University of Reading

Mobile Learning in Oman: ACase Study of Two 'Cycle 2' (Grades 5-10) Private Schools

Thesis Submitted for the Degree of Doctor of Philosophy Institute of Education

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Declaration

"I, [Muna AlSiyabi], declare that the PhD thesis entitled [Mobile Learning in Oman: A Case Study of Two Cycle Two Private Schools] contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work".

Signature	Date
Muna Al-Siyabi	March 2019

Abstract

Mobile technologies have been utilised in all aspects of life including education. Research on implementing these technologies in educational settings has been flourishing in recent years, yielding a new field of research called mobile learning (mLearning). This field of research has been given a significant focus in many countries across the world. Although mLearning has been employed in schools in Oman since 2005, there has been a struggle to implement it due to weak network coverage and lack of training. Moreover, there is a gap in this research area in schools in Oman. This study aims to explore the perceptions of teachers, students, headteachers and school IT technicians in regard to exploring the opportunities and challenges at their schools with the aim to inform the implementation of mobile technologies in more schools in Oman. Two private mixed gender schools in Oman were involved and a total of 16 teachers, two headteachers, two IT technicians and 237 students responded to questionnaires, while seven teachers, two headteachers and three focus groups of 13 students were involved in interviews in order to explore how mobile technologies are used in these two schools.

The results indicated that each school had a different time scale in implementing mLearning. The first school had a longer time in the process of implementation than the second school. All participants taking part in the questionnaires and interviews believed that mobile learning enhances students' learning and engagement, provides authentic and situated learning opportunities, and enhances communication and collaboration.

The results also revealed that teachers and students face a number of challenges with mobile learning, such as considering a cognitively demanding environment for students and technical problems for both teachers and students. Moreover, most teachers complained about the difficulty to control the behaviour of their classes when their students were using the mobile devices, which distracted their attention and affected their understanding. This study also showed that most teachers use mobile technologies as a substitution of other resource tools like desktops or books, using them mainly for searching purposes, which ultimately affects their confidence in using these devices.

During the interviews, three factors that help implementing mLearning were suggested: financial support, a social contract between teachers and students, and teacher collaboration groups to share effective usages of these devices in each subject area.

The results of this study indicated that mobile technologies can be effectively employed in the classrooms if these considerations of technical support, teacher training and curriculum resourcing are addressed. Teachers have a significant role in the implementation of mobile learning in classrooms and their professional development should be considered when starting any mobile learning project. Furthermore, students should be educated about the appropriate and inappropriate uses of mobile technologies in schools.

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Chapter 1: Introduction

1.1 Background of the Research

Mobile devices such as mobile phones and tablets complement and enhance face-to-face learning by offering new practices for learning and teaching. There are certain technical characteristics which facilitate these new practices, such as portability, connectivity, location awareness, taking photos and video, and recording sounds and voices (Kukulska-Hulme & Traxler, 2005). Mobile technologies support the delivery of multimedia content, facilitating discussion and discourse, and providing synchronous and asynchronous text, voice and multimedia (Traxler, 2009) in efficient ways in relation to time, cost and effort and authenticity. Mobile learning is a type of learning whose learner is not in a specific location, or benefits from the opportunities offered by mobile technologies (O'Malley, Vavoula, Glew, Taylor, Sharples & Lefrere, 2003).

Mobile learning, or mLearning, is a type of learning that takes places via such wireless portable devices; the learner is not in a specified location and takes advantage of the learning opportunities offered by such mobile technologies (O'Malley et al., 2003). Mobile learning, as described by Traxler (2009), is "uniquely placed to support learning that is personalised, authentic, and situated" (p.17). It is personalised because it recognises the history and context of each learner and delivers learning at the time and place of their choosing. Moreover, mobile learning is considered "situated" as it is appropriate to different learning contexts, such as the classroom, the field, hospitals, workshops and theatres. Additionally, it facilitates distance learning as it connects remote learners with the taught subject. Finally, mLearning is "authentic" because learners can easily access information on the internet and synthesise responses using their own curated resources.

Mobile learning research has grown dramatically in the recent years (Hwang & Tsai, 2011; Yu-Chang, Yu-Hui, & Snelson, 2014) coinciding with continuous technological advancements in mobile devices. Nowadays, mobile technologies have a ubiquitous use, beyond communication purposes, in education, shopping, bill-payment, and searching for information. In Oman, the Information Technology Authority report of 2014 revealed that nearly all individuals in the age group between 20 to 49 years old have had a mobile phone over the last twelve months (ITA, 2014). As a result of the widespread use of such devices, several opportunities arise for educationists to benefit from the flexibility and portability features that they offer for teaching and learning.

Mobile devices, such as smartphones and tablets, have great potential for learning as they can allow students to develop the 21st century skills, such as sorting and extracting information, solving problems and evaluating results (Hokanson, 2014). These skills can help cultivate knowledge by gathering information from different environments, such as museums or fieldtrips. Likewise formal education institutions, such as schools and universities, are embracing these devices with the aim of enhancing teaching methods and improving the students' learning experiences. Hokanson (2014) argued that learning could not be enhanced simply by the use of a new technology or device, but rather through the variation in teaching and learning methods. Moreover, this is emphasised by Sharples, Arnedillo-Sanchez, Milrad, and Vavoula (2009), who urged that mobile technologies are not the focus themselves and are mere tools to facilitate learning activities. For example, teachers can use mobile devices to encourage and discuss students' learning at the end of a lesson. Hence, educators who intend to use these mobile technologies for learning must find effective ways of integrating them into the curriculum in order to increase their benefits.

Using mobile devices in schools has considerable advantages, as outlined by Mundie and Hooper (2014), and Hokanson (idem); however, at times these devices are also blamed for creating non-educational distractions for students. Mundie and Hooper (2014) reported that mobile devices are frequently viewed as distractive to daily educational practices, notably when school students bring them into the classroom. There is also a fear that mobile devices may distract learners and expose them to unknown external dangers (Pachler, Bachmair, & Cook, 2013). As a result, some schools still prohibit use of mobile phones on their premises, despite the wide use of such devices in everyday life and the educational benefits outlined in the literature.

Mobility, immediacy and ubiquity are key characteristics in definitions of mobile learning (Peng, Su, Choua & Tsai, 2011), which will be discussed in more detail in section 3.2. Recent definitions around mobile learning (mLearning) place more emphasis on the process of learning rather than the device itself and the possible challenges that such ubiquitous access to mobile devices like smart phones or tablets may pose to teachers and learners. Mobile learning research can be traced back to the late 1990s (Cerratto-Pargman & Milrad, 2015). In the last 20 years there has been a shift in mLearning research focus from attitudes, motivation and perceptions (Hwang & Tsai, 2011) to strategies for employing mobile technologies and the impact on social practices and learning cultures (Cerratto-Pargman & Milrad, 2015). Ten research priorities for mLearning research, presented in Table 1.1, were emphasised by an

international expert panel in Yu-Chang et al.'s research (Yu-Chang et al., 2014). Applying the Delphi method, popular for forecasting and facilitating 'a detailed critical examination and discussion' (Green, 2014:1), 59 experts in the field of mLearning were selected through their published work and invited to reach a consensus about the areas that need more research in mLearning. It is interesting to note that pedagogical considerations around the use of mLearning were prioritised over access and infrastructure. For example, the top priority is given to investigating teaching and learning strategies in mLearning while the second priority focuses on the tasks and activities that can be facilitated through mobile learning, emphasising in this way the need for clear consideration of the purpose and pedagogical approach of implementing mLearning interventions.

Table 1.1. Priorities of Mobile Learning Research (Yu-Chang et al., 2014)

Rank	Priority
1	Teaching and learning strategies
2	Affordances
3	Theory
4	Settings of learning
5	Evaluation/assessment
6	Learners
7	Mobile technologies and interface design
8	Context awareness and augmented reality
9	Infrastructure and management
10	Country and digital divide

The current focus of mobile learning research is on how to employ mobile devices in schools and how learning tasks and activities may be shaped and enhanced through the use of these technologies. Although there has been international research on mLearning in schools (Jahnke & Kumar, 2014; Lai, Yang, Chen, Ho, & Chan, 2007; Song, Wong, & Looi, 2012; Wong, 2013; Wright, 2011), there is no evidence of research on the topic in Oman. As there is a government plan to consider wider funding for such devices at schools, the current research project aims to fill this gap by investigating perceptions about mLearning and the use of mobile devices in Omani schools to support teaching and learning. It will shed light on the opportunities and challenges in using such devices in the participating Omani schools with the view to providing suggestions and recommendations to schools and policy makers for enriching mLearning opportunities at Omani schools further.

1.2 Focus of the Study

The objective of this study is to share Omani students', teachers', headteachers' and IT technicians' views on mLearning use in their school and thus raise more awareness about the mLearning opportunities and possible challenges when further whole-school implementation is considered.

