) and Robert (2012), feedback activities may increase the learner‟s belief on a test‟s usefulness and that may relax their concerns of test fairness. Derouin et al., (2005) suggested that when feedback is given frequently

and immediately following a response from the learner in e-learning, it is helpful to learners and makes them knowledgeable.

When the current hypothesis was moderated with *gender* and *major/subject*, the results indicated there were no significant differences between groups in term/subject of gender nor major among the three ways of learning of video, audio and cartoon.

9.2.14 **Discussion of Results Related to the (H10) Experiment 2:**

Hypothesis ten in Experiment 2 stated that "*the interaction activities in m-learning will positively influence students' effectiveness"*. The results of this hypothesis showed that there were statistically significant relationships and influences of the interactive activities (quick exercise, feedback and self-assessment) on the students‟ pedagogical performance and effectiveness if the learning was via m-learning with audio and video avatar. This significant effectiveness result stemming from the audio mode of delivery was found in the first experiment. In contrast, the video mode of delivery was not so successful. As a result of this the MADE-ME model was extended in order to incorporate the interaction features and the findings showed that the video mode also significantly improved student performance. This implied that students who had more interactions with the content were able to perform better in m-learning settings. In the current research, the web-app is found to be a flexible learning tool which allows interactions with human characters, including movement and voice and that something agreed with by Farsi (2016). According to Tang & Byrne (2007), the level of interaction increased learners‟ participation in the learning activities, which in turn influenced positively the learning outcomes. The approach to learning used in this study is an assistive learning approach and the results are in line with previous studies, such as those reported in Ghaith (2013, p169), which suggested that blended learning shows better efficiency and effectiveness of training in the U.S.; the results of the study illustrated that 77% of U.S institutions currently use blended learning. Sonak et al. (2002) conducted a study on how feedback affects learner performance through the internet, and the results here showed a positive significant relationship between feedback via the internet and students‟ academic achievement. Further to that, Bates (2015) concluded a case study by saying that feedback supports learners to learn and apply the self-learning strategies which helps them to succeed in online learning.

When moderated by *gender*, the results show that female students score higher than male students in the audio, video and cartoon post-test score. A possible reason for this may be related to female students feeling as if they were in a real class which can present the info, assessing and testing their knowledge about the subject matter, and then providing them with their progress via the auto feedbacks. However, no significant differences were found when moderated with *major/subject*.

9.3 Discussion of the Open-Ended Questions

Open-ended questions were used at the end of the questionnaires which can be characterised as qualitative data. The relationship between qualitative and quantitative methods is complementary rather than exclusive enriching the data by exploring issues further and supplementing the quantitative work as part of the validation process. The discussion of these are as follows:

9.3.1 Discussion of Experiment 1 Open-Ended Comments

Advantages/benefits of Mobile Devices for Student Learning

Looking at Table 8 - 87, many students (n=47) pointed out that the „pause and repeatable" features of the lessons on the mobile device were the most useful advantages of that approach of learning. Students found the ability to „stop" and „pause" lessons and to fast-forward or rewind materials in order to repeat and/or focus on any part of the content, was *the* feature which distinguished m-learning over traditional face-to-face learning. This is consistent with earlier studies (Kukulska-hulme et al., 2015; Evans, 2008; Farsi, 2016). According to the statistical analysis of this study, significantly more students believed that revising and learning from m-learning materials made them more receptive and effective than learning via traditional face-to-face. M-learning has an additional advantage, which is the ability to access information quickly. A factor identified by a number of students (n=20) who perceived the use of m-learning provided the ease and speed with which information could be found. They felt that mobile devices allowed them to reach course materials quickly, a finding confirming the investigations of Algahtani (2011) and Gikas & Grant (2013). This advantage was also mentioned by one of the instructors, who she was asked: "*What benefits do you expect that this kind of education through mobile device will bring to the students?"*. She stated:

". . . It gives them the access to review whatever they need in seconds"

Table 8 - 87, also shows that students (n=33) believed that the convenience of learning from mobile devices was a useful aspect of m-learning. Other, m-learning allows students to access learning materials at a time that is convenient and from a location at which were not required to meet there by reducing the need to physically move from place to place for lectures This theme of m-learning advantages has been discussed elsewhere (Al-emran et al., 2016; Liaw, 2008). Because of the connectivity to the internet and the small weight of mobile devices, students felt that it would allow them to be used at their convenience, regardless of place and/or time. An instructor of these participants described this feature as:

"M-learning seems to be convenient to our world today, as you know, most of the students spend a lot of time in their phones"

Further:

". . . It's a great brilliant idea. Simply, because most of them spend their whole time on their cell phones"

And again:

"They are interested. There are some reasons like they have their phones almost all day"

In addition, Table 8 - 87 presents other advantages of adopting m-learning in Saudi higher education, such as it being easy to understand the content, and the increased engagement and motivation, which they believe would help them to concentrate on the learning materials (n=18; 6; 5, respectively). The provision of increased concentration and enhanced learning through m-learning are all perceptions associated with the positive intentions, attitudes and usefulness components of the TAM, leading the researcher to assume that they have changed their way of learning from the routine face-to-face learning to incorporating technology in their learning which enhance their motivation of learning. The results from this research supports findings of Chen & Wu (2015) who concluded that the usage of multimedia technology in education positively affects learning processes and encourages learners to concentrate. Some learners commented as following:

". . . Especially to break the daily routine and to attract the attention of more students"

In addition,

"I think the use of technology in education helps us to understand with faster, stronger and more helping keeping information in the mind of the student . . . and create an atmosphere of fun that helps to reduce the boredom during the lecture at the classroom"

Challenges of Mobile Devices for Student Learning

Although the participants considered m-learning was helpful, a number of challenges and barriers from learning via mobile devices were also identified. Table 8 - 87, shows some of these challenges. Some students (n=15) identified that the low speed of internet connection is one of the issues which prevented the acceptance of using m-learning in Saudi Arabia. This study realised that low internet connectivity, whether at home or in the university, was related to the land‟s geographic factors of having many large mountains, which disturbs the implementation of m-learning, as highlighted by the prior studies (Mirza & Al-Abdulkareem, 2011; Tarus et al., 2015). M-learning has an additional barrier, as identified by a number of students (n=12) who stated that students‟ objections m-learning were based on miscommunications a lack of interaction with other peers and instructors to ask about concepts not understood. When students studied via the distance learning format, it minimised the level of discussion, as well as the level of contact, among students. Liaw (2008) also found that this is a concern when implementing m-learning. The researcher therefore determine this point as an objective to improve the autonomy of the learning and to convert the learners experience from being passive to interactive. One of the interviewee‟s instructors supported the authors‟ assumption and expressed that:

"M-learning may stimulate students' self-learning mode and change the way of learning and receiving English language by practicing the language or answer some electronic tests .. All that because the English learning required learning with practice and understanding until the student reaches the top of the level of knowledge and information"

Furthermore, looking at Table 8 - 87, a small number of students (n=8) claimed that learning via using mobile device may be disturbed by the small size of the screen. Whilst this was certainly a problem when using old fashion types of devices such as Nokia and Panda; it is seen based on the statistical analysis of this study that, all of the sample of this population owned smartphones such as iPhones and Galaxy, which have greater success of screen size and user acceptance. In addition, there were a very small number (n=4) who claimed the limited batteries of the mobile device may be an issue in implementing m-learning, however, this could be solved with the new device versions and by portable chargers. Moreover, “escape” from learning to other entertainments or social media was pointed out by (n=13) students something that can be tackled by distance learning tracking which encourages learners to complete the lesson and remain focused. Table 8 - 87, also shows a lack of awareness, attention and motivation in m-learning as one of the barriers that might make so students avoid the use of m-learning; this could be solved by having professional and well-designed interfaces of learning. Providing instructors with training courses and technical support on how to use technology in education environment would tackle this issue and reduce the number of staff who are against the adoption of technology in learning (Alabdulaziz & Higgins, 2016).Other barriers that have been highlighted by participants, include the difficulty of tracking and monitoring students‟ feedback; students postponing completion of the lesson; and reluctance to receive the lesson because it disturbed other functions of their mobile device. A further barrier from the student‟s point of view is high internet subscription fees although only (n=3) highlighted this case. From this small number of students, researchers do not assume that this is a big issue, especially as all Saudi higher education students are joining universities in their country free of fees and they are also receiving a monthly allowance from the government to cover all studying requirements (Alfarani, 2016).

9.4 Chapter Summary

This chapter has discussed and interpreted the results from the previous chapter quantitatively and qualitatively, seeking to answer the research questions regarding the way in which m-learning can be used effectively for learning the English language. The first part of the chapter discussed the evaluation of the results that based on statistical tests to find out the relationships and correlations between factors and evidence from the

literature was also given to support these findings. The summary of the main findings confirm the preference for mode of delivery and students‟ perceptions has the largest impact on engagement. In addition, it also showed that the level of enjoyment experienced in a mobile learning is influenced by the learner‟s level of intrinsic engagement. Also, the study identified that students‟ preferences for the learning mode of delivery and their engagement for any learning styles were not linked to pedagogical performance (effectiveness), consistent with previous studies which reported similar findings (Al-azawei et al. 2016; Prajapati et al. 2011). The chapter provided a discussion of the quantitative findings and supported them with the qualitative perceptions of the participants in the second part of the chapter. The potential advantages and challenges of implementing m-learning among Saudi learners from their perceptions have been discussed. This study can confirm that the use of learning interactivities while designing the m-learning lessons were the strongest factor which influence m-learning effectiveness.

The summary of the main contributions of the work are presented in the next chapter.

10 Chapter: Conclusion and Future Works

10.1 Introduction

This chapter summaries the research undertaken, highlights its novelty and the implications for the field. The aim of the research was to investigate how different ways of delivering learning content to students can influence learning outcomes and optimize the learning process especially when they are away from the traditional classroom. More specifically, this study focused on investigating how m-learning can be used to assist the teaching of compulsory English modules within Higher Education courses in Saudi Arabia.

The chapter begins by revisiting each of the objectives of the research and the corresponding research questions, highlighting how each was addressed during the research. The chapter then summaries the major contributions to the field stemming from the research and proposes a set of recommendations linked to the implementation of m-learning in Saudi Arabia. Finally the study identified the limitations of the current study and identified future work directions.

10.2 Revisiting the Research Questions

To evaluate if this thesis was successful in achieving its objectives, this section gives a review and insight into the main questions it set out to address. The overall aim of this research was to investigate the increasing interest in m-learning from an educational point of view in Saudi Arabia and to ascertain how m-learning can be used as a tool to complement and/or substitute traditional learning environments, with specific attention being paid to the ways in which engagement and performance in learning can be influenced by the type of avatar representation of the teacher on the mobile device. Associated with this aim a number of objectives was identified and a number of research questions defined.

10.2.1 **The Research Objective and Question 1:**

- To identify the main benefits, opportunities and challenges of m-learning when adopted in Saudi Arabia from a students‟ perspective, and to investigate students‟ readiness and willingness to use an m-learning approach in their studies within the context of a specific module within their degree courses.

The research question which associated with this objective was as follows:

- What are the benefits, opportunities and challenges that m-learning can bring to the student population within specific higher education institutions in Saudi?

This question was answered by reviewing the literature as a means of collecting information to seed the development and support of the research model. Within this question, the potential benefits and barriers of m-learning from the literature, were identified. From open-ended questions in the questionnaire and from the discussions occurring during the co-creating workshop which expanded participants comments and explored their views and perceptions further.