Attempts to implement mobile technologies in schools in Oman started in 2009 but there has been reluctance to fund such implementation projects more extensively, notably by policy makers in the Ministry of Education, as reported by Al-Abri (2014). This was due to their uncertainty about the academic benefits of mLearning. In 2010, a digital pilot project school (a government cycle 2 for girls) was initiated by the Department of Educational Technology in the Ministry of Education, being funded entirely by private organisations (Al-Abri, 2014). In this project, one class of 30 female students was equipped with "classmates", mobile devices designed especially for students. Unfortunately, the project lasted only one year and was curtailed due to the unsupportive opinions of teachers who were struggling with the devices and regarded them as wasting the time of the lessons, and hence not achieving the lesson objectives. While key lessons from this pilot project were around the importance of teacher training and technical support, no educational resources or policies were introduced to pave the way for the wider implementation of mLearning at schools. However, the decision to open five digital cycle two (Grades 5-10) schools in Muscat was announced in 2013 (Al-Abri, 2014). Implementing this decision was delayed until 2015 to ensure that the schools' technical infrastructure could support the connectivity that the mobile devices required. At the time of writing the thesis, these schools have not opened yet due to the oil crisis which has affected the Omani economy.

The few mLearning studies that have taken place in Oman focus on higher education. For example, a study that was conducted in 2009 explored the effect of using mobile phones to teach English listening skills at college level (Al-Mamary, 2009). This experimental study revealed that students who used mobile devices improved their listening skills and had positive attitudes towards such technology for language learning. Another study in Oman by Al Hamdani (2014) investigated how mobile phones helped higher education students on a communicative language course. Students reported that using their mobile phones helped them to manage the course information, and to cooperate with each other, and as a result promoted their thinking skills (Al Hamdani, 2014).

These small-scale and brief intervention studies in higher education settings in Oman highlight the positive contributions that mLearning can make to student learning but also highlight the lack of research on the topic at school-based environments, where the present study is focusing. Currently there is no record of mobile learning research in schools in Oman and it is important for research to focus more on pre-university students in an attempt to support their successful transitions to higher education. While the focus of this study is not around the transition to higher education, it is worth acknowledging that the results of the university-based studies point towards thinking and collaborative skills, key aspects of successful learning. If we implement mLearning successfully at school level, there is the hope that students will develop more independency in their learning to manage the move from the more controlled, teacher-led and highly-structured learning environment that schools offer to the bigger class sizes and the expectations of more self-organisation and ownership of managing personal learning that universities expect.

The absence of research at the school level has contributed to the Ministry of Education's hesitance around implementing mobile devices in government schools further. As a result, there are only two basic cycle private schools in Oman that have implemented mobile learning, having secured funding mainly from parents to purchase and manage the purchased mobile devices. There are no other schools in Oman using mLearning at the time of this study. The quick-paced advancements in connectivity, app creation and mobile device design necessitate considerations around the perceptions of mobile device uses from current stakeholders in order to develop further implementation of mLearning at schools. While the aspiration of the study is to inform decisions around mLearning planning across schools in Oman, it is acknowledged that part of its limitations is that it is informed by work at independent schools. However, it is also worth mentioning that both private and government schools in Oman are overseen and regulated by the Ministry of Education, 'thereby preserving the primacy of Islamic values, pride in the Omani identity and the ongoing promotion of citizens who are devoted to the well-being of their country' (Wajeha Al-Ani, 2017, p.327) (See section 2.2 for detailed discussion around the educational system in Oman).

The overarching aim of this research is to explore educational stakeholders' perceptions of mobile learning implementation in these two private schools in Oman with the view to finding out effective factors for implementing mLearning in teaching and learning. These stakeholders include headteachers, IT technicians, teachers and students in both schools. The two research questions that guide the study are:

1. What learning opportunities can the use of mobile technologies create in these two schools?

2. What are the challenges surrounding the introduction of mobile learning in schools?

It was considered important to include stakeholders who are directly involved in mobile learning, such as teachers and students and compare their views on the use of mobile devices in the classroom. This was considered important by Passey (2010), who emphasised that different stakeholders can contribute in implementing mLearning successfully in schools. Headteachers or senior managers at the two schools were also included to shed light on the strategic vision they have for such school-wide implementation. Technical staff, such as IT technicians, were also chosen, as technical infrastructure is considered an important factor in any technological intervention, and especially in mLearning that relies on digital connectivity. Other stakeholders such as parents or policy makers were not selected in this research. Parents have an important role in supporting their children's work at home; however, they were not included in this research as the focus of the study was the employment of mobile devices at school. Policy makers were not accessible for this study due to strict protocols around direct participation in research studies, though they facilitated establishing contact with the two case study schools.

1.3 Significance of the Study

The outcomes of this study will be of interest to:

- Educationalists who can consider further ways of implementing mobile learning for teaching and learning.
- The Ministry of Education in Oman and policy makers to inform forthcoming education policy around mLearning implementation at schools.
- Mobile learning researchers interested in the use of mobile devices in schools.

1.4 Summary

Reviewing the background of the current research shows a number of opportunities and challenges around the implementation of mobile learning for schools. The review of mLearning research in recent years reveals that teaching and learning strategies and mLearning affordances are at the top of research priorities. Such research is significant to inform educators of the appropriate strategies of mLearning and the affordances of mobile

technologies. There is a gap of research on mLearning in schools in Oman, which this study aims to address by exploring the perceptions, opportunities, challenges, success factors and examples of effective implementation of mLearning in Oman in order to enlighten future policies. Consequently, it is hoped that this research will inform the Ministry of Education and policy makers of ways that they can support the implementation of mLearning in schools in Oman further. At the same time, it is hoped that educationalists such as headteachers, teachers and researchers will reflect further on the use and management of mobile devices in teaching and learning processes.

1.5 Structure of the Thesis

This thesis is structured as follows:

Chapter 1 introduces mobile learning research and the research priorities in this area. It also explores the problem of the study, the significance of the study, and the research aims and questions. Chapter 2 describes the context of the study - Oman - in detail. It aims to give a clear picture of the Omani geography, and education system. It also explains the position of ICT in Oman in general and in schools specifically. Finally, the chapter describes the mLearning Omani context. Chapter 3 explores the definition of mobile learning from different perspectives. It investigates mobile learning practices, including the advantages and the challenges of mobile learning and illustrates successful factors in mobile learning. The research methodology is described in Chapter 4 by reference to the research paradigm and through the explanation of the research strategy. The qualitative and quantitative strategies are discussed in order to illustrate the mixed methods approach adopted in the research. Succeeding this, the case study approach is explained, followed by the three data collection approaches used in this study: questionnaires, semi-structured interviews and focus group interviews. Lastly, ethical considerations are described.

Data from the headteachers', technicians' and students' questionnaires is analysed and discussed in Chapter 5, while Chapter 6 presents an analysis of the interview results. First, an analysis of the headteachers' interviews is provided, then the teachers' interviews are analysed. Finally, the results of the students' focus group interviews are discussed. Chapter 7 focuses on the discussion and analysis of the results arising from the questionnaires and the interviews. This is followed by a discussion of the opportunities and challenges of mLearning in the two schools. Chapter 8 concludes the thesis and offers recommendations.

Chapter 2: Background of the Study

2.1 Introduction

This chapter provides background information about Oman. Initially, a short description of its geography and history is followed by a general exploration of the education system at both government and private schools. Finally, the current practice of mobile learning in schools in Oman is explained.

2.2 Oman Context

Oman is located in the extreme south-eastern corner of the Arabian Peninsula and has a population of 4,432.380 according to the recent figures of the National Centre for Statistics and Information (NCSI, 2017). Omanis form about 55% of the total population, while the expatriates form about 45%. Most of the expatriates are from India, Pakistan and Bangladesh. Oman has 11 governorates (regions): Muscat, Dhofar, Buraymi, Dakhiliyah, the North Batinah, South Batinah, North Sharqiyah, South Sharqiyah, Dhahirah, Musandam and Wusta, Each of these governorates has a number of wilayats (districts) (Information, 2014). The current research was located in one of the districts in Muscat.

Oman's economy depends mainly on oil revenues. The country's contribution of oil is 5.6 billion of a total of 9.1 billion in 2015. The falling of oil prices in 2016 had negative effects on the economy of Oman which led to a decrease in public spending and a plan to decrease the contribution of non-oil to the national revenue (Information, 2016).

The modern Renaissance in Oman started from 23rd July 1970, when Sultan Qaboos became the ruler of Oman. The development plans have paid great attention to developing education, health and training in order to build a strong infrastructure in every governorate in Oman. Equal attention was also given to the economic sectors such as tourism, industry, agriculture and fisheries.

2.3 Education System in Oman

Education in Oman, like other sectors, started to develop from 23rd July 1970. By this date, only three government schools for boys were providing the new type of formal education known today. Before this, there were no schools, and children only learned how to read the

Quran and read and write simple words and sentences in Quranic schools, mosques or even under the trees (Portal, 2015).