10.2.2 **The Research Objective and Question 2:**

- To investigate the most preferred/engaging avatar representation of a teacher (audio, video, image, cartoon, text) for delivery of learning content via mobile technology.

The research question which associated with this objective was as follows:

- What is the preferred/most engaging way of representing the teacher through an avatar (audio, video, image, cartoon, text) on a mobile device?

This question was answered by conducting the first case study which explored the different types of that could be used to represent the teacher when learning content is delivered via mobile phone, with feedback being collected from the pre and post questionnaires for Experiment - 1.

10.2.3 **The Research Objective and Question 3:**

- To develop an educational model that links delivery of learning content via mobile technologies with pedagogical performance by:
  a) Setting the variables and factors that align with the research context.
  b) Testing a set of hypotheses to determine whether engagement with specific avatar types has a significant impact on pedagogical performance.

The research question which associated with this objective was as follows:

- Is there a significant relationship between students‟ preference for engagement with particular avatar types and their pedagogic performance; and can such potential relationships be represented on the research model?

This question was answered by reviewing current technology acceptance models and extending them to take into account key factors associated with this study in order to create the conceptual MADE-ME model (Multi Avatar Delivery Environment for Mobile Education) described in Chapter 6, and the definition of a corresponding set of hypotheses by which engagement and pedagogical performance can be assessed.

10.2.4 **The Research Objective and Question 4:**

- To design and create the framework for an online web-app that can deliver m-learning content to a mobile device via different avatar representations of the teacher (audio; video; image, cartoon; text) and which can be used to test the pedagogical effectiveness of each approach by:
  a) Constructing different m-learning avatar interfaces.
  b) Delivering the content via mobile web-app.
  c) Testing students‟ pedagogic performance of avatar interface type through the mobile we-app.
  d) Providing students with the opportunity to co-create and re-design their best m-learning interface framework based on their opinions, preferences and performance.

The research question which associated with this objective was as follows:

- How can different avatar representations of the teacher be used to develop and deliver learning content via a mobile web-app in order to engage students and improve their pedagogic effectiveness?

This question was answered by designing and developing The MADE-ME web app framework as detailed in Chapter 7. Five types of multimedia (audio, video, cartoon, image, text) were initially implemented to deliver English learning material to learners

through that mobile app, followed by adjustment of the avatar interface on the basis of a co-creation workshop.

10.2.5 **The Research Objective and Question 5:**

- To evaluate the proposed m-learning model and web-app through:
  a) Testing the effectiveness of engagement and pedagogical performance through a first stage of experimental design via questionnaires and exam scores.
  b) Assessing the second round of experiments based on participants‟ perceptions through a second stage of experimental design via questionnaires and exam scores.

The research question which associated with this objective was as following:

- What conclusions can be drawn by investigating the links identified through the evaluation of engagement and pedagogical performance in m-learning when the teacher is represented by different avatar types using a cohort of students studying on a degree course at a university in Saudi Arabia?

To address this question, two experiments/case studies were conducted. The m-learning web app framework and the research model were further redeveloped based on participants‟ feedbacks and perceptions stemming from the co-creation workshop. Once the design stage was finalized, implementation and evaluation of the final model was undertaken in the second experiment, which enabled the researcher to analyse participants‟ thoughts via quantitative analysis as well as qualitative open-ended comments.

10.3 Contributions of the Thesis

Stemming from this work there been three key contributions to the field and a number of recommendations which made to the Ministry of Higher Education in Saudi Arabia regarding m-learning. This study contributes to the field of m-learning delivery both theoretically and practically by investigating the effectiveness of learning via the use of mobile avatar interfaces in higher education. This thesis presents its key contribution as following.

10.3.1 **MADE-ME Model**

This study fills a gap in the literature by providing a new conceptual research model. This model extends the current technology acceptance model (TAM) by including a number of important factors related to the Saudi Arabian m-learning context. The model factors were obtained from a combination of educational models in prior developed studies of online learning and it extends them by adding new variables. The proposed model of this research, MADE-ME (Multi Avatar Delivery Environment for Mobile Education), is an important output from this work. The MADE-ME has been used to identify how students can use different ways of learning through mobile devices to receive English language content. The model provides hypotheses and criteria to ensure successful implementation of the technology and to evaluate the engagement and experience of the students using the technology. The Saudi country has a unique culture, in particular, it follows gender segregation in schools and universities classes which in turn is reflected in the education environment. Therefore, there is a need to add the gender variable as a moderator on all investigated factors to find out the differences between genders and what impact these differences have on intentions to use m-learning. Further, this model defined how students can interact with different avatar representations of the teacher to deliver learning content by identifying how the interactive elements affected the effectiveness of m-learning and how interactivity can be improved in m-learning applications. As a consequences, this new model of evaluation could be utilised in further research to evaluate the engagements and effectiveness of m-learning at higher education institutions.

The MADE-ME model of (Multi Avatar Delivery Environment for Mobile Education) which is illustrated in Figure 10 - 1, gives the ability for educators and instructional designers to consider how they might design new learning activities for their mobile learners.

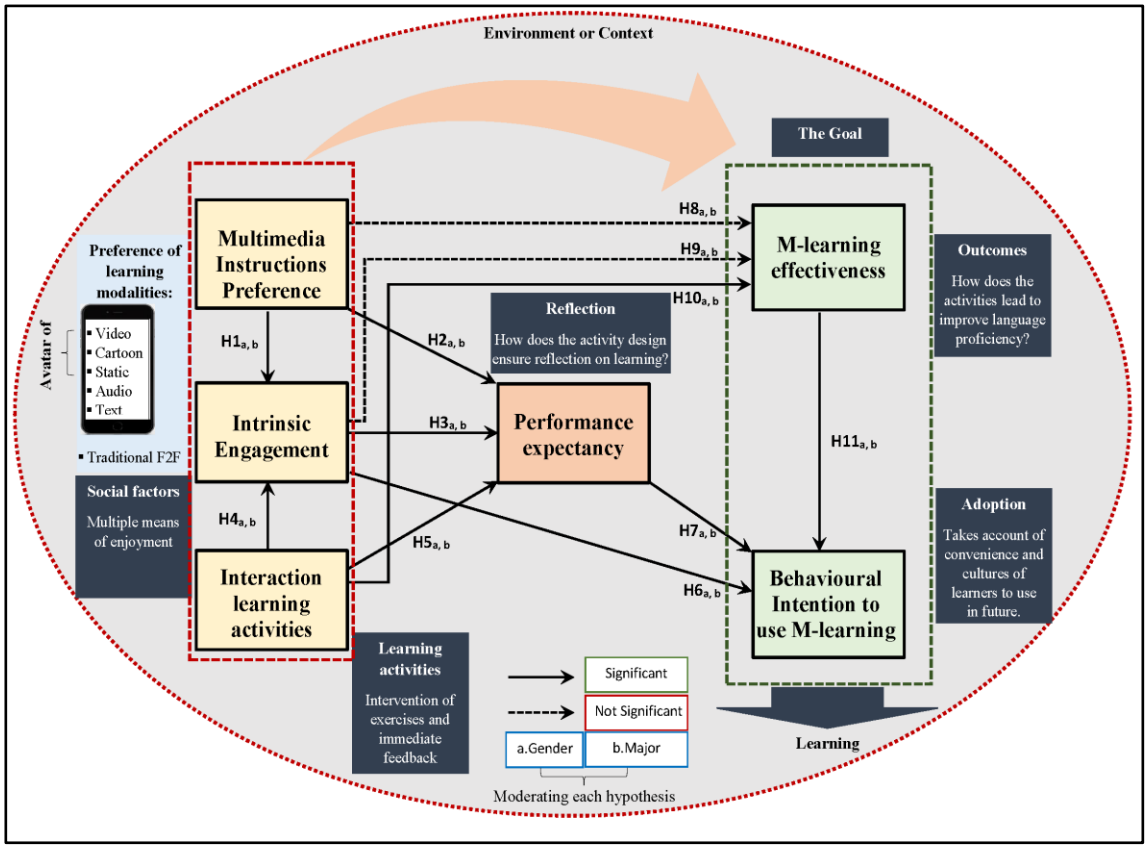


Figure 10 - 1 The model of Multi Avatar Delivery Environment for Mobile Education (MADE-ME)

10.3.2 **MADE-ME Web-App**

Another output from this study is the design and development of a web-app platform for delivering learning content on mobile phones. the MADE-ME (Multi Avatars Delivery Environment for Mobile Education) web-app has been developed to deliver learning content with the optimisation of learning outcomes in mind. The MADE-ME web-app enables the delivery of lessons using a range of avatars to represent the teacher (audio, video, cartoon, image, text) and to deliver interactive learning content to students see Figure 10 - 2. The most significant element of the app and its platform is that it is designed to provide learners with the opportunity to learn through exercises and receive immediate feedback. The app is also designed to test their retention of the content they have been delivered. Further, the instructor can provide different types of tests such as multiple choice, true or false, drag and drops and/or open-ended questions. The mobile app can be accessed anytime and anywhere via an internet connection and it can be used to deliver course material in any language from any point in the world. For the purpose of this study the MADE-ME app was used to deliver English language teaching material, but it could be used to deliver content for any educational course.

Figure 10 - 2 The web-app framework of Multi Avatar Delivery Environment for Mobile Education (MADE-ME)

10.3.3 **Case Study**

The third key contribution from this thesis is a comprehensive case study investigating the perceptions of a group of students studying an English language module in Al-Baha university in order to determine how they engaged with the mobile content and how effective their learning was when using the MADE-ME app.

In light of the results that were found which were identified while implementing the research and based on a review of the literature, the researcher groups some recommendations in order to achieve the objective of m-learning implementation in Saudi Arabian universities.

10.4 Implication of the Research to Saudi Arabian Education

The study provides positive information for the Saudi Arabian Higher Educational Ministry, and this information may also help them change their conditions and regulations toward using new learning approaches such as a blended learning method combining m-learning with traditional face-to-face teaching. The findings of the study show this approach has been appreciated by students, and the thesis presents the importance of m-learning engagement and effectiveness that could encourage pedagogical policy makers to adopt this approach of blended learning in Saudi universities. In addition, the results of this research provide researchers, educators, m-learning application developers and practitioners with important guidelines for designing successful mobile learning application and how to motivate learners about the

advantages of m-learning higher education study. The findings of this research will not only assist m-learning application developers and practitioners to design better user-experienced interfaces and promote this new approach to potential users, but also provide insights into research on mobile learning acceptance. In light of the thesis findings, the research recommends Saudi universities to consider adopting m-learning through applications such as the MADE-ME web-app to improve the learning process as well as increasing engagement and effectiveness of learning this type of app. This type of application or similar could facilitate and serve the cultural norms in the country such as gender issues. Whilst the MADE-ME app supports easy delivery of online content to mobile devices, for this to be universally acceptable, however, it will still be necessary for Saudi universities to provide training courses for educators on how to use such m-learning web-apps and incorporate multimedia and interactivity elements.

10.5 The Study's Limitations

Despite the many strength of this research, there are a number of ways in which it could be improved linked to scope, culture and the available technical infrastructure. These can be summarised as follows:

- The research has been limited to two faculties‟ of students (Arts and Science) at one of the Saudi public universities (Al-Baha University). Furthermore, because Al-Baha University is a new university, it may not be typical if compared to older universities in Saudi Arabia and findings cannot be generalised to other (old or new universities) populations.
- Even though three case studies with three groups of participant have been conducted, this is still a relatively small number of participants and further trials are needed to confirm accuracy of findings and generalisations to other populations.
- The researcher tried to conduct the second experiment with the same sample of students who undertook the first experiment but they had moved into the second year where English language is not a core module. Although there were 19 respondents, this was too small a number for valid comparisons to be made for this set.
- Due to cultural norms, the female avatar had to be used as a static image and it was not possible to present a female instructor with an uncovered face on an online teaching platform in Saudi Arabia.

- The rules of the Saudi Higher Education Ministry do not allow female students to bring their mobile phones to the university campus, therefore, the female participants may have found that the m-learning approach to be less convenient to them than the male counterparts.
- Due to unreliable internet connections in the male university campus, the students‟ perceptions may have been negatively affected against the behavioural intention to use m-learning or against the convenience factor.
- The research model focused on only eight of the subscales to investigate: engagement, enjoyment, performance expectancy, convenience, effectiveness, interactive and the behavioural intention to use m-learning. Literature reviews have been undertaken comprehensively on these factors, however, the findings of the study contribute to knowledge about these subscales alone.
- This experiment did not track or capture students‟ login activity to the application.

10.6 Future Research

The limitations of this study as well as the promising findings to date create opportunities for future research which are outlined as following:

1- Further studies can be undertaken with more to confirm the current findings and also to increase the generalisation of the research model and the web-app. In addition, further factors can be explored and integrated into the MADE-ME model.

2- The experiments could be extended to include students from different faculties or subjects of study; students from different cities across Saudi Arabia; students from different urban versus nomadic cultural backgrounds; students at public versus private universities; and those at Middle Eastern universities in general.

3- The experiments involving students can examined from their instructors‟ point so that they can become informed about potential benefit and limitations of implementing m-learning in the educational process. As mentioned earlier, out of the scope of the research, the researcher conducted a short interview with the participants‟ English instructors and their supervisor who supported this as a point to be considered in future research by commenting that:

"As an English Supervisor, I found that the experiment is really more effective for both students and teachers. In somehow, this experiment gave us a general overview of how to teach students the English course as a second language through a new way of teaching via convenience technology which I obviously realised its impact on their effectiveness and improvement".

4- It would be useful to analyse data collected from the 2nd, 3rd and fourth year students at the same university and compare the findings with the main participants of this study (foundational year). Students at these higher levels are studying most of their courses in English and they may realise the benefit of this approach or have different concerns about it as an approach.

5- The research addressed some cultural challenges with female students and their teachers. That is due to the cultural restrictions of gender segregation within Saudi Arabia. Female students should have m-learning with female teachers only inside the campus of the university. However, this will require a female researcher to conduct this experiment for female students which may encourage and motivate them to learn from someone of the same gender.

6- Further research can be conducted to design and develop educational lessons specifically for mobile devices instead of programmes which are prepared to be delivered via PCs and then optimised to work on mobile devices.

7- Hosting the mobile web app on the university‟s online learning portal such as Moodle would provide the opportunity to capture and track students‟ login activities, providing rich log files that track student activities within the system and indicate the extent of their engagement with m-learning.

8- Conducting similar research with other taught modules being provided in Al-Baha University to explore whether or not there are subject specific differences between the research models factors.

10.7 Chapter Summary

This final chapter has revisited the research objectives and questions and how they have been addressed in this thesis. The three main contributions of the work to the field (model, web-app, and case study) have been summarised and recommendation from, limitations of, and opportunities for further work have been highlighted.

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12 Appendices

Appendix A: Research Ethics approval.

Appendix B: Supervisor's letter to the Saudi Arabian Cultural Bureau in London for the data collection.

Appendix C: The Saudi Arabian Cultural Bureau in London approval letter.

Appendix D: The Al-Baha University approval letter to conduct the experiment.

Appendix E: The pre-post questionnaire of the Experiment - 1.

Appendix F: The pre-post questionnaire of the Experiment - 2.

Appendix G: The copy of the exam/test.

Appendix H: A release letter from the main supervisor at Al-Baha University for the completion

Appendix A

The Research Ethics approval

Research Ethics Committee

University of Reading

Project Submission Form

Note All sections of this form should be completed.
Please continue on separate sheets if necessary.

Principal Investigator: Prof. Rachel McCrindle

School: School of system Engineering

Email: r.j.mccrindle@reading.ac.uk

Title of Project: **Application of M-learning Using Avatars to Assist the Teaching of English as Part of Higher Education Courses in Saudi Arabia**

Proposed starting date: 24/ 08/ 2015

Brief description of Project:

This study is conducted to investigate the potential effectiveness of using m-learning to assist the teaching process and the benefits that it can bring to the Higher Education process in Saudi Arabia.

The study will be conducted amongst the students of Saudi Arabian university in order to identify student preferences for, and engagement with, different avatar types as a way of receiving and interacting with course content and the effects this has on their pedagogic performance.

The proposed methodology for this research is a mixed methodology of both qualitative and quantitative methods based on the "Research Onion" model for collecting data and stepping through the different stages required when formulating an effective research approach. A Grounded theory approach is used whereby the hypothesis is built up as the different stages of the research are undertaken. According to Ross and Morrison (2007), the method of experimental design is used to "test hypotheses regarding causation, for example, that a particular instructional strategy leads to better student performance".

This study to advancement of the field of mobile learning delivery by investigating the effectiveness of learning through the use of mobile avatar interfaces in Saudi Arabian Higher Education courses. Further, it will contribute to the field of m-learning interface by the co-creation and customisation of Avatars interface by the students themselves.

I confirm that to the best of my knowledge I have made known all information relevant to the Research Ethics Committee and I undertake to inform the Committee of any such information which subsequently becomes available whether before or after the research has begun.

I confirm that I have given due consideration to equality and diversity in the management, design and conduct of the research project.

I confirm that if this project is an interventional study, a list of names and contact details of the subjects in this project will be compiled and that this, together with a copy of the Consent Form, will be retained within the School for a minimum of five years after the date that the project is completed.

Signed:

..... Date: 11-6-15

(Investigator)

..... Date: 11-6-15

(Head of School or authorised Head of Department)

..... Date: 11-6-15

(Student -where applicable)

Checklist

1. This form is signed by my Head of School (or authorised Head of Department) [√]

2. The Consent form includes a statement to the effect that the project has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct [√]

3. I have made, and explained within this application; arrangements for any confidential material generated by the research to be stored securely within the University and, where appropriate, subsequently disposed of securely. [√]

4. I have made arrangements for expenses to be paid to participants in the research, if any, OR, if not, I have explained why not. [ ]

   No expense will be incurred because it's done as a part of my course.

5. EITHER

   (a) The proposed research does not involve the taking of blood samples; [√]

   OR

   (b) For anyone whose proximity to the blood samples brings a risk of Hepatitis B, documentary evidence of immunity prior to the risk of exposure will be retained by the Head of School or authorized Head of Department. [ ]

   Signed:

   .... Date 11/06/15

   (Head of School or

   authorised Head of Department)

6. EITHER

   (a) The proposed research does not involve the storage of human tissue, as defined by the Human Tissue Act 2004; [√]

   OR

   (b) I have explained within the application how the requirements of the Human Tissue Act 2004 will be met. [ ]

7. EITHER

(a) The proposed research will not generate any information about the health of participants; ☑

OR

(a) If the research could reveal adverse information regarding the health of participants, their consent to pass information on to their GP will be included in the consent form and in this circumstance I will inform the participant and their GP, providing a copy of the relevant details to each and identifying by date of birth ☐

OR

(c) I have explained within the application why (b) above is not appropriate. ☐

8. EITHER

(a) the proposed research does not involve children under the age of 5; ☑

OR

(b) My Head of School (or authorised Head of Department) has given details of the proposed research to the University's insurance officer, and the research will not proceed until I have confirmation that insurance cover is in place. ☐

Signed:

…….. Date……...…

(Head of School or authorised Head of Department)

This form and further relevant information (see Sections 5 (b)-(e) of the Notes for Guidance) should be returned, both electronically and in hard copy, to:

Dr Mike Proven
Coordinator for Quality Assurance in Research
Whiteknights House
Email: m.j.proven@reading.ac.uk

You will be notified of the Committee's decision as quickly as possible, and you should not proceed with the project until a favourable ethical opinion has been passed.

University of Reading

School of

[Avoid using personal contact details. If it is necessary to use a mobile, ensure that it is a project specific mobile]
Contact address

Researcher (principal):
Email:
Phone:

Researcher (role):
Email:

phone
fax
email

Appendix A: INFORMATION SHEET

What is the purpose of the study?

The aim of this study is to investigate the benefits that mobile devices can bring to students' learning. The objective of this study is to develop and build an online mobile web application which has been designed with four types of avatar to interact with learnings while delivering their course content. The main purpose of the study is to measure how engaged and motivated students are to use this approach and how effective the approach is with regards to students retaining information that have been taught. A framework will ultimately be produced that provides a checklist and criteria to ensure successful implementation of the technology and to evaluate the engagement and experience of the technology with the avatar, the acceptance levels and measure the performance of the technology.

How are the participants selected?

We are recruiting from students at Al-Baha University, Saudi Arabia who are studying English as part of their degree courses in the faculties of Computer Science, Science and Art faculty.

Participants will need to be able to understand verbal explanations and writing information in English.

What will I be asked to do?

You will be required to fill in a questionnaire before and after receiving a small amount of course content on your mobile phones designed to help you learn elements of English Language. You will also take part in a short quiz about the material presented. Learning material will presented in English but the questionnaires will be supplied in both English and Arabic. The actual experiment will last for 1-2 hours. Some students will be invited to participate further in the co-creating of user interfaces for content delivery.

What data will be collected, and how will it be used?

Data from the questionnaires and quizzes will be analysed using SPSS and will lead to identification of issues that will be explored by the participants in the co-creating workshops.

Where will the studies take place?

The procedure will take place in the classrooms of Al-Baha University, Saudi Arabia where you are studying.

What if I do not wish to complete the study?

Participants is entirely voluntary, and you can withdraw at any time without giving a reason.

Will my data be kept anonymous?

You will be asked to provide your name and contact details, and to sign a consent form so that the University can keep a record of your participation in the study. However, data from the study will be stored, processed, and reported using an anonymous user ID.

Can I learn the results of the study?

If you would like to learn the results at the end of the study, please contact the researcher.

Who are the researcher responsible for this study?

Experiments and study will be conducted by Ali Alowayr (PhD Computer Science) and will be supervised by Prof Rachel McCrindle.

Contact details:

Ali Alowayr

Email address: a.s.a.alowayr@pgr.reading.ac.uk

Mobile: 0507779632

Please feel free to contact us directly if you have questions about this study:

This project has been subject to ethical review, according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.

Appendix B: CONSENT FORM

Consent Form

1. I have read and had explained to me by Ali Alowayr

   The accompanying Information Sheet relating to the project on:

   Application of M-learning Using Avatars to Assist the Teaching of English as Part of Higher Education Courses in Saudi Arabia

   Contact details:

   Ali Alowayr

   Email address: a.s.a.alowayr@pgr.reading.ac.uk

   Mobile: 0507779632

2. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

3. I understand that participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment.

4. I agree to the interview/session being video/audio taped and understand that unless further agreement is obtained I will not be personally identified through these activates.

5. I understand that this project has been subject to ethical review, according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.

6. I have received a copy of this Consent Form and of the accompanying Information Sheet.

   Name: ……

   Date of birth ……

   Signed: ……...

   Date: ……..