Since that time, the Sultanate started its strategic five-year plan to develop education and build the basic infrastructure. The number of schools increased from three schools accommodating 900 male students only in 1970 to 207 schools accommodating 55,752 students of both genders during the academic year 1975/1976. The general system included students from age 6 to 17. By 2001, there were over 1000 government schools and 123 private schools. During the academic year 2015/2016, the number of students reached 551,867 in 1,077 government schools in all the Omani governorates (Information, 2016; Portal, 2015; ViewsWire, 2003; World Bank, 2013).

Education at government schools has been provided free of charge and equally to both boys and girls. Education opportunities for girls have increased rapidly: the percentage of girls within the students' population increased from 27% in the academic year 1975/1976 to 48% in 2001. The gross enrolment ratio (GER) in basic education for Omanis in cycle 1 was 97%, and 98% for cycle 2; the two cycles will further be described in the following paragraph. The GER for the post-basic education grew from 82% in the academic year 2006/2007 to 86% in 2008/2009, which is considered high when compared with middle-income countries (ViewsWire, 2003; World Bank, 2013).

From 1970 to 1998 general education typified education in Oman. In this system, school education lasted for twelve years and was divided into three stages: primary, preparatory and secondary. The new system of Basic education started in the academic year 1998/99. Basic education lasts for ten years and is followed by two years of post-Basic education. Basic education is divided into two stages: cycle one (grade 1 to 4), and cycle two (grade 5-10). In cycle one, male and female pupils are mixed in the same schools; while in cycle two they are separated into different schools. The structure of the Omani system of education in schools is shown in Figure 2.1 (Portal, 2015; World Bank, 2013).

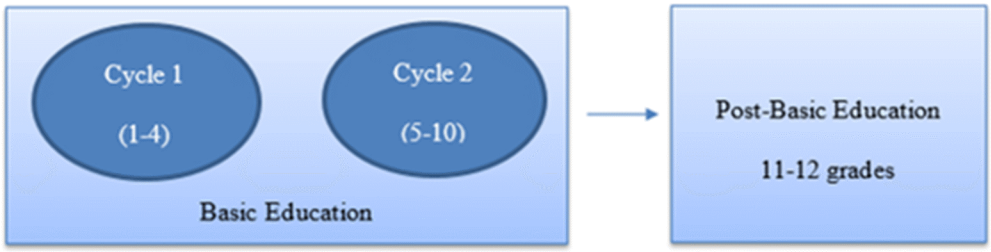

Figure 2.1. Education System in Schools in Oman

In 2012, 890 basic education schools were operated by the government, as reported by Alpen Capital's GCC Education Industry. These schools had about 538,313 students. The percentage of enrolment to primary and secondary schools has increased over the years as primary education has been compulsory for both boys and girls (Daily, 2014).

According to Faraj (2009), the Basic Education system in Oman has the aim of reducing student dropout from school, increasing literacy skills and guaranteeing that students can attend the basic ten years of schooling. The Ministry of Education (MoE) is responsible for the administration of state schools from grades 1-12 throughout the Sultanate. Private schools have been given the opportunity to invest in education in Oman since 1970. These schools are run by private investors and supervised by the Ministry of Education. They share the same curriculum for Arabic language, Islamic studies and social studies as the government schools, but are different in science and mathematics. They are also different in their funding: while the government schools receive their funding from the Ministry of Education, the private schools have independent funding from investors. Statistics show that during the academic year 1972/73, there were only two private schools of 115 students and these two schools were merely for pre-school and primary education. The number of private schools has grown dramatically since the resolve of the Omani government in 1970 to reach 158 schools in the academic year 2005/2006. Recent statistics for the year 2012/2013 show that the number of private schools is 454, of which 40 are international schools. These schools are supervised by the Department of Private Schools in the Ministry of Education (Information, 2014; Portal, 2015).

2.4 Technology and Connectivity in Oman

A survey conducted by the Information Technology Authority (ITA), which is responsible for implementing, supervising and maintaining Oman's digital strategy revealed that 95% of households in Oman have mobile phones and 83% of them have at least one computer. In addition, 80% of houses in Oman have internet access. The main reason for not having internet access for the remaining 20%, as indicated by this survey, is the lack of internet coverage in some remote areas of Oman. The internet is frequently used and the results of the survey show that three out of four individuals browse the internet on a daily basis (ITA, 2014). Such results indicate that the internet is widely used in Oman. However, there is a need to expand internet facilities to all parts of the country as recommended by Sarrayrih and Sriram (2015).

The ITA report also states that nine out of ten people in Oman have a mobile phone with no significant difference between Omanis and non-Omanis. However, there is a significant difference between Omanis and non-Omanis in the percentage having smart phones: 79% of Omanis own smart phones. Moreover, nearly all individuals who are in the age group between 20 to 49 years old have had a mobile phone over the last twelve months (ITA, 2014). The focus of this report was confined to adults, and data on mobile phone access and use did not include school-age people. Such data would have been difficult to collect; not only due to ethical reasons including minors, but also because as mobile phones may have been registered to parents/carers.

2.4.1 ICT in Schools in Oman

The Omani government established the National Information Technology Committee in 1998, which was headed and led by the Minister of National Economy. The committee was responsible for the creation of a national plan and policy for the implementation of ICT in the Sultanate. Since 2002 ICT has been given more attention by the government as a strategy to assist the private and the public sector to incorporate ICT into the infrastructure. Also, many state services were provided online, notably within the health, education and social sectors (Oman, 2008).

Lower-income families were also given the opportunity to access ICT when Sultan Qaboos issued a Royal Grant offering a free laptop for every Omani family on social insurance benefits who had at least one child in school (MENA, 2011).

The first schools that were introduced with ICT were the mixed gender Basic Education first cycle schools in 1998. Each school was provided with seven computers that were located in the learning resource centre (LRC). Classes visited the LRC once or twice a week to have ICT lessons. In 2000, eight additional computers were provided to first cycle schools (grade 1 to 4). Computers were then introduced to subject classrooms and integrated into the subjects' activities. Second cycle schools (grade 5 to 10) have separate computer classrooms which were visited by the students twice a week for Information Technology lessons. Subject teachers are encouraged to take their classes to the Learning Resource Centres (LRC) to use the ICT facilities such as laptop computers and the LCD (liquid-crystal display) projectors (Oman, 2008).

According to the World Bank report (World Bank, 2013), 20% of schools in Oman have been provided with computers in classrooms, LRCs, computer laboratories, science laboratories, and careers guidance rooms. 450 computer technicians have been assigned to provide technical support for these schools. About one third of schools are provided with (DSL) web connections, although many other schools suffer from poor and slower connections because they rely on mobile telephone networks. Unfortunately, some schools are still not connected to the web or to any other networks which does not favour student-centred internet practice (World Bank, 2013).

Grade 11 in General Education was introduced with the International Computer Driving License (ICDL) programme in September 2004. This programme introduced important skills like word processing, spreadsheet and database creation, which are helpful to build students' digital skills and prepare them for the job market. In September 2007, the ICDL programme was discontinued with the initiation of the Post-Basic Education programme. Students were offered a number of optional ICT courses like graphic design (Oman, 2008).

Teachers are trained in ICT skills by attending short in-service courses. Moreover, an initiative of the Information Technology Authority (ITA) to train all the employees in the Sultanate to gain the Internet Core Competency Certification (IC3) since 2009 has involved about 7,000 teachers. Most pre-service teacher training courses involved ICT training, so new teachers are qualified to use ICT, though the level of digital literacy among teachers varies (World Bank, 2013).

The World Bank report also highlights that there is a shortage of data which can accentuate the use of ICT for teaching and learning in Oman. It shows the discrepancy between teachers using ICT to promote learner-centred activities and those who do not appreciate its importance due to their experience with didactic approaches and traditional offline teaching. The report also points out that short-course training may help teachers to acquire technical skills, but they fail to change their pedagogical attitudes. In addition to the ITA internet training discussed above, the MoE launched an initiative in 2009 to train teachers to use ICT in classroom activities, and nowadays around 200 teachers are members of iEARN, an organisation that promotes teachers' and students' communication online. Nonetheless, ICT application in schools needs long-term professional development training for teachers in order to change their pedagogical attitudes and the use of ICT in curriculumand assessment (World Bank, 2013).

The use of ICT in schools has flourished since the Electronic Educational portal launched by the Ministry of Education on 9th December 2007. Since then all schools in Oman have been using this portal to input and access information previously provided by mail. This portal serves as an educational gateway that can provide online programmes and services for parents, students, teachers and headteachers. The portal provides teachers and students with past papers for their examinations and online content like e-books and interactive e-lessons. It serves 11 educational regions that include 1,047 schools, 500,000 students, 80,000 employees (headteachers and teachers) and 300,000 parents (Oman, 2008; Portal, 2015).

The E-Learning and E-Content Directorate was established under the supervision of the General Directorate of Information Technology in the Ministry of Education in 2008. The Directorate's main responsibilities are to implement and supervise ICT in schools and to produce e-content that supports the school curriculum (ICT, 2015). As reported by Al-Abri (2014), the E-Learning and E-Content Directorate initiated and supervised the first digital school in Muscat in Oman in 2009. This project was funded by private organisations dealing with learning solutions such as Siveco and Sunflower, which supplied the school with smartboards for all the classes, as well as wireless network and mobile technologies for 30 students of a grade 10 class. These students were given mobile PCs specially designed for students by the American cooperation and technology company "Intel". The project lasted for one year only as the Ministry of Education curtailed it in order to reconsider its effectiveness. This happened as a result of receiving complaints from a number of teachers who were opposing the implementation of such a programme. Lack of technical support and unreliable internet access influenced the participating teachers' views of the intervention. After a few years, the project was resumed but without the use of mobile technologies because no funding was received to supply the classes with mobile devices.

On 23rd August 2013, a decision was made by the Ministry to establish five digital schools in Muscat funded by the government, though this decision has not been processed to this day with no known available reason (Al-Abri, 2014). Mobile learning research in Oman is in its infancy and the focus of the limited number of studies is mainly in higher education. These case studies though small-scale, revealed positive effects on student learning, attitudes and collaboration.

2.5 Summary

The chapter explored the background of the study in detail. It highlighted the new type of formal education which started in 1970 when the present Sultan became ruler of Oman; the number of schools and students has been growing since then. The education system has moved from general education to Basic Education, which started in the academic year 1998/99. In this new system, schooling is composed of ten basic years of education and two years of post-basic education. Private schools have also grown since 1970 and the Department of Private Schools in the Ministry of Education oversees them both technically and administratively.

The ATA survey of 2014 revealed that 95% of the households in Oman have mobile phones and 80% of households have internet access. The first schools to be introduced with ICT were the mixed gender cycle one schools in 1998. Since then, computers have been provided to LRCs and computer laboratories in some schools. One third of schools are now provided with internet access through DSL web connections. Teachers have been trained to develop ICT skills through the ICDL programmes first, and then through IC3, since 2009. The use of ICT has flourished since the launch of the electronic education portal in 2007 and the E-learning and the E-content Directorate in 2008.

Chapter 3: Literature Review

3.1 Introduction

This chapter presents a review of the current literature of mLearning. It includes definitions of mLearning and highlights the working definition used in this study as well as the theoretical framework that guided thinking around the development of this work. Considerations about the educational opportunities and challenges around employing and implementing mLearning in teaching and learning are discussed as part of this section as well.

3.2 Definitions of Mobile Learning

The aim of this section is to provide a working definition of mLearning in the context of the current study. While earlier definitions of the term mobile learning in the literature focus on the mobility of the learner (Lehner & Nosekabel, 2002) with or without the use of technology, quoting examples such as "pupils revising for exams on the way to school" (O'Malley et al. 2005, p.7), the advances of wireless technologies promoted a reconceptualisation of the definition of learning that takes place over wireless devices such as PDAs (Personal Digital Assistants) or mobile phones and focused instead on the features of these portable devices (Traxler, 2005). However, more recent definitions focus on the learning process and the social interaction that mobility can support (Crompton, 2013b; Koole, McQuilkin, & Ally, 2010; Sharples, Taylor, & Vavoula, 2007), reinforcing this emphasis on learning and how it is "mediated … through mobile technology" (Winters, 2007, p.9).

Winters (2007) also discusses the lack of a consensus on a definition of mobile learning in the literature and as a result the lack of a theoretical conceptualisation of the term which can impact practice. He proposes that a definition of mLearning should be considered under four perspectives: techno-centric, relating to e-learning, augmenting formal education and learner-centred (Winters, 2007). Winter's work acknowledges the techno-centric origins of the term, and echoes Traxler's definition that mLearning encompasses "any educational provision where the sole or dominant technologies are handheld or palmtop devices" (Traxler, 2005, p.262).

The relationship between e-learning and mobile learning is the second perspective, where mobile learning is recognised as "an extension of e-learning" (Winters 2007, p.7). Other theorists such as Behera (2013, p.65) define mLearning as "a subset of e-learning". Both definitions affirm the complementary relationship between e-learning and mLearning (Peng,

2009) and the focus that they both place on flexible learning. However, it is important to acknowledge that there are some distinct differences between e-learning and mobile learning. Korucu and Alkan (2011) believe that considering mLearning as an evolution from e-learning has some deficiencies. They argue that e-learning has developed as an extension of distance learning and as such it is associated more with the traditional classroom in terms of duration of learning units as well as environment. In addition, while e-learning is associated with "functionality" (Behera, 2013, p.65) and makes use of terms such as interactive, multimedia, media-rich environment, and hyperlinked, mLearning is associated with "mobility" (Behera, 2013, p.65) and "terms like spontaneous, intimate, situated, connected, informal, lightweight" (Korucu & Alkan, 2011, p. 1,927).

Augmenting formal education is Winter's (2007) third consideration around mobile learning. He discusses that formal education is usually associated with face-to-face teaching and invites the reader to consider that formal education extends beyond the walls of the traditional classroom or lecture theatre and reflects on the role that mobile learning can play in formal learning.

The learner is the focus of the fourth perspective of mobile learning and this view is defined by O'Malley et al. (2005) as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies" (p.7). Additionally, Lehner and Nosekabel (2002) view mobile learning as a service supplied to the learner in the form of electronic information and content that can help in acquiring the knowledge anywhere and anytime.

Other definitions in the literature are more comprehensive and combine the technology and the learner, as well as the social aspects that mobile technologies can offer. Sharples, Taylor, and Vavoula (2007) view mLearning as the processes of knowledge developed through conversations and interactions among people by using their personal technologies. The Framework for the Rational Analysis of Mobile Education (FRAME) model proposed by Koole, McQuilkin, and Ally (2010) defines mLearning as "a convergence of device, learner and social aspects" (p.62). Here, the social aspect is an important component of mLearning, where the learner is not only using the device and moving in different contexts but also interacting with other people. While earlier definitions focused primarily on learners, recent ones put emphasis on the process of learning and teaching (Baran, 2014) and perceive mobile devices as facilitators for learning. For example, Crompton modified Sharple's definition of mLearning as "learning across multiple contexts, through social and content

interactions, using electronic multiple devices" (Crompton 2013b, p.1). MoLeNET, a three-year programme of UK government funding on mobile learning projects in further education institutions running from 2007 until 2010 was instrumental in establishing mLearning as a process of learning and teaching facilitated by mobile technologies and wireless networks; the programme aimed at enhancing "the exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning" (MoLeNET, 2014, para 4).

Having set out the various ways in which mLearning has been defined in the literature, the current study adopts a working definition on mLearning that focuses on the process of learning and teaching in different contexts and considers mobile technologies as facilitators in this process. It takes into account both the technical functionality and the interaction that mLearning supports users to develop. The study does not focus on the technology per se but on the connectivity shared by the technologies the participants use, which in this context are the school tablets. However, due to limitations to resource access and strict cultural protocols for technology use at home, the research is limited to exploration of mLearning in different contexts only around the school. Context in this research is taken to mean mobility across classrooms, lessons, the use of the internet as a context for learning as well as opportunities for capitalising on the social aspects that the mobility of the devices offers for students' learning; it does not focus on learning outside the school (e.g. school trips, home learning, etc.).

After discussing the definitions of mLearning and forming a working definition for this research, the next section will explore how learning with mobile technologies occurs by discussing models used to evaluate mLearning.

3.3 Models for Evaluating Mobile Learning Experiences and Interventions

Technological advancements in mobile technologies have facilitated the use of such devices in teaching and learning. As a result, there is the need for conceptual frameworks around design, application and evaluation of this increasing interest in mobile learning experiences.

Several theoretical models have been developed in the context of mLearning. Hsu and Ching (2015) offered a systematic analysis of mLearning models and frameworks, identifying 17 of the most popular models that have been used in the research and design of mLearning experiences. The list includes models such as Huang, Lin, and Chuang's (2007) Extended TAM (Technology Acceptance Model), Koole's (2009) FRAME (Framework for the Rational Analysis of Mobile

Education), Taylor, Sharples, O'Malley, Vavoula and Waycott's (2006) Task model, and Vavoula and Sharples's (2009) 3-LEF (Level Evaluation Framework). Hsu and Ching (2015) also discuss the difference between the concepts 'framework' and 'model', emphasising the theoretical focus of the term 'framework' versus the empirical basis of the term 'model'. In the context of this study the terms framework and model are used interchangeably, as the difference between the terms is not the focus of the study. This decision around terminology also replicates practices from the mobile learning literature where both terms are usually employed interchangeably (Koole, Buck, Anderson, & Laj, 2018).