Appendix B

The Supervisor's letter to the Saudi Arabian Cultural in London for the data collection

Professor Rachel McCrindle
School of Systems Engineering
University of Reading
Whiteknights
Reading, RG6 6AY

1st October 2015

To Whom it May Concern,

Mr Ali Alowayr

PhD Title: Application of m-learning with avatars to deliver English courses for Higher Education in Saudi Arabia

This letter is to confirm that I support the visit of my PhD student, Ali Alowayr, to Saudi Arabia for the period of three months, for the purposes of data collection in Albaha University. Ali needs to collect this data as it is an integral part of his PhD.

Yours faithfully

Professor Rachel McCrindle
Professor of Computer and Human Interaction
National Teaching Fellow
Director of Enterprise, School Systems Engineering
University of Reading, RG6 6AY
r.j.mccrindle@reading.ac.uk

Appendix C

The Saudi Arabian Cultural Bureau in London approval letter

بسم الله الرحمن الرحيم

ROYAL EMBASSY OF SAUDI ARABIA
CULTURAL BUREAU
LONDON

سفارة المملكة العربية السعودية
الملحقية الثقافية
لندن

التاريخ 1436/08/02هـ

إفـــادة

رقم الملف BHU100

تفيد الملحقية الثقافية بسفارة المملكة العربية السعودية في لندن بأن المبتعث/ علي سعيد عبدالله آل عوير سجل مدني (1044673091) مبتعث من قبل جامعة الباحة لدراسة الدكتوراة بجامعة University of Reading إعتبارا من 04-11-1434 هـ حتى 08-12-1437 هـ .

وقد أعطيت له هذه الإفادة بناءً على طلبه لتقديمها إلى جامعة الباحة.

وتقبلوا فائق التحيات،،،

الملحق الثقافي

بسفارة المم دية في لندن

فيصل بن محمد المهنا أبا الخيل

الرقم : ..... التاريخ : ..... الموافق : ..... المرفقات : .....

630 Chiswick High Road, London W4 5RY Tel: +44 (0) 20 3249 7000 Fax: +44 (0) 20 3249 7001 E-mail: sacbuk@uksacb.org
www.uksacb.org

Appendix D

The Al-Baha University approval letter to conduct the experiment

بسم الله الرحمن الرحيم

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الباحة (٠٤٢)
عمادة البحث العلمي

KINGDOM OF SAUDI ARABIA
MINISTRY OF HIGHER EDUCATION
AL-BAHA UNIVERSITY (042)
Deanship of Scientific Research

سعادة عميد كلية العلوم والآداب بالمخواه سلمه الله

السلام عليكم ورحمة الله وبركاته وبعد،،،

يقوم المحاضر/ علي بن سعيد آل عوير المبتعث في بريطانيا بإجراء دراسة بحثية عن طلاب وطالبات السنة التحضيرية بكلية العلوم والآداب بالمخواه ويرغب في تطبيق الدراسة طلاب وطالبات الكلية و جمع بيانات تتعلق بالبحث الحاقي بدرسة لمرحت الدكتوراه.

وعليه آمل تسهيل مهمة الباحث.

وتقبلوا خالص تحياتي وتقديري ،،،

١٤٢٧/٧/١٣

الرقم : ..... التاريخ : ..... المشفوعات : .....

تليفون : ٧٢٧٤١١١ - ٧ - ٠٠٩٦٦ فاكس : ٧٢٤٧٢٧٢ - ٧ - ٠٠٩٦٦ الباحة : ص.ب (١٩٨٨)

Appendix E

The pre-post questionnaire of the Experiment - 1

Part 1: Questionnaire to investigate the effectiveness of delivering course content through mobile devices using avatar interfaces

Ali Alowayr

Participant No. الرقم الجامعي

I am a PhD Student at the University of Reading, United Kingdom and as a part of my research I am investigating whether mobile devices can be used effectively for learning. This may be in relation to making learning more <u>effective</u>, <u>engaging</u> or <u>convenient</u>. Your answers to this questionnaire will be helpful to my study and ultimately in enhancing the use of mobile devices for learning. I would appreciate you taking the time to complete the following questions. They should take no more than 10 - 15 minutes of your time. Your participation is voluntary and your responses will be confidential and not attributed to any individual.

أنا طالب دكتوراه في جامعة ريدنج في المملكة المتحدة وكجزء من بحثي أقوم بدراسة ما إذا كان يمكن استخدام الأجهزة المحمولة بفعالية للتعلم. قد يكون هذا فيما يتعلق بجعل التعلم أكثر فعالية أو جاذبية أو ملاءمة. إجاباتك على هذا الاستبيان ستكون مفيدة لدراستي وفي النهاية في تعزيز استخدام الأجهزة المحمولة للتعلم. أود أن أشكرك على الوقت الذي ستستغرقه لإكمال هذا الاستطلاع والذي يجب أن يأخذ 10 - 15 دقيقة من وقتك. ما أود إبلاغك به هو أن مشاركتك طوعية وستكون إجاباتك سرية ولن تنسب إلى أي شخص على الإطلاق.

Section 1: About you and your mobile device الجزء الأول: أسئلة حول نفسك وعن جهازك المحمول

1. What is your gender?
   حدد جنسك؟
   ☐ Male ذكر ☐ Female أنثى

2. How old are you? .....
   كم عمرك؟

3. What is your faculty?
   ما هو تخصصك الدقيق؟
   ☐ Computer Science علوم الحاسب ☐ Science علوم ☐ Art آداب ☐ Other please specify:..... غير ذلك، حدد

4. Which year of study are you in?
   في أي سنة تدرس؟
   ☐ First year السنة الأولى ☐ Second year السنة الثانية ☐ Third year السنة الثالثة ☐ Fourth year السنة الرابعة

5. What mobile devices do you have now or have had in the past? Tick all that apply.
   ما نوع جهاز الجوال الحالي أو الذي سبق وأن استخدمته؟ قم بوضع علامة (√).

Type of Mobile نوع جوالك	**Now** الحالي	**Have had** سبق وان استخدمت
Basic-phone الجوال العادي		
IOS smart phone (e.g. iPhone) الفيون		
Android smart phone (e.g. Samsung Galaxy) سامسونج جالكسي		
Windows smart phone (e.g. Nokia Lumia, LG) نوكيا و إل جي		
Tablet (e.g. iPad) الفيباد		
Tablet (e.g. Galaxy) الجالكسي نوت		
Other please specify..... غير ذلك حدد		

6. If you have a mobile device (smart phone or tablet), how long have you had it?
في حال كنت تملك جهاز جوال، إما الجوال الذكي او التابلت مثل الايباد وغيره؛ حدد كم فترة تملكه؟

☐ Less than 1 year ☐ 1-2 years ☐ 2-3 years ☐ More than 3 years ☐ Do not have one
أقل من سنه واحده بين 1-2 سنه بين 2-3 سنه أعلى من 3 سنه لا تملك جوال

7. On average how many hours a day do you use your mobile device?
كم تقدر متوسط ساعات التي تقضيها يوميا على استخدام جهاز الجوال؟

☐ Less than 1 hour ☐ 1-2 hours ☐ 2-3 hours ☐ More than 3 hours ☐ Do not have one
أقل من ساعه بين 1-2 ساعه بين 2-3 ساعه أكثر من 3 ساعات لا استخدم مطلقا

8. How easy do you find your mobile device(s) to use?
كيف تجد سهولة استخدام جهاز جوالك؟

☐ Very easy ☐ Easy ☐ Fairly easy ☐ Quit complicated ☐ It is too complicated
سهل جدا سهل نوعا ما معقد نوعا ما معقد جدا

9. What features of mobile device(s) do you use? Tick all that apply.
ما هي مميزات الجوال التي تستخدمها؟ اختر من فضلك جميع ما ينطبق عليك بوضع علامة (√).

Usages of mobile devices استخدامات جهاز الجوال	**Often** غالبا	**Regularly** بانتظام	**Some** بعض	**Seldom** نادرا ما	**No at all** أبدا
Making phone calls إجراء المكالمات الهاتفية					
Text messaging الرسائل النصية					
Using Twitter for social purposes استخدام تويتر للأغراض الاجتماعية					
Using Facebook for fun استخدام الفيس بوك للتسلية					
Using WhatsApp for social purposes استخدام الواتس اب للأغراض الاجتماعية					
Calendar التقويم					
Reading articles, books, online content for fun قراءة المقالات والكتب والمحتويات الانترنت للتسلية					
Watching videos (e.g. YouTube) for fun مشاهدة مقاطع الفيديو اليوتيوب للتسلية والترفيه					
Playing games الألعاب التسلية					
Map facility خدمات الخرائط					
Taking, sending or viewing photos التقاط وإرسال ومشاهدة الصور					
Taking, uploading videos اخذ مقاطع الفيديو وتحميلها					
Browsing the web for fun تصفح الانترنت للتسلية والمتعة					
Browsing the web to find educational content (e.g. reading articles and attending virtual classes or tutorials. تصفح و مشاهدة الدروس التعليمية على الانترنت كقراءة المقالات وحضور الدروس الصفوف الافتراضية					
Other please list ..... غير ذلك حدد					

Section 2: Mobile Learning الجزء الثاني التعليم عن طريق الجوال

10. Do you understand what m-learning involves?
هل لديك فهم عن ماذا يُقصد بالتعليم الالكتروني عن طريق الجوال؟

☐ Yes نعم ☐ No لا ☐ Partially جزئي ☐ Not sure غير متأكد

11. Given the definition of m-learning as "learning across various contexts, through social and content interactions, using personal electronic mobile devices, thereby enabling students to access learning materials", have you had experience of using m-learning?
بالنظر الى تعريف التعلم عن طريق الجوال نجد انه يقول التعليم أشكاله المتنوعة سواء مقروء او مسموع او فيديو من خلال التفاعل مع المحتوى العلمي باستخدام اجهزة الجوال الذكية الشخصية، مما يساعد المتعلم في سهولة الدخول للمادة العلمية والاستفادة منها. هل لديك اي خبرة او تجربة عن هذا التعليم؟

☐ Yes, a lot نعم، كثيرا ☐ Yes, a little نعم قليلا ☐ No لا ☐ Not sure غير متأكد

12. How important do you think the convenience of m-learning is?
ما مدى الاهمية الذي تعتقد في راحة وملاءمة التعلم المحمول عن طريق الجوال؟

☐ Very important مهم جدا ☐ Important مهم ☐ Neutral محايد ☐ Not important غير مهم ☐ Not sure غير متأكد

13. In your previous and/or current education what kinds of learning have you experienced? Check all that apply.
في دراستك الماضي والحالية ما نوع التعليم الذي جربت؟ اختر ما ينطبق بك بوضع علامة (√).

Male and female respondents للذكور والاناث				
Mechanism of learning delivery طرق توصيل التعليم	**Regularly** بانتظام او دائما	**Some** بعض	**Seldom** نادرا ما	**Not at all** لا بدا
Face-to-face lectures (traditional course) in class المحاضرات التقليدية وجها لوجه داخل الصف				
Face-to-face screen cast with male instructor in class صورة المحاضر من خلال الشاشة داخل القاعة الدراسية				
Online learning (e-learning) via PCs or laptops التعليم الالكتروني عن طريق الكمبيوتر او اللابتوب				
Mobile learning (m-learning) via phones or tablets التعليم الالكتروني عن طريق جهاز الجوال				
Female respondents only للاناث فقط				
Face-to-face screen casts with female instructor in class صورة المحاضرة من خلال الشاشة داخل القاعة الدراسية				
Other please list ..... غير ذلك حدد				

14. The following are examples of learning related activities that can be done on a mobile device. Tick all those that you have done or think you would do if they were available.
فيما يلي أمثلة لأنشطة يمكن أن تكون سبق لك وأن استخدمتها عن طريق الجوال أو لديك الرغبة في استخدامها عن طريق جهاز الجوال. حدد اي منها يناسب معك بوضع علامة (√).