While each conceptual framework attempts to provide a holistic approach to evaluating mLearning, the focal points of each model vary. In all models, communication and social interaction play an important role when learning with mobile technologies. However, there is a shift between the mobility of the learner and learning that takes place through the use of mobile devices. For instance, the Extended TAM focuses on how perceived usefulness, use, enjoyment and mobility influence mLearning users' attitudes, while the 3-LEF model follows a three-level lifecycle approach of evaluation and moves from individual activity at the micro level to integration with other activities at the meso level and then institutional impact at the macro level. The Task model focuses on the mobility of the learner and explores how control, context and collaboration influence learning across environments, while the FRAME model (Koole, 2009) illustrates how the interaction between the learner, the device and social interaction influences learning.

In the context of this study, the FRAME Model (Koole, 2009) is adopted (Figure 3.1) and extended as one of the key theoretical lenses through which the participants' perceptions of mLearning will be explored. The researcher of this study is interested in exploring the interactions between the learner with the device and other learners and teachers in the school setting. The FRAME model is presented in a Venn diagram, where three key aspects of mLearning are identified and intersect. All three aspects are equally important in creating successful mobile learning experiences while the central intersection (DLS), where all three aspects overlap, characterises the core for successful mobile learning implementation.

According to the model, mobile learning is "a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction" (Koole, 2009, p. 25). The places where two circles overlap include features that relate to both aspects. For example, the intersection between learner and device focuses on device usability (DL), while the

intersection named Interaction Learning (LS) acknowledges the context in which learners are based and its influence on their engagement with the technology, as well as the collaborative aspects of learning that can impact individual and group learning. Highly influenced by social constructivism, as evidenced by the LS intersection, the model considers that learners "may move within different physical and virtual locations and thereby participate and interact with other people, information, or systems – anywhere, anytime (Koole, 2009, p. 26). In social constructivism, learning is viewed as a construction of knowledge by active participation in a community. While these interactions can influence learning, there is also acknowledgement on the information overload and knowledge navigation that these collaborative interactions can pose (Wong, 2013).

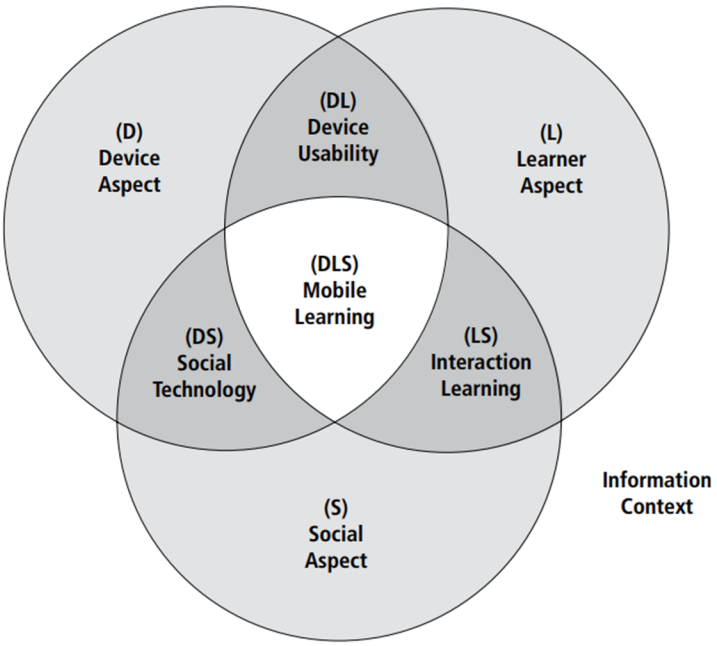

Figure 3.1. The FRAME Model (Koole, 2009)

The researcher, as others before her (Hosler, 2013; Sandpearl, 2016), fully agrees that in order to employ successful mLearning in schools there ought to be consideration around the communication and interactions (social aspect) between the mobile device (device aspect) and the learner (learner aspect).

However, she also believes that there should be more explicit reference to the role that the educator (for instance, the teacher) plays in that process, especially when the mobile learning is initiated in a formal learning environment such as school/college/university, rather than as a self-paced learning intervention, for example, when users access MOOCs (Massive Open Online Courses). While the Information Context of the FRAME model can be used to provide

consideration of additional aspects that can influence mLearning such as location and environment, it is felt that the teachers' role should be included more centrally rather than under Context as, especially in the context of Omani education, it plays a central role in facilitating learning interactions.

The researcher did not want to change the equal focus that the model places on all its three aspects, either by creating a fourth one as Norman, Din, and Nordin (2011) proposed, reflecting more on the role of the learner, or by changing the focus of the three-part interaction by bringing the teacher in the middle of the model, as Wong (2015) did with the learner.

Ng and Nicholas (2013) also proposed a person-centred sustainable model for mLearning and argued that the people involved in the process must be at the centre of a sustainable framework for mLearning. Their study in an Australian secondary school identified that teachers and students developed positive attitudes towards the project when they were provided with the necessary technologies and technical support. Secondly, effective communication among the key participants in the project should be ensured. Finally, responsibilities and trust among the management members, the teachers and the students should be delegated. Trust is important so that all the participants involved can feel that they own the process.

Again, the researcher considered that while Ng and Nicholas's research offers helpful insights around the multiple users involved in successful mLearning implementations, their points can be covered by the (L) and the Information Context of the FRAME model, and more explicit focus on the technology itself should be considered when evaluating mLearning.

Dikkers (2014) also proposed four principles for mLearning that centre around the educator's role. While the first principle is around informing users about netiquette and safe internet use to minimise the dangers of misuse, the other three principles focus on opportunities for teachers' professional development that active interaction with mobile offers. Dikkers (2014) suggests that educators should produce mobile applications using the features mobile devices offer more than consuming ready-made applications; consider new subjects and interests and expects that learners will pursue these interests rigorously; share their practice with other experts in the field.

The researcher of this study proposes to replace the term 'learner' with 'user' on the relevant circle in order to provide more discussion around how an educator's prior knowledge, skills and experience influences the implementation of mobile learning. The role that the educator

plays in the successful implementation of mLearning initiatives has been highlighted in the literature. Cochrane (2014), in his work around the implementation of mLearning in higher education, discussed the importance of the lecturer modelling the pedagogical use of the tools used for learning as well as the need for regular formative feedback from lecturers to students.

The term 'user' will also allow for further reflection on the role of other stakeholders such as senior management, IT technicians and parents/carers (though parents have not been the focus of this study, as explained in the introduction to the thesis). Passey (2010) also highlighted how different stakeholders can contribute in implementing mLearning successfully in schools. He identified headteachers, teachers, parents, project consultants and pupils as important participants in such implementations and focused their contribution around commenting on the nature and purpose of the learning activities, ensuring technical support and infrastructure are available, and providing opportunities to reflect on use and learning. An example of the roles of each group in the learning activity path is presented in Table 3.1. It reinforces the importance of including a range of stakeholders in decision making around institution-wide implementations.

Table 3.1. The roles of each group (Passey, 2010)

Focus Group	Learning Activity
Headteachers	- Recognise the devices' learning potential - Offer opportunities for monitoring, discussion and reflection
Teachers	- Identify and select suitable learning activities - Support activities that focus on significant areas of learning. - Allow and mediate the development of social, metacognitive and mega cognitive learning activities. - Gain feedback about the effectiveness of learning activities - Provide pupils with chances to increase independence when using the devices inside or outside the classroom. - Widen the uses of learning activities during every school term,
Parents	- Support learning activities with children - Monitor how the devices are used - Support social and educational uses
Project Consultants	- Provide examples of effective learning activity
Pupils	- Explore the learning activities using their devices - Explore the uses of mobile devices inside and outside the school

As part of the current project it was important to consider points around institutional support and curriculum integration as experienced by different stakeholders who are directly involved in teaching and learning at the school setting. Naismith and Corlett (2006) identified a set of "Critical Success Factors" (CSFs) for successful mLearning projects. They included

institutional support, internet access, curriculum integration, real-life skills and ownership of the mobile technologies. These factors reinforce the triage that the FRAME model proposes and the importance of considering institutional support alongside curriculum interventions.

Alrasheedi, Capretz, and Raza (2015), in their systematic review of critical factors for the successful implementation of mobile learning in higher education, identified 13 factors that contribute to successful mLearning implementation. The factors range from the personal to collective and authority decisions that influence successful mLearning interventions. It is important to acknowledge that the need for institutional support towards teachers and students alongside a clear vision around the integration of mLearning across the school are critical in the success of institution- and programme-wide mLearning implementations. Such support will be present in the form of providing time for teacher training and teacher rewards as well as access to resources and commitment for technical support.

Futurelab's earlier study (2004) also highlighted ten factors that can support the effective implementation of mobile learning. They ranged from curriculum to technical support and emphasised the need for security andtraining. More specifically the ten factors included: 1) investigating a cost model for technology, infrastructure and services; 2) studying the requirements of the people involved in using technology, particularly teachers and students; 3) accessing the technology to be suitable to the learning task; 4) assigning the necessary roles for introducing and subsequently supporting mobile learning; 5) developing strategies and procedures to manage the mobile devices in the institution; 6) providing training and continuing technical support for teachers to enable them to use mobile technologies to improve current and new instructional activities; 7) considering the use of mobile technologies for administration work like monitoring students and marking; 8) considering the use of mobile technologies to support group and collaborative learning; 9) adopting and discovering appropriate applications that can match the classroom and the curriculum needs; and 10) ensuring privacy and security of the students' personal data and their current location. Factors 7, 10 are beyond the scope of the current study, which focuses on curriculum use. The other factors are included in the adopted FRAME model as they consider interactions among teachers, students and the devices.

The core of the FRAME model, the central intersection of the three aspects labelled Mobile Learning, indicates the importance of support for teachers and learning in considering how their roles will change as part of the mLearning process (Koole, 2009) while the Interaction

Learning (LS) and the Social Technology (DS) sections highlight the need for connectivity in supporting effective learning communities. While references to school senior management are not explicit, decisions in terms of device purchases, technical support and access to online resources depend on management decisions and digital vision. Again, the researcher considered that the FRAME model represents factors included in the other taxonomies, giving equal weight to all aspects of mobile learning from a sociocultural perspective (Koole, McQuilkin, & Ally, 2010).

The FRAME model captures the dialectic relationship between users and technology with the Device Usability (DL) section makes explicit reference to pedagogical approaches of introducing learning tasks, for instance, by "reducing cognitive load by chunking content, reducing the number of required actions to complete tasks, using mnemonic devices, and simplifying displays" (Koole, 2009, p.26). However, there is an assumption that the selected learning, and usually collaborative, tasks will promote higher order thinking skills and as a result there is no detailed consideration of the type of learning activities in which the users may be engaging.

It is clearly important to consider such types of learning activities. The wider literature on mLearning has attempted to classify learning activities that relate to the use of mobile devices to facilitate teacher planning and student learning. Naismith, Lonsdale, Vavoula, and Sharples (2004) proposed six types of mLearning activities: five of them focused on student learning and were based on learning theories and one focused on the use of technology to facilitate teacher co-ordination of classroom activities. It can be argued that the sixth category is centred around the use of digital technologies in general and may not be specific to mLearning; however, it is important to acknowledge that co-ordination of learning activities is important in mLearning as well as consideration of how the implementation of digital innovations impacts teachers' workload. The type of activities focused on a wide range of pedagogical learning approaches from behaviourist to informal and lifelong learning and included the following:

Behaviourist: in this theme, activities promote learning through a change in behaviour or actions. They include presenting learning materials, obtaining responses from learners and offering appropriate feedback. Drill and feedback is an example of such activities.

Constructivist: the activities related to the constructivist approach require constructing new concepts or ideas built on previous and current knowledge. An example of such activities is

participatory simulations, where the learners are acting as significant parts in an immersive recreation of a dynamic system. The learners are part of the simulation itself and they are engaging in the learning process as they are seeing the effect of their actions on the system.

Situated: in this approach, activities are promoting learning through authentic context and culture. They include context-based activities like problem-based learning, context-aware learning and case-based learning. In problem-based learning, students are given an ill-defined problem that they may encounter as practising professionals and then they explore the problem to gain the required knowledge. Context-aware learning involves gathering information from the surrounding environment, such as museums and galleries. Case-based learning is similar to problem-based learning in getting the learners to solve a problem; however, the problem is well defined and might or might not involve real world issues.

Collaborative: this theme concerns activities that promote learning via social interaction. Small group collaboration through online discussion boards is an example of these activities.

Informal and lifelong: the activities of this theme support learning outside a committed learning environment or formal school curriculum. They include informal learning through intentional or accidental learning, as well as incidents that can be supported by mobile technologies used to record, reflect and share learning.

Learning and teaching support: in this theme activities help to coordinate between learners and resources. Here, teachers can use mobile devices for recording attendance, accessing data, recording grades and organising schedules.

This wide range of activities can provide rich experiences if combined but the authors did not clarify how the teacher can plan the orchestration of such a diverse range of activities.

For some researchers the focus was not on the pedagogical methodology but on the enrichment of classroom tasks. For instance, Johnson (2010) recommended that mLearning opportunities should be added to common classroom activities through lectures, polling systems, recording and posting lectures, sharing worksheets online, playing educational games, assigning online readings, and allowing students to share their understanding through audio, video and multimedia presentations. Johnson's work acknowledged the fact that designing activities for mobile learning should be determined by specific learning objectives. Sharples et al. (2009) reinforced the point that mobile devices should be used to increase benefits to the learners and that they are tools that can facilitate activities that are otherwise

not possible without them. Therefore, mobile technologies can be suitable for part of an activity and can be supported either by other technologies or no technology (Sharples et al., 2009). Passey (2010) also reinforced the importance of considering mLearning activities in the ways they support students' communication and thinking skills.

Kukulska-Hulme and Traxler (2005) reported that there are many generic learning activities that can incorporate the use of mobile devices, such as solving problems, reflecting, evaluating, gathering information and skills' acquisition, while Johnson (2010) expanded that list to include differentiating instruction according to the participants' learning needs, encouraging collaboration through the online social networks, and encouraging interaction with students from other countries. Kukulska-Hulme and Traxler (2005) also distinguished between didactic and discursive mobile learning according to their pedagogical intent. Didactic mobile learning occurs when mobile educational materials are used, such as e-books and web caching, while discursive mobile learning depends on interaction and discourse among mobile learners.

In the context of Oman, where there has been a tradition of a didactic approach to teaching, it is important to consider whether the mobile devices will be used as a substitution of paper-based or oral activities, and whether the opportunities to redefine tasks and solutions based on the functionality that these devices offer will be utilised. Therefore, the researcher is also making use of the SAMR model (Puentedura, 2014) as part of the Learner Aspect (L) to reflect on the quality of the mLearning scenarios in the classroom.

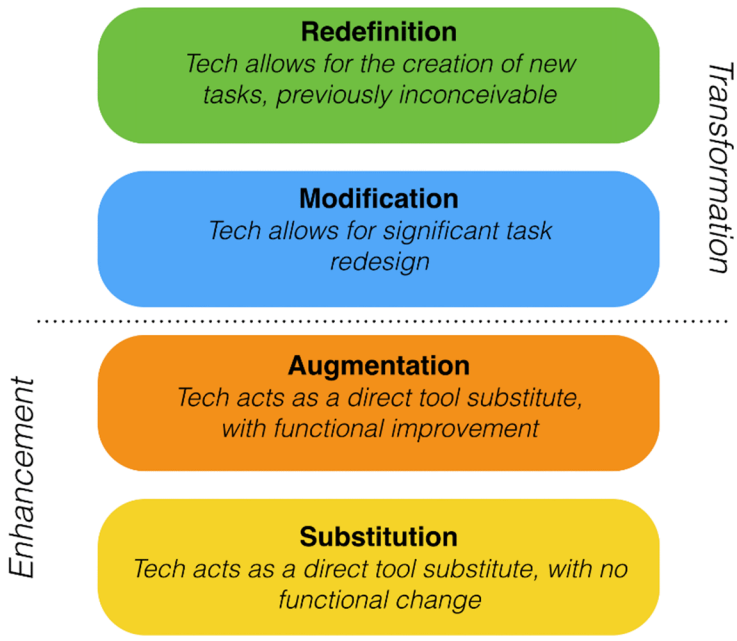

Figure 3.2. SAMR Model (Puentedura, 2014)

The abbreviation SAMR refers to four terms: Substitution, Augmentation, Modification and Redefinition (Figure 3.2). It focuses on the digital activity rather than the technology and it can be applied to mLearning opportunities and the use of mobile devices in the classroom. For instance, Hockly (2012) describes classroom tasks that English teachers can introduce through mobile devices. In the Substitution stage teachers can give short dictations, which can be typed as SMS messages, and then saved and shared electronically. This task is a substitution for paper and pen. An Augmentation task can involve asking learners to write a chain story in groups and then upload their work into a blog. They can receive comments by other groups, classes or even parents, which then involve interaction. Although it is a substitution task for paper and pen, the enhancement part of the interaction is there to have changes with functional improvement. In the Modification stage, Hockly suggests that learners can be put in pairs to rehearse and video tape oral presentations. Videotaping with mobile devices allows them to practise until they produce the final version that satisfies them. The final version can then be shared in one of the video-sharing sites such as YouTube or Facebook. This task can transform the traditional oral task into more change modalities by involving the learners with repetition and rehearsal of language learning, Finally, in the Redefinition stage, new tasks can be created using mobile technologies like the Global Positioning System (GPS) feature to solve clues in specific locations outside the school, which creates a new learning experience