Activity examples أمثلة على الفعاليات	Have done سبق وان استخدمت	Would do سوف استخدمه	Might do قد استخدمه	Would not do لا ارغب في استخدامه
Register for courses تسجيل مواد الفصل الدراسي				
Check course timetable التعرف على الجدول الدراسي				
Check course syllabus and references information التعرف على مفردات المنهج و مراجع المقرر الدراسي التعليمية				
Listen to lectures as screen casts الاستماع الى المحاضرات				
View educational videos مشاهدة مقاطع فيديو تعليمية				
Submit course work تسليم الاعمال والواجبات المنزلية				
Access library account for reserve or renew books الدخول على الحساب الخاص بالمكتبة وتجديد الكتب المستعارة				
Access library database to search for books or information الدخول على قاعدة بيانات المكتبة والبحث في المصادر التعليمية				
Use social media for education (e.g Facebook) استخدام ادوات التواصل الاجتماعي في التعليم مثل الفيس بوك				
Pay fees دفع الرسوم				
Take tests إجراء اختبارات				

Section 3: Avatars ممثل أو وكيل

15. Have you heard of the term avatar?
هل سبق وان سمعت بمصطلح الممثل أو التشبيه بدور شخص ما، مثل المعلم او الطبيب الالكتروني؟

☐ Yes نعم ☐ No لا ☐ Not sure غير متأكد

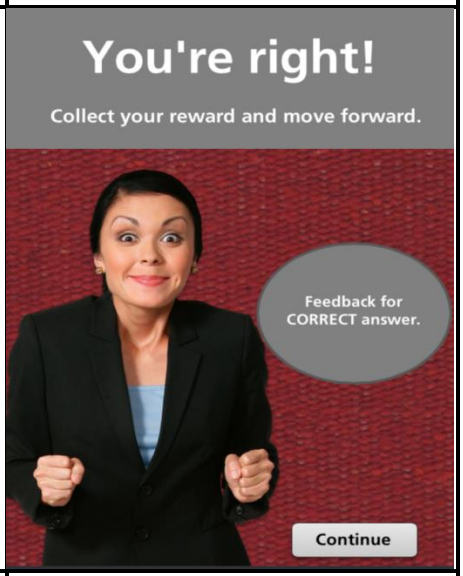
16. Do you know what the term avatar means?
هل تعرف ماذا يعني مصطلح الممثل او التشبيه؟

☐ Yes نعم ☐ No لا ☐ Not sure غير متأكد

17. Given the definition of an avatar as a digital representation of a person that can be static or animated and which might take the form of audio, talking heads or full-figure models, have you had any experience of using avatars?
بالنظر إلى تعريف التشبيه من جديد أنه تمثيل رقمي أي الكتروني لصفات الشخص (المعلم) بحيث يكون إما على شكل صور مثبته أو متحركة كما يمكن أن يلقي صوتيا أو يظهر على هيئة رأس المتحدث أو يظهر كامل شكله و اطرافه على شاشة الكمبيوتر، وحدات التعلم المحمول مثل الجوال، أو على أجهزة الالعاب لغرض إرشاد وتوجيه المستخدم. هل سبق وأن استخدمت أو رأيت مثل ذلك؟

☐ Yes, a lot نعم، كثيرا ☐ Yes, a little نعم قليل ☐ No لا ☐ Not sure غير متأكد

A	B
	
Audio and text avatar صمم صوتي وصلها	**Static male photo avatar** صمم شكل على شكل صورة رجل شبكته

C	D	E
		
Talking head male avatar صمم شكل على شكل شخصي رجل تحكه	**Static or animated Cartoon avatar** صمم شكل على شكل شخصيات كارتون تتحرك	**Static female photo avatar** صمم شكل على شكل شخصية إمرأة شبكته

18. Each of the above examples can be classified as a type of avatars, have you encountered any of these types?
كلا من الأمثلة أعلاه يمكن تصنيفه كنوع من أنواع الممثل أو الشخصية؟ هل سبق لك وإن واجهت أيا من عينة هذه الأنواع؟

☐ Yes نعم ☐ No لا ☐ Not sure غير متأكد

Which ones, Tick all that apply? A☐ B☐ C☐ D☐ E☐
أي منها ؟

Section 4: Mobile learning and Avatars' preferences and effective performance

الجزء 4 التعليم عن طريق الجوال و مدى فاعلية وتأثير المشاعر على أداء الطلاب مقرونا بالمشاعر الأكثر رغبة

19. If given a choice would you prefer your course to be delivered through:
لو اعطيت الاختيار، هل ترغب أن تتعلم اللغة الانجليزية من خلال:

☐ Traditional face to face ☐ Mobile device ☐ Combined approach ☐ Not sure
التعليم التقليدي وجه الوجه جهاز الجوال الاثنين معا غير متأكد

20. If you were learning via a mobile device how important do you think it is to have an avatar on the m-learning screen rather than just textual delivery to **engage** you in learning?
لو كنت تتعلم بواسطة الجوال، ما مدى الاهمية الذي تعتقد بأنه لابد من احتواء شاشة الجوال التعليمية على المشاعر لكي **يجذبك** التعلم مقارنة فقط بالتعليم النصي ؟

☐ Very important ☐ Important ☐ Neutral ☐ Not important ☐ Not sure
مهم جدا مهم محايد غير مهم غير متأكد

21. Which avatar type do you think would be **most engaging and enjoyable** to learn through on mobile phone? Please rank 1 as the most preferred and carry on to 5 as the least preferred.
أي من أنواع المشاعر تعتقد أنه سوف **يبهجك و يجذبك** للتعلم من خلال شاشة الجوال؟ فضلا قم بترتيب الاكثر رغبة بترقيم متسلسل بالارقام حتى 5 للأقل رغبة.

Male and female respondents 	**للذكور والإناث**
Type of m-learning delivery on mobile device which would engage me طرق التدريس من خلال الجوال التي تعتقد أنها **ستزيد من حماسي** للتعلم	**Rank** قيّم
Instructor voice only with text (but no image) صوت المعلم شارح للدرس مع ظهور النص فقط وبدون أي صورة	
Static photo avatar including text + voice صوت وصورة للمعلم الثابتة مع ظهور النص المشروح للقراءة	
Talking head avatar including text + video صوت وصورة للمعلم المتحركة مع ظهور النص للقراءة (مثل المقاطع الفيديو)	
Static or animated cartoon avatar including (text + speech) صوت وصورة للمعلم على شكل شخصيات كارتون مع ظهور النص المشروح للقراءة	
No avatar text only لا يوجد مشاعر للمعلم النص للقراءة فقط	
Female respondents only 	**للإناث فقط**
In general do you have a preference for male or female avatar ☐ Male ☐ Female ☐ No preference بشكل عام هل تفضلين التعلم من مشاعر المعلم الذكر أو الأنثى؟ لا مهم سواء تفضلين	

22. Which avatar type do you think would be **most effective** in helping you to learn the most information and improve your performance of the course through your mobile phone? Please rank 1 as the best avatar for retaining information and 5 as the least effective avatar.

أي من أنواع الأفاتار التالية تعتقد أنه سوف **يؤثر** على قدرتك على التعلم من خلال **تحسين أدائك** من خلال التعلم عن طريق شاشة الجوال؟ من فضلك قم بترتيب الأفاتار التالية بالأرقام حيث رقم 1 هو الأفضل لاستخدامه.

Male and female respondents	**للذكور والإناث**
Type of m-learning delivery on mobile device which would affected me to learn	**Rank**
طرق التدريس من خلال الجوال التي تعتقد أنها ستؤثر إيجابا على تعلمي	ترتيب
Instructor voice only with text (but no image) صوت المعلم لشرح الدرس مع ظهور النص فقط وبدون أي صوره	
Static photo avatar including text + voice صوت وصورة للمعلم الثابتة مع ظهور النص المشروح للقراءه	
Talking head avatar including text + video صوت وصورة للمعلم المتحركه مع ظهور النص للقراءه (على الهاتف الفيديو)	
Static or animated cartoon avatar including (text + speech) صوت وصورة للمعلم على شكل شخصية كارتون مع ظهور النص المشروح للقراءه	
No avatar text only لا يوجد معلم للنص للقراءة فقط	
Female respondents only	**للإناث فقط**
In general do you have a preference for male or female avatar ☐Male ☐Female ☐No preference بشكل عام هل تفضلين التعلم من مثل المعلم الذكر أو الأنثى؟ للذكر الأنثى كلاهما سواء	

We are particularly interesting in how m-learning could be used to help students learn English language as a core course within their programme of study.

يهمنا من القيام البحث تحديدا في كيفية استخدام الجوال في التعليم كيف يساعد الطلاب على تعلم اللغة الانجليزية والتي تعتبر مقررا أساسيا في خطتك الدراسية

23. How **engaging and enjoyable** do you think m-learning using avatars will be compared to traditional face-to-face learning of English would be?

ما هو رأيك في **الجاذبيه والابتهاج** الذي يتسبب في تعلم اللغة الانجليزية من خلال الجوال الذي يحتوي على مثل قارنه بالتعليم التقليدي وجها لوجه في الصف الدراسي؟

☐ Very engaging مجذب جدا ☐ Quite engaging مجذب ☐ Not engaging غير مجذب ☐ Not sure غير متأكد

24. How **effective** do you think m-learning with an avatar will be in helping you to learn information and improve your performance of English language compared to traditional face-to-face learning?

ما هو رأيك في **فاعليه** التعليم من خلال الجوال بوجود مثل على الشاشه ومدى **تأثيره الايجابي** على تعلمك لتحسين الأداء اللغة الانجليزية قارن بالتعليم التقليدي وجها لوجه في الصف ؟

☐ Very effective فعال جدا ☐ Quite effective فعال ☐ Not effective غير فعال ☐ Not sure غير متأكد

Please select by (√) an answer that best represent how much you agree or disagree with the following statements مفضلك قم باختيار ما ينطبق من مدى موافقتك او عدم موضوع علامة (√)

1. Strongly Disagree لا اوافق بشدة 2. Disagree لا اوافق 3. Neutral محايد 4. Agree اوافق 5. Strongly Agree اوافق بشدة

No	Questions الاسئلة	Represent				
		Strongly Agree اوافق بشدة 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافق بشدة 1
25	I think that m-learning could be more **convenient** to me than learning face-to-face in class أنا اعتقد أن التعلم من خلال الجوال باللغة الانجليزية يمكن ان يكون اكثر **ملائمة** و**مناسب** لي اكثر من التعلم بالحضور لمحاضرات الصف فيه					
26	I think the portability of mobile device plays a strong factor in enabling me to learn anywhere and anytime اعتقد أن خاصية المحمول والتنقل بالجوال عبك عامل قوي في تمكيني من تعلم اللغة الانجليزية في أي مكان وزمان					
27	I think the repeatable and pause features of lessons on the mobile device would be more beneficial to me than a traditional class. اعتقد ان خاصية الايقاف المؤقت و اعادة تكرار شرح الدروس على الجوال تساعدني في التعلم عن طريق الجوال اكثر فائدة من الصف التقليدي حيث لا اجد هذه الخاصية في التعلم في الصف					
28	I think that m-learning could **engage** me in learning English lesson more than learning in face-to-face أنا اعتقد ان التعلم من خلال الجوال **سيجذبني** اكثر في تعلم اللغة الانجليزية بشكل أكبر من التعلم عن طريق الحضور لصفي					
29	I think that m-learning could be a more **effective** way to learn English language than learning in face-to-face class أنا اعتقد أن التعلم من خلال الجوال يمكن أن يكون وسيلة **جيده فعاله** و**ناجحة** لتعلم اللغة الانجليزية أكثر من حضور المحاضرات الصفية					
30	I think having access to the English materials on my mobile device would enhance my motivation to learn English language أنا اعتقد أن الدخول على محتوى مقرر الانجليزي عن طريق جهاز الجوال سيعزز من تحفيزي لتعلم اللغة الانجليزية					
31	I think m-learning could strengthen my participation when learning English language أنا اعتقد ان التعلم من خلال الجوال يمكن أن يقوي مشاركتي في تعلم اللغة الانجليزية من خلال هذا البحث					
32	I think having access to the English materials on my mobile device could enhance my learning-content interaction أنا اعتقد أن الدخول على دروس مقرر الانجليزي عن طريق جهاز الجوال سيعزز من تفاعلي مع محتوى تعلمي في مقرر اللغة الانجليزية					
33	I think what the avatar interface looks like is important for m-learning انا اعتقد ان الذي في شكل و مظهر الواجهة محتوى على مهم في التعلم، هي شيء مهم لتعلم من خلال الجوال					
34	I think having an image of the instructor on mobile screen is important for helping me to concentrate انا اعتقد ان احتواء شاشة الجوال لتعليمي على صورة المعلم شرح يحسوف يكون مهم ومساعد لي في التركيز في المحاضرة الم شروحه					