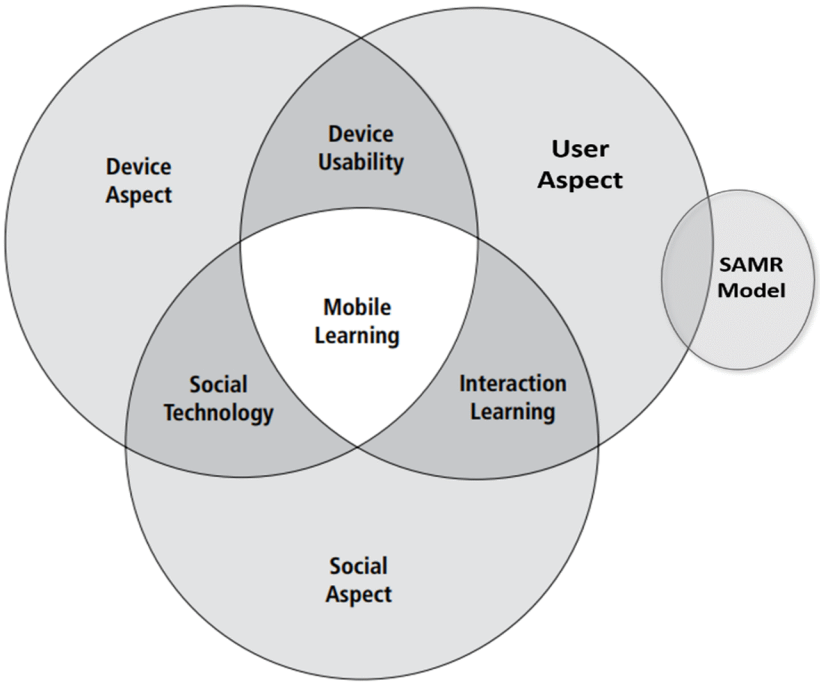

Figure 3.3. The Updated Frame Model

The updated model used in this study (Figure 3.3) will inform the data collection and analysis process, as well as ensure that the literature review acknowledges all the aspects included.

3.4 Pedagogical Benefits of mLearning

International research has identified many pedagogical benefits of mLearning. They include: enhancing learning (GSMA, 2011) by raising engagement (Pegrum, Oakley, & Faulkner, 2013), providing authentic and situated learning opportunities through ubiquitous access to vast resources (Kukulska-Hulme et al., 2009), and enhancing communication and collaboration and learning everywhere (Pfeiffera et al., 2009). Some studies have focused on one of those benefits while others have identified more than one. For instance, Naismith and Corlett (2006) identified the following six positive educational outcomes of mLearning: motivation; higher engagement; personalisation; collaboration; interactivity; and a sense of community belonging. Their work focuses on benefits that mLearning has on an individual student as well as to groups. In the context of this study the benefits of mLearning have been organised in the following three groups to reflect the key points from the literature and the elements of the FRAME model: engagement and learning; authentic and situated learning; and collaboration and communication. These will now be discussed in the following sections.

3.4.1 Enhancing Student Learning and Engagement

The literature reveals that mLearning engages and motivates students to learn The results of using mobile learning are well noted in positive students' achievements, both at school and university-level. Studies conducted on mLearning interventions have demonstrated positive results in students' performance in different subject areas, their attitudes towards learning, and their autonomy towards the learning tasks (Al-Fahad, 2009; Shih, Chu, Hwang, & Kinshuk, 2011; Yang, 2012). Mobile learning has been reported to have a positive impact on students' achievement in schools (Hwang & Chen, 2013b; Kiger, Herro, & Prunty, 2012a; Looi et al., 2011; Shih, Kuo, & Liu, 2012) and higher education institutes (Cheng, Hwang, Wu, Shadiev, & Xie, 2010; Kert, 2013; Oberg & Daniels, 2013).

These studies indicate that mobile learning is appropriate to all age groups: school pupils and university students. Corbeil and Valdes-Corbeil (2007) suggest that mLearning can improve student-centred learning, engage 'tech-savvy' learners because of its richness in media, and personalise learning to support different learning needs. Rogers and Price (2009) also acknowledge that the different kinds of information flow as well as the access and

management of information that mLearning and mobile devices support, play a positive role in student motivation and engagement. Mobile devices can enhance, extend, enrich, challenge and disrupt existing assumptions and ideas about learning, and as a result raise motivation for learning, particularly among disengaged and disenfranchised learners (Traxler, 2011b).

A number of experiment-based studies across the world have investigated the effect of mobile technologies on the learning of students at school and found positive results.

Shih, Kuo, & Liu (2012) reported on fifth-grade students in Taiwan improving their mathematics knowledge more than the control group who used only paper and pencil-based tasks, while a similar study by Kiger, Herro, & Prunty (2012) that tested the effects of mLearning on mathematics achievement in a Midwestern elementary school in the United States also yielded with similar positive results. In that study, iPods with maths applications for students to learn multiplication were used with two experimental group classes of third-grade students, while two other classes learned multiplication using flashcards. The study revealed that the students using web applications in iPods outperformed those using flashcards. The novelty of the technology alongside users' positive response to the use of iPods may have contributed to the positive results.

Another project in Singapore that aimed to transform the third-grade science curriculum through mobile technologies also proved the effectiveness of mobile learning on science achievement. The experiment lasted for one academic year (21 weeks) in which the experimental class had 'mobilised' science lessons. The findings showed that the experimental group outperformed the other classes in the usual science assessment processes. Moreover, the students in the mobilised class demonstrated more engagement with the learning tasks and positive attitudes towards mobile learning (Looi et al., 2011).

A case study by Chou et al. (2012) reported the findings of a four-month project of ninth-grade students in the United States who used iPads during the Geography lessons. The researchers collected data from three sources: teacher focus group, student focus group and classroom observations. The results showed that the students benefited from the integration of tablets as they were actively engaged in the activities, and they improved their information literacy and digital citizenship skills. Similar gains in learning achievement through the use of mobile devices have also been found in studies on students in higher education, and these will be presented next. The studies discuss positive results in learning as well as student confidence.

Studies also emphasise learning gains in using mobile technologies beyond the classroom. An experimental study about learning English as a Foreign Language (EFL) at a university in northern Taiwan (Hwang & Chen, 2013) used PDAs to explore whether students would develop their listening and speaking skills further. The experimental group used PDAs during the lunch break, while the control group used paper-based materials in class. The experiment revealed that the achievement of the group using the mobile system was higher than that of the control group. In addition, students in the experimental group expanded the use of the mobile system from school to home. An online mobile system, StudentPartner, was used with a group of university students to learn English on campus with the support of multimedia and GPS (Cheng, Hwang, Wu, Shadiev & Xie, 2010). In this mLearning activity, an example of the redefinition SAMR stage, students were assigned two activities: English presentation and exploring the campus for six months. Following the experiment, the questionnaires and the interviews used revealed that students enjoyed using the system to learn English. The students' performance in their English Presentation was enriched and they demonstrated more confidence in their English-speaking skills.

MLearning has offered opportunities for students to revise and prepare for exams. For example, a teacher education study was conducted in Yildiz Technical University with 115 students enrolled on a pedagogical proficiency course. Researchers (Kert, 2013) developed YTUMOB, a piece of software that was downloaded on mobile phones. The YTUMOB system contained the required content for the course, supportive questions and feedback for the module questions. The evaluation of the mobile system included two academic tests and six assignments. The results showed that the proposed system successfully improved the students' achievements in the tests and the assignments and part of the success was attributed on the fact that the students could use their phones and study anywhere.

Studies have also compared the benefits of mobile learning against offline learning emphasising the opportunities for the self-directed pace mLearning offers. Forty-eight students from the Nursing department in a Taiwan university participated in an experiment that used a mobile learning system to study the respiratory system. The experimental group used the mobile system, whereas the control group learned through traditional face-to-face methods. The results of the students' final test found that the experimental group achieved more than the control group. Moreover, the students' confidence in understanding the course increased and they expressed favourable attitudes towards the mobile system.

Likewise, Oberg and Daniels (2013) explored the effect of self-paced instruction using iPod Touch, as opposed to group-oriented instruction on language acquisition and attitudes. First-year students at a Japanese university were divided into four groups to learn English: two experimental groups used iPod Touch and two control groups learned English through traditional offline methods. The results of the experiment indicated that the groups that used mobile devices scored higher than the control groups. Furthermore, the experimental group held positive attitudes towards the mobile method.

3.4.2 Providing Authentic and Situated Learning Opportunities

The terms authentic and situated learning are used in various different ways in the field of educational technology but in the field of mobile learning authenticity relates to students' participation "in activities and tasks like those undertaken by professional communities of practice" (Burden & Kearney, 2016, p.30). The opportunities for providing access to content anytime and anywhere and helping people on the go (Corbeil & Valdes-Corbeil, 2007) facilitate learning to be situated within the context, activity, and culture in which it occurs.