No	Questions الاسئلة	Strongly Agree اوافق بقوة 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافق بقوة 1
35	I think interacting with the English materials on my device via an avatar would improve my understanding of the lesson أنا اعتقد أن التفاعل مع محتوى مقرر اللغة الإنجليزي عن طريق جوالي بوساطة المُمثل سوف يحسن من فهمي للدروس في اللغة الإنجليزية					
36	I think having the mobile interface with an avatar would assist me to learn English language أنا اعتقد أن استخدام شاشة جوالي مع المُمثل **يساعدني** على تعلم قواعد اللغة الانجليزية					
37	I think having the mobile interface with an avatar will be fun to learn from أنا اعتقد أن استخدام شاشة جوالي مع المُمثل على شكل شخصية كرتونية سوف يجعل تعلمي ممتعاً					
38	I think having an avatar will **improve** my retention of information that I have learnt أعتقد أن وجود المُمثل على شاشة جوالي سوف يحسن من تذكري للمعلومات التي تعلمتها					
39	I think female students should be able to choose and learn from whatever screen gender they prefer to learn from on a mobile device اعتقد ان الطالبات لديهن القدرة والحرية في اختيار الجنس الذي يفضلن التعلم منه على شاشة جوالي					

Female respondents only  **للإناث فقط**

No	Questions الاسئلة	Strongly Agree اوافق بقوة 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافق بقوة 1
40	I think learning from a female instructor in a face-to-face class would **engage** me to learn more than learning via a screen cast of a male instructor اعتقد أن التعلم من وجه لوجه مع المعلمة داخل الصف سوف **يحمسني** للتعلم أكثر من التعلم من المعلم الرجل من خلال الجوال					
41	I think learning from a female instructor via a mobile screen cast would be more **effective** than learning from a male instructor via a mobile screen cast اعتقد أن التعلم من المعلمة من خلال شاشة الجوال التعليمية له **تأثير فعال** أكثر من التعلم من الرجل المعلم على شاشة الجوال					
42	I find a face-to-face female instructor more **engaging** to learn from than screen based a male instructor أنا أجد شكل عام أن التعلم من المعلمة الأنثى وجه لوجه داخل الصف الحقيقي أكثر تشويقاً للتعلم من المعلم الرجل الموجود على الشاشة					

43. What do you think would be two potential benefits to you of m-learning?

عدد اثنين أو أكثر تعتقد أنها من مميزات التعلم من خلال الجوال

1- .....

2- .....

44. What do you think would be two potential negatives to you of m-learning?

عدد اثنين أو أكثر تعتقد أنها من عيوب التعلم من خلال الجوال

1- .....

2- .....

45. Are there any other comments you would like to make about how traditional face to face teaching of English language as a part of your course could be improved or enhanced through the use of m-learning and avatars?

هل لديك أي تعليقات أو ملاحظات أخرى ترغب أن تضيفها على التعليم التقليدي (وجه لوجه) الذي تتبعه الآن والتي يمكن أن تطورها وتحسنها من خلال التعلم عن طريق الجوال التحتوي على مثل؟

Thank you for your participating. No comments made will be attributed to any identified individual. We would like to develop more specific avatars for mobile learning. If you would be willing to participate further in this research, please fill in your contact details below

اشكر لك مشاركتك في تعبينه هذه الاستبانه و أود أن اشعرك بأنه لن يفشى أي معلومات خاصة عنك ولن يظهر اسمك الشخصي بملاحظات فرديه. كل ما يريده الباحث هو عمليه تطوير التعليم من خلال الجوال بإضافة ممثل للمعلم على شاشه المستخدم لكي يتفاعل معه. اذا كنت مهتما وترغب في المشاركه في هذا البحث، فمن فضلك املاء بياناتك في الحقول التاليه

Please write your name, email address below and/or your mobile phone number.

(فمن فضلك اكتب اسمك وعنوان بريدك و/أو رقم جوالك اختياري)

Full name: .....

Email address: .....

Mobile number: .....

Part 2: Post-questionnaire to investigate the effectiveness of delivering course content through mobile device using an avatars interfaces. The purpose of this questionnaire is to help the researcher as a part of his PhD therefore, participants are going to do short tests which would not be formal nor connect to their modulus.

Participant No. _____
الرقم الجامعي

Now that you have experienced mobile learning in your university study, Please answer the following questions الآن اصبح لديك الخبرة الوتجربه للتعلم من خلال جهاز الجوال. فنرجو منك أجب عن الاسئلة التالية

Please tick all that apply: بوضع علامة (√) أمام ما تراه مناسب مع وضعك

No	Questions الاسئله	A lot كثيرا	Some بعض	Not at all لا بلدا	Not sure غير متأكد
46	Did you **enjoy** having content delivered to you by a mobile device هل **استمتعت** بمحتوى المحتوى المقدم من خلال جهاز الجوال الخاص بك				
47	Did the content delivered to you by a mobile device **engage** you هل المحتوى الذي أعطى لك من خلال جهاز الجوال **جذبك وتحمست له**				

48. If you had more content delivered on your mobile device would you be more motivated to learn English than via traditional teaching (face-to-face)?
في حال كان هناك مزيدا من المحتويات التعليمية ستعطى لك عن طريق جهاز الجوال الخاص بك، هل ستكون متحمس لها أكثر من التعليم التقليدي وجها لوجه؟

☐ Yes, more motivated نعم متحمس جداً ☐ As motivated متحمس ☐ No, less motivated لا غير متحمس ☐ Not sure غير متأكد

49. How important do you think the **convenience** of m-learning is?
ما مدى الاهمية الذي تعتقد في **ملاءمه و راحة** التعلم من خلال الجوال المحمول؟

☐ Very important مهم جدا ☐ Important مهم ☐ Neutral محايد ☐ Not important غير مهم ☐ Not sure غير متأكد

50. Do you think accessing course material on your mobile device with an avatar helped you to learn the material better than the same content presented in traditional formats (face-to-face)?
هل تعتقد ان الدخول على المحتوى المقرر الدراسي عن طريق الجوال المزود بالمساعد على التعلم الدرس مقارنة مبأن أعطي لك بالطريقة التقليدية وجها لوجه؟

☐ Yes نعم ☐ May be احتمال ☐ No لا ☐ Not sure غير متأكد

51. Which type of teaching do you think enabled you to learn the most information and made you feel you have learnt something? Please rank 1 as the **most effective** way of learning information and 6 or 7 as the least effective way.
أي من طرق التدريس التالية تعتقد أنها **ساعدتك على الاحتفاظ بالمعلومات** التي تعلمت وجعلتك تشعر ما؟ فنرجو منك تقييم الطرق التالية بوضع رقم 1 أمام الطريقة الأكثر فاعلية وتنتهي برأيك بوضع رقم 6 أو 7 أمام الطريقة الأقل فاعلية.

Male and female respondents للذكور والإناث	Rank تقيّم
Type of teaching mechanism that I really find it affected my performance of learning نوع او طريقة التدريس التي تعتقد أنها ساعدتك على **الاحتفاظ بالمعلومه ورفعت من أدائك في الاختبار**	
Traditional class teaching face-to-face in class التدريس التقليدي وجها لوجه داخل الصف	
No avatar, textual only through mobile device تعلم من خلال شاشة الجوال النصوص فقط	
Text and audio avatar through mobile التعلم من خلال جهاز الجوال بدون أي صوره النصوص والصوت	
Static male avatar with text + voice through mobile device صوت وصورة ثابتة من خلال جهاز الجوال مع النص للقراءه	
Talking head male avatar with text + video through the mobile device صوت وصورة المعلم المتحركه من خلال جهاز الجوال مع النص للقراءه اي المقطع الفيديوي	
Animated cartoon avatar with text + speech through the mobile device صوت وصورة المعلم على شكل شخصيه كرتونيه تتحرك من خلال جهاز الجوال مع النص للقراءه	
Female respondents only للإناث فقط	
Static female avatar with text + video صوت وصورة ثابتة من خلال جهاز الجوال مع النص للقراءه	

52. Which type of teaching did you find **most engaging and enjoyable** to learn from? Please rank as 1 as the most preferred and 6 or 7 as the least preferred way.

أي من طرق التدريس التاليه وجدت فيها الاكثر جاذبيه ومتعه و تحقق رغبتك في التعلم من خلالها. من فضلك قيم الطرق التاليه بوضع رقم 1 امام افضل طريقة تدريس لاستخدام الارقام الأقل تفضيلا ورقم 6 للذكور و 7 للاناث

Type of teaching mechanism that I really find most engaging and enjoyable to learn نوع او طريقه التدريس التي تحقق لك **رغبت التلعم من خلالها وزادت من حماسك للتعلم**	**Rank** قيّم
Traditional class teaching face-to-face — طريقة التدريس التقليديه وجه لوجه داخل الصف	
No avatar, textual only through mobile device — بدون مُمَثِل للتعليم من خلال شاشه الجوال النص فقط	
Text and audio avatar through mobile — الصوت والنص المقروء من خلال جهاز الجوال بدون أي صوره للمعلم	
Static male avatar with text + voice — صوت وصورة المعلم الثابته من خلال جهاز الجوال مع النص للقراءه	
Talking head male avatar with text + video through the mobile device — صوت وصورة المعلم المتحركه من خلال جهاز الجوال مع النص المقروء اي المقطع الفيديوي	
Animated cartoon avatar including text + speech through the mobile device — صوت وصورة المعلم على شكل شخصيه كرتون متحركه من خلال جهاز الجوال مع النص للقراءه	
Female respondents only — **للإناث فقط**	
Static female photo avatar with text + voice through the mobile device — صوت وصورة المعلمه الثابته من خلال جهاز الجوال مع النص للقراءه للطالبات فقط	

Having tried m-learning please select by (√) an answer that best represent how much you agree or disagree with the following statements.