Authenticity in mLearning for Traxler (2009) includes access to current information available online. While this statement emphasises the importance for teachers to support their students with digital literacy skills, a study of 61 racially diverse high school students by Marchi (2012) revealed a youth preference for opinionated rather than objective news and preference towards the plethora of information shared on social media rather than a single 'objective' perspective. Studies around the use of social media as part of mLearning opportunities (Nowell, 2014) emphasised the importance of extending students' learning beyond the walls of the classrooms and supporting their development of digital literacy skills such as media literacy and digital identity and wellbeing (JISC, 2014).

The opportunities for students to engage with genuine real-world contexts and scenarios and engage in conversations, as well as being able to share the captured and saved work at any time (Passey, 2010), reinforce learning to be presented in an authentic setting that support knowledge exchange between learners (Naismith et al., 2004).

Brown and Mbati (2015) listed listening and recording audio for language learning, location-aware applications and GPS, context-aware and situational learning and augmented reality among the mLearning affordances. In an exploratory case study for EFL Chinese students by Liu and Tsai (2013), the researchers redefined learning activities using mLearning. The

researchers established an augmented-reality mobile application to support students in learning English. By using GPS, students could identify their locations and were able to describe their surroundings through the images seen on the mobile phone camera. Such installed learning material also enabled students to access information about the nearby scenic spots like views, places and buildings of interest in English. The results revealed that there was more engagement in learning, production of meaningful essays, as well as construction of linguistic and content knowledge.

Traxler (2011) lists five ways that mLearning can enhance and enrich learning through authentic experiencesThe first is contingent learning, where learners are allowed to respond to the environment and experiences. Situated learning is the second way in which learning is more meaningful because it takes place in the surroundings. The third way is authentic learning, in which learning tasks are associated with instant learning goals. Context-aware learning is the fourth way that can enhance learning, in which learning is informed by history, environment and surroundings. The fifth way is through personalised learning in which learning is customized by the preferences and interests of individual learners. These five factors reinforce the opportunities for mobility and learning outside the classroom that mLearning offers.

Mobile technologies can deliver learning resources to individuals, societies and countries where other educational resources have been difficult, costly, demanding or dangerous to implement (Traxler & Kukulska-Hulme, 2015). Traxler (2009) considers mLearning as 'situated' because it is appropriate for different learning contexts, such as the classroom, the field, hospitals, workshops and theatres. It also facilitates distance learning as it connects remote learners to the learning content. In Wu, Hwang, Su, and Huang's (2012) study, the researchers developed a context-aware mobile learning system to train nursing students about the physical assessment of patients. Instead of using printed lists, the researchers redefined the activities based on the technology features and nursing students were equipped with sensing mobile devices that were used to detect whether the students had correctly checked the locations of the stated disease in the physical assessment on the dummy patients. If the processes or the working sequences were incorrect, the learning system offered instant feedback and additional materials for further guidance. By comparing the results of pre-test and the post-test, the researchers confirmed that the students' learning outcomes had improved as a result of employing the mobile learning system for nursing training.

Rainger (2005) argues that mLearning can promote accessibility if learning information and material can be accessed anywhere and anytime, portable communication tools (messages and emails) are integrated and learning scaffolds and support tools such as dictionaries are easily accessed. Crompton (2013a) argues that learning in multiple contexts with mobile technologies allows learning to become portable and versatile because we can learn anywhere, anytime and any subject. Learning everywhere can help teachers and students. Teachers can take their students to learn outside the classroom and in different contexts like fields and museums by using their mobile devices. Kolb (2008) discussed the use of mobile phones in fieldtrips where students take photos, record audio clips and videos and then post them on one of Web 2.0 sites to be shared with other students.

While social communication and interaction are significant parts of situated learning (Lave & Wenger, 1991), personalised learning is also facilitated by mobile learning opportunities. Crompton (2013b) differentiated between "self-directed" mobile learning, where the learner decides on his or her technique to meet a learning goal, and "spontaneous" mobile learning, where the learner looks up in his or her device due to a prompt interest. Wright (2011) discusses the case study of an ESOL (English as a Second or Other Language) class that used computer software connected to handheld devices, which allowed students to send instant messages to answer the questions displayed on the screen. Using interviews and observations as the tool for data collection, the study revealed that the students enjoyed and appreciated creating their own content and were able to review the mobile content in various locations, such as at home and on the bus. While this was an example of substitution in the case of the SAMR model, it was fit for purpose and the ESOL students enjoyed texting the answers through the handheld devices because all the answers could be seen on the screen and could be discussed with the teacher.

3.4.5 Enhancing Communication and Collaboration

Corbeil and Valdes-Corbeil (2007) listed a number of benefits for teaching and learning with mobile devices, among which three are related to social and communication enhancement. They argued that mobile learning can improve interaction between students and teachers, decrease cultural barriers between students and their teachers, and facilitate collaboration by using synchronous and asynchronous communication tools. Wheeler (2009) also stated that learning with mobile devices facilitates delivery of content and interaction of students with their tutors and their peers. Cobcroft, Towers, Smith, and Bruns (2006) reported that

mLearning could support the social construction of knowledge by enhancing the learners' creative, critical, collaborative and communicative engagement. Crompton (2013a) pointed out that the feature of social and content interactions in mLearning permits learners to make connections with people and with subject areas. Moreover, mLearning can enhance problem-based learning and context-aware learning (Caballé, Xhafa, & Barolli, 2010).

A number of case studies have investigated collaborative learning opportunities offered through the use of mobile devices and mLearning (Rodríguez, Riaza, & Gómez, 2017). They point to the capabilities for social interaction and learning inside the formal classroom as well as outside in users' own physical and virtual environments like the home.

For instance, in Ott et al.'s (2014) study, students used mobile devices at home to accomplish school work for several purposes, such as communicating and cooperating with classmates, browsing for information, checking the calendar, looking for pictures, translation, and calculations.

However, at times these case studies fail to acknowledge the multidimensional considerations that mobile collaborative learning includes or analyse these interactions from the perspective of the device, the technology and the infrastructure (Caballé, Xhafa, & Barolli, 2010). For instance, a study around the redefinition of technology interventions by Jahnke and Kumar (2014) reported the use of iPads in a Danish language classroom. Grade 7 students were learning the Danish language and were directed to write a childhood story using the "Pages" application (a word processing application for Mac products) on their iPads. Then, their stories were posted on Facebook in order to gain feedback from their teacher and their peers. At the next stage, the teacher displayed some of their stories on the Smartboard to elicit face-to-face peer reviews. Finally, the students edited their stories and uploaded their final version to a shared online area.

Jahnke and Kumar's (2014) study also involved modification (SAMR) of teachers' practice. Grade 9 students were instructed by their teacher to design physics experiments in the area of sound, light, electricity, magnetism and chemistry, based on prior knowledge from previous classes. The students, who were working in groups, recorded their work and prepared multimedia presentations using features of their devices to take photos and record videos. They submitted their work online and the teacher provided feedback. The mobility of the devices allowed them to record their work in a seamless way.

Kearney, Burden, and Rai (2015) reported on research with secondary students who used an online digital storytelling app ("Story bird") to create their digital stories; another group of students, who were studying poetry, worked in groups to put together and video record their rap music compositions. Once they completed their tasks, they shared them online and the students received feedback from their peers, artists, and families.

Another example of modification was highlighted in Wang, Yu, and Wu's (2013) study, where they designed a module (mobile-assisted social e-learning) eMASE for a speaking and debating course. The students were instructed to work in groups and training was provided on social media applications such as Facebook, Google Hangouts, and YouTube. All the participants including the instructor and the students were on the users' contact lists. The results revealed that the students felt their learning had improved thanks to the use of mobile applications. Furthermore, the students who used the social networking applications more frequently showed more confidence and engagement in their learning.

These case studies provide evidence of the positive aspects that mobile collaborative learning offers but also reinforce the dominant presence of the teacher in guiding the learning process and outcome.

To summarise, three key pedagogical benefits of mLearning have been discussed: the enhancement of student learning and engagement; authentic and situated learning that allows users to learn everywhere; and the enhancement of communication and collaboration. Students can be more engaged with learning and can achieve better results. They can access a vast range of resources, such as video clips, images and animations, anywhere and anytime. These resources can facilitate richer communication, authenticity in the learning experiences and contexts, and collaboration among students, and between teachers and students. Learning can be extended outside the formal classroom in multiple contexts like museums and fieldtrips, while communication and learning between home and school can be enhanced as well. These benefits are great incentives for educators who are planning to implement mLearning in their practices; however, there are also a number of challenges that should be considered.

3.5 Challenges of Mobile Learning

The literature also identifies challenges around the introduction and implementation of mLearning. Corbeil and Valdes-Corbeil (2007) listed seven challenges when employing mLearning in the classroom. The list identifies both technical and pedagogical challenges that

can affect learning. Their concerns focus around challenges that non-technical students may face in terms of access and involvement in the learning process.. Rogers and Price (2009) focused on students' learning experiences and identified three main challenges in implementing mobile learning in education settings: avoiding information overload; preventing distraction; and designing collaborative learning experience. Börner, Glahn, Stoyanov, Kalz, and