بعد ان قمت بتجربة هذه التجارب حول التعلم بواسطة الجوال، من فضلك قم باختيار ما يناسبك من مدى موافقتك أو عدم موافقتك بوضع علامة (√)

1. Strongly Agree اوافق بقوه
2. Agree اوافق
3. Neutral محايد
4. Disagree لا اوافق
5. Strongly Disagree لا اوافق بقوه

No	Questions الاسئله	Represent				
		Strongly Agree اوافق بقوه 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافق بقوه 1
53	I think the m-learning would be more **convenient** to me than learning face-to-face in class أنا اعتقد ان التعلم من خلال الجوال للغه الانجليزيه يمكن ان يكون **مفيد** و**مناسب** لي اكثر من التعلم بالحضور للمحاضرات الصفيه					
54	I think the repeatable and pause features of lessons on the mobile device would be more **convenient** to me than a traditional class. اعتقد ان خاصيه الايقاف المؤقت و إعادة تكرار تشغيل المقطع التعليمي عن طريق الجوال كانت أكثر **فائده و ملاءمه** لي حيث لا اجد هذه الخواص في التعليم الصفي					
55	I think the portability of mobile device plays a strong factors in enabling me to learn anywhere and anytime اعتقد أن خاصيه المحمول لتنقل جهاز الجوال كانت عامل قوي في تمكيني من تعلم اللغه الانجليزيه في أي مكان و زمان					
56	I think that the m-learning would be a more **effective** way to learn English language than learning face-to- face in classes أنا اعتقد ان التعلم من خلال الجوال كان وسيله **جيده فعاله وناجحه** لتعلم اللغة الانجليزية أكثر من حضور المحاضرات الصفيه					
57	I think having access to the English materials on my mobile devices would enhance my motivation to learn English language أنا اعتقد ان الدخول على محتوى مقرر الانجليزي عن طريق جهاز جوالي عزز وقوى الرغبة في تعلم اللغة الانجليزيه					

No	Questions الاسئلة	Strongly Agree اوافق بقوة 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافق بقوة 1
58	I think m-learning would strengthen my participation when learning English language أنا اعتقد أن التعلم من خلال الجوال سوف يقوي من مشاركتي في التعلم إذا كان المحتوى هو مقرر اللغة الانجليزية					
59	I think m-learning will increase my understanding of the learning material than face-face in class أنا أعتقد أن التعلم من خلال الجوال سوف يزيد من فهمي للغة الانجليزية بشكل أكبر من التعلم عن طريق الحضور في الصف					
60	I think having access to materials on mobile devices would enhance content–learner interaction أعتقد أن الدخول على محتوى مقرر اللغة الانجليزية عن طريق الجوال يزيد من تفاعلي مع المحتوى التعليمي لمقرر اللغة الانجليزية					
61	I think what the avatar interface looks like is important for m-learning انا اعتقد أن الذي يشكل ومظهر الواجهة المحتوي على الشخص المعلم، هي شيء مهم للتعلم من خلال الجوال بسبب جاذبيته وشده انتباه المتعلمين					
62	I think having an instructor avatar would cause me to lose concentration انا اعتقد ان وجود الشخص المعلم على شاشة الجوال التعليمي سوف يسبب فقدان التركيز في الدرس					
63	I think having an m-learning interface with an avatar would positively assist me to learn English أنا اعتقد أن واجهة شاشة الجوال المستخدم لها شخص المعلم سوف يساعدني بشكل إيجابي على تعلم اللغة الانجليزية					
64	I think having an interface with an avatar will be fun to learn from أنا اعتقد أن واجهة شاشة الجوال المستخدم لها شخص المعلم يعبر شيء ممتع للتعلم منه					
65	I would prefer to learn in the normal traditional face-to-face class التعلم من خلال حضور المحاضرات التقليدية وجها لوجه					
66	I would prefer having an m-learning interface without an avatar (e.g text only) أفضل التعلم من خلال شاشة الجوال النصية فقط من دون صوت أو صور للمعلم					
67	I would prefer to learn through mobile devices including text + voice via mobile device (but no image) أفضل التعلم من خلال الجوال الذي يحتوي على نص وصوت لشرح المعلم ولكن لا يحتوي على صوره					
68	I would prefer to learn with a static male avatar via mobile device with text + voice انا افضل التعلم من خلال جهاز الجوال الذي يحتوي على صوره المعلم الثابته مع ظهور الصوت والنص المشروح					
69	I would prefer to learn with a talking head male avatar via mobile devices with text + video انا افضل التعلم من خلال الجوال الذي يحتوي على صوره المعلم المتحركه ظهور الصوت والنص المشروح الفيديو مع					
70	I would prefer to learn with a cartoon photo avatar via mobile devices with text + speech انا افضل التعلم من خلال الجوال الذي يحتوي على صوره المعلم على شكل شخصيه كرتونيه تتحرك مع ظهور الصوت والنص المشروح					
71	I plan to continue using my mobile device for receiving educational content (if available). انا أعزم أن أواصل على استخدام الجوال التعليم اذا كان متاحا					
72	I believe extending the concept of the avatar to other courses would be useful. انا اؤمن ان وجود المعلم المخلف في المقررات الاخرى سيفيد جدا					

No	Questions الأسئلة	Strongly Agree أوافق بقوة 5	Agree أوافق 4	Neutral محايد 3	Disagree لا أوافق 2	Strongly disagree لا أوافق بقوة 1
73	I think having an avatar approach would increase my understanding of information that I have learnt أعتقد أن طريقة المثل التي استخدمت سيزيد من فهمي للمعلومات التي تعلمت					
74	I think having an avatar approach would increase my retention of information that I have learnt أعتقد أن طريقة المثل التي استخدمت سيزيد من احتفاظي بالمعلومات التي تعلمت					
75	I think female students should be able to choose and learn from whatever screen gender they prefer to learn from on the mobile device أعتقد أن الطالبات يجب أن يكون قادرات على اختيار جنس المعلم الذي يفضلن التعلم منه على الشاشة عند استخدام التعلم من خلال الجوال					
Female respondents only						
76	I would like to learn with a static female avatar via a mobile device with text + voice أفضل التعلم من خلال الجوال الذي يحتوي على صورة المعلمة الثابتة مع ظهور النص والصوت					
77	I think learning from a female instructor in a face-to-face class would **engage** me to learn more than learning via a screen cast of a male instructor أعتقد أن التعلم وجها لوجه مع المعلمة داخل الصف سوف **يحمسني ويدفعني** أكثر من التعلم من المعلم الرجل من خلال الجوال					
78	I think learning from a female instructor via a mobile screen cast would be more **effective** than learning from a male instructor via a mobile screen cast أعتقد أن التعلم من المعلمة من خلال شاشة الجوال التي يبدو له **تأثير فعال** أكثر من التعلم من المعلم الرجل على شاشة الجوال					
79	I find a female face to face instructor more **engaging** to me than learning via screen cast of male instructor at the class أنا أجد بشكل عام أن التعلم من المعلمة الأنثى وجها لوجه **يحمسني ويجذبني** للتعلم أكثر من المعلم الرجل عبر الشاشة المرئية					

80. How well do you think you have done in the test using your favourite avatar?
كيف تعتقد أن أحد نماذج المعلمين **ساعدك في رفع أدائك** وتحصيلك العلمي في الاختبار. اختر الإجابة التي تعتقد أنك تستحقها؟

☐ Great ممتاز ☐ Good جيد ☐ Average متوسط ☐ Poor ضعيف ☐ Do not know لا أعلم

Having tried m-learning, would you like to experience it further, please tick all that apply:
بعد أن قمت بهذه التجارب من خلال التعلم عن طريق الجوال، هل ترغب في تكرار هذه الطرق من التعلم المتنقل، ضع علامة (√) أمام ما يناسبك

No	Questions الأسئلة	Yes نعم	May be احتمال	No لا	Not sure غير متأكد
81	Would you like to undertake future courses with integrated mobile learning for English language هل ترغب في أن تدرس المقررات الإنجليزي عن طريق الجوال				
82	Would you like to undertake future courses with integrated mobile learning for other courses هل ترغب في أن تدرس المقررات الأخرى عن طريق الجوال				
83	Would you recommend m-learning with an avatar interface to other students هل ستنصح هذه الطريقة لطلاب الأخرين للتعلم من خلال الجوال المحمول مع وجود المعلم لغرض الشرح والتوجيه وشد الانتباه				

84. What did you like most about learning using avatars?
ما هو أكثر شيء أعجبك وربما غيره من خلال تعلمك مع وجود المشكل ؟

85. What did you dislike most about learning with an avatars?
ما هو أكثر شيء لم يعجبك ولربما تمنيت تغييره من خلال تعلمك مع وجود المشكل؟

86. What do you feel was engaging about m-learning using avatars?
صف مدى إندماجك واستمتاعك الذي شعرت به أثناء أخذك هذه الدروس العلمية مع وجود المشكل العلم؟

87. How could the avatars you used be improved? ما هو رأيك في تطوير المشكل العلم التي استخدمت؟

88. Are there any other comments you wish to make about your experience of receiving course content with an avatar?
هل لديك أي ملاحظات تتمنى أن تضيفها من أجل تحسين وتسهيل تعلمك المشكل العلم على استقبال الدروس العلمية ؟

Thank you for your participation. No comments made will be attributed to any identified individual. We would like to develop specific avatars that are engaging to you for mobile learning. In order to do this the researcher will run a workshop where learners will be given the opportunity to express their views and ideas about how the avatars should be developed.

اشكرك على مشاركتك في هذه الدراسه البحثيه واحيطك علماً بانه لن يفشى أي معلومات خاصة عنك ولن يظهر اسمك الشخصي بملاحظات فرديه. كل ما يريده الباحث هو عمليه تطوير التعليم من خلال الجوال بإضافة ممثل للمعلم على شاشه المستخدم. من اجل ان نقوم بذلك فان الباحث يتطلع الى انشاء ورشه عمل والتي من خلالها يتاح للمتعلمين الفرصه لإعطاء وجهات نظرهم والمشاركه بأفكارهم والتي ستوخذ بعين الاعتبار والجديه في تطوير واعاده تصميم هذه الواجهات لعرض الدروس العلميه. اذا كنت ترغب في المشاركه في هذه الورشه، فاكتب بياناتك في الحقول التاليه.

If you are willing to take part in the workshop, please write your name, email address below and/or your mobile phone number. فنرجو منك كتابة اسمك وعنوان بريدك الخاص وكذلك رقم جوالك حتى يتم التواصل معك

Full name: .....

Email address: ..... Mobile number: .....

Appendix F

The pre-post questionnaire of the Experiment - 2

Thank you for taking part in this experiment. This second set of experiments builds upon an initial experiment to investigate whether mobile devices can make English language learning more effective and engaging. I would appreciate you taking the time to complete the following questions. They should not take more than 10 – 15 minutes of your time. Your participation is voluntary and your responses will be confidential and not attributed to any individual.

Section 1: About you and your mobile device الجزء ا .ول أسئله عزمعلومهتك

1. What is your student number? كتتب اسلك الثلاثي باللاعربي
2. What is your gender?
   حدد جنسك؟
   ☐ Male ذكر ☐ Female ثنى
3. What is your faculty?
   ما هوتخصصك مرتقبلاً؟
   ☐ Science علوم ☐ Arts أدآب
4. In your previous and/or current education, have you experienced m-learning?
   ☐ Yes ☐ No ☐ Maybe

Section 2: Your views about how effective and engaging you find different styles of m-learning delivery. Please tick the box that most closely represents your views.

No	Questions الاسئله	Represent				
		Strongly Agree اوافقبشدوه 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافقبشدوه 1
	I liked having an m-learning interface with: **انا أفضل التعلم عن طريق شاشة الجوال اذا كانت تحتوي على:**					
5	Voice (audio) media instruction صوت لتعليم مع ظهور النص المشروح					
6	Video media instruction صورةوصوت لتعليم على شكلفيديو					
7	Cartoon media instruction مثل للتعليم على شكلشخصيه كرتونيه مع ظهورلصوت والنص					
	With regards to self-assessment and feedback interaction **التقييم الذاتي والتغذيه الراجعه**					
8	Having immediate feedback improved my interaction with the learning process ان ا أشعربأنالتغذيه الراجع الفوريه ساعدنيعلى التفاعل مع المحتوى					
9	Having commands to continue with or review the lesson helped me to interact with the learning process أزرار التحكم للتقدم السريع الى الامام او الرجوع الى الخلف إذا الاجابه صحيح والعودة للدرس السابق في حال كانت الاجابه خاطئه					
10	Having m-learning with a voice, video or cartoon interface assisted me in the learning process. أن ا أتعلم عن طريق الجوال الذي يحتوي على أحد الوسائط الثلاث ه(الصوتي الفيديو أو الشخصيه الكرتونيه) أن ه ساعدني في عملية التعلم					

	I believe having access to the English materials on my mobile devices with the *audio* instructions interface: **أنا اعتقد ان الدخول على درس اللغه الإنجليزيه من خلال جهاز جوالي عندما تكون الشاشه *صوتيه* مع النص انه:**					
11	Enhanced my motivation to learn English language عزز من حوافزي لتعلم اللغه الانجليزيه					
12	Engaged me in the English language lesson زاد من حماسي لتعلم اللغه الانجليزيه					
13	Enabled me to interact with the learning process جعلني قادر على التفاعل مع المحتوى التعليمي					
14	Assisted my learning performance ساعدني في تحسين تواصل العلمي في الاختبار					
15	Positively helped me to learn English language لها أثره الإيجابي على في تعلم اللغه الانجليزيه					
	I believe having access to the English materials on my mobile devices with the *video* instructions interface: **أنا اعتقد ان الدخول على درس اللغه الانجليزيه من خلال جهاز جوالي عندما تكون الشاشه *فيديويه* كصوره وصوت المعلم مع النص انه:**					
		Strongly Agree اوافق بقوه 5	Agree اوافق 4	Neutral محايد 3	Disagree لا اوافق 2	Strongly disagree لا اوافق بقوه 1
16	Enhanced my motivation to learn English language عزز من حوافزي لتعلم اللغه الانجليزيه					
17	Engaged me in the English language lesson زاد من حماسي لتعلم اللغه الانجليزيه					
18	Enabled me to interact with the learning process جعلني قادر على التفاعل مع المحتوى التعليمي					
19	Assisted my learning performance ساعدني في تحسين تواصل العلمي في الاختبار					
20	Positively helped me to learn English language تأثر على إيجابي لتعلم اللغه الانجليزيه					
	I believe having access to the English materials on my mobile devices with the *cartoon* instructions interface: **أنا اعتقد أن الدخول على درس اللغه الانجليزيه من خلال جهاز جوالي عندما تكون الشاشه على شكل *شخصيه كرتونيه* انه:**					
21	Enhanced my motivation to learn English language عزز من حوافزي لتعلم اللغه الانجليزيه					
22	Engaged me in the English language lesson زاد من حماسي لتعلم اللغه الانجليزيه					
23	Enabled me to interact with the learning process جعلني قادر على التفاعل مع المحتوى التعليمي					
24	Assisted my learning performance ساعدني في تحسين تواصل العلمي في الاختبار					
25	Positively helped me to learn English language تأثر على إيجابي لتعلم اللغه الانجليزيه					
	Based on your experience of m-learning from this experiment:					
26	I would recommend to others the use of m-learning interfaces to deliver m-learning					

27	I would use m-learning for English language frequently if it was available					
28	I would use m-learning in my studies for other courses if it was available					

Which interface style of interaction did you prefer?

29. In which order did you find the lessons most engaging:
    - ○ Audio then Video then Cartoon
    - ○ Audio then Cartoon then Video
    - ○ Video then Cartoon then Audio
    - ○ Video then Audio then Cartoon
    - ○ Cartoon then Audio then Video
    - ○ Cartoon then Video then Audio

30. Which order do you think has helped you learnt most effectively:
    - ○ Audio then Video then Cartoon
    - ○ Audio then Cartoon then Video
    - ○ Video then Cartoon then Audio
    - ○ Video then Audio then Cartoon
    - ○ Cartoon then Audio then Video
    - ○ Cartoon then Video then Audio

Section 3. Further views of finding from the first experiment about m-learning

معلومات إضافيه ووجهات نظر من التجربه السابقه حول التعليم من خلال الجوال توصلنا إلى الأتي:

In the earlier experiments we found that:

31. More male students than female students preferred m-learning to traditional face-to-face lecturing. Why do you think this might be the case?

كثير من الطلاب يفضلون التعلم عن طريق الجوال التعليم مقارنة بالطالبات التي يفضلن التعليم التقليدي وجه لوجه. ما هو السبب الذي يتوقعه لذلك؟

32. Both male and female students particularly liked learning with a video interface. Why do you think this might be the case?

جميع الطلاب والطالبات يرغبوا التعلم عن طريق واجهات الجوال الفيديو هو ما هي الأفضل مقارنة بالواجهات الاخرى سواء النصية أو الصوتية، ما السبب الذي يتوقعه لذلك؟

33. In the first experiment, audio was the least preferred but was found to enable the students to perform best. Why do you think this might be the case?

في التجربة السابقة خلصنا إلى أن الدرس الصوتي كان هو الأقل تفضيلا ورغبة لكن لاحظ أنه جعل الطلاب والطالبات في الاختبار هي الأعلى ما السبب الذي يتوقعه لذلك؟

34. Female students preferred female rather than male audio. Why do you think this might be the case? Do you think it would be the same for a video presentation (for female students only).

توصلنا إلى أن الطالبات يفضلون التعلم عن طريق الشاشة الصغيرة للجوال أكثر من الشاشة الصغيرة للحاسب الآلي، بينما الطلاب الرجال، ما السبب الذي تعتقدين ذلك؟ و هل تتفقين مع أن نفس الوضع على الشاشات في الفيديو؟

35. Science students liked using m-learning more than Arts students, however, Arts students intended to continue using m-learning after the experiment more than Science students. Why do you think this might be the case?

طلاب وطالبات التخصصات العلمية يفضلون استخدام الجوال التعليمي أكثر من طلاب وطالبات التخصصات الأدبي، لكن الأدبيين عزموا على استخدام الجوال في التعلم أكثر من طلاب وطالبات التخصصات العلمية، ما السبب الذي تعتقدينه لذلك؟

36. Male students rated the convenience of m-learning higher than female students. Why do you think this might be the case?

الطلاب قيموا ملائمة استخدام الجوال في التعلم أكثر من الطالبات؟ ما السبب الذي تعتقدينه لذلك؟

37. Can you suggest any improvements to the way in which learning can be delivered via an audio, video or cartoon interface?

هل تستطيعين أن تقترحي أية تطوير على طرق شرح الدروس التعليمية سواء الصوتي أو الفيديو أو الكرتون على شاشة الجوال؟

38. Is there anything else would like to add about m-learning interfaces or m-learning in comparison to face-to-face teaching in general?

هل هناك أي شيء آخر تريدين أن تضيفيه حول شاشة الجوال التعليمي، أو حول التعليم عن طريق الجوال مقارنة بالتعليم التقليدي الوجاهي؟

39. If given a choice would you prefer your course to be delivered through:

لو أعطيت الاختيار، هل ترغب أن تتعلم اللغة الانجليزية من خلال:

☐ Traditional face to face التعليم التقليدي وجاهياً ☐ Mobile device جهاز الجوال ☐ Combined approach الاثنين معاً ☐ Not sure غير متأكد

40. Maybe you have chosen the traditional face-t-face learning ,however, if you have given the choice would you prefer your course to be delivered through:

☐ E-learning via PCs or laptops ☐ M-learning via phones or tablets ☐ No preference

Appendix G

The copy of the exam/test

Find verbs in the two brackets and choose the right answer which linked to each tenses' grammar

Present simple

1. You …….. English language every class. (Speak). **Negative**
   - are not speak
   - does not speak
   - do not speak
   - do not speaks

2. She ……. Tennis every week. (Play). **Positive**
   - is play
   - plays
   - does play
   - play

3. They ……the school at 3.00pm every day. (Leave). **Positive**
   - do leave
   - leaves
   - are leave
   - leave

4. It …… at 8 o'clock every morning. (Start). **Negative**
   - does not start
   - is not start
   - does not starts
   - not starts

5. I ……. to eat Chicken Burger every night. (Like). **Negative**
   - am not like
   - do not likes
   - not like
   - do not like

Past simple

1. You …….. English language yesterday. (Speak).**Negative**
    - did not speaked
    - did not speak
    - did not speaks
    - are not speak

2. She ……Tennis last month. (Play).**Positive**
    - did paly
    - play
    - is played
    - played

3. They …… the school at 2.00pm yesterday. (Leave). **Positive**
    - leave
    - did leave
    - did leaved
    - leaved

4. It …….. at 8.00 o'clock in the morning. (Start). **Negative**
    - did not start
    - is not started
    - did not started
    - does not start

5. I ……. the chicken burger last night. (Like). **Negative**
    - did not like
    - not liked
    - am not like
    - did not liked

Present continuous

1. You …… English language right now.(Speak).**Negative**
   - do not speaking
   - are not speaking
   - not speaking
   - are speaking not

2. She ……tennis at the moment. (Play).**Positive**
   - is playing
   - playing
   - plays
   - does playing

3. They …… for their exams just now. (Leave). **Positive**
   - studying
   - do studying
   - are study
   - are studying

4. It ……to move right now. (Start). **Negative**
   - is not start
   - does not starting
   - is not starts
   - is not starting

5. I …… to eat chicken burger at the moment. (Like). **Negative**
   - am do not liking
   - do not liking
   - am not liking
   - not liking

Appendix H

A release letter from the main supervisor at Al-Baha University for the completion of the data collection

بسم الله الرحمن الرحيم

KINGDOM OF SAUDI ARABIA
MINISTRY OF HIGHER EDUCATION
AL-BAHA UNIVERSITY (042)

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الباحة (٠٤٢)

إلى من يهمه الأمر

اسم المبتعث: علي سعيد عبدالله آل عوير.

الكلية : كلية علوم الحاسبات و تقنية المعلومات.

الجامعة : جامعة الباحة .

افيد سعادتكم أن المبتعث المدون اسمه أعلاه قام بدارسة ميدانية وجمع البيانات والمعلومات في مقر الجامعة في مدينة الباحة،

و التي تتعلق بمجال بحثه في موضوع :

(Application of M-learning Using Avatars to Assist the Teaching of English as Part of Higher Education Courses in Saudi Arabia)

لمرحلة الدكتوراه في جامعة ريدنج و قد بدأت الدراسة في ٢٠١٥/١٠/١٦ و انتهت في ٢٠١٦/٠١/١٦ م . هذا و قد تم إصدار هذا الخطاب بناء على طلب منه ، و ذلك لتقديمه إلى (الملحقية الثقافية السعودية بلندن).

التاريخ : ١٦ / ٠١ / ٢٠١٦م

المشرف على البحث

د. عبدالله محمد الخطاب

قسم علوم الحاسب – كلية العلوم والاداب بالمخواة

باحة

الت

الختم

تليفون : ٧٢٧٤١١١ – ٧ – ٠٠٩٦٦ فاكس : ٧٢٤٧٢٧٢ – ٧ – ٠٠٩٦٦ الباحة : ص.ب (١٩٨٨)
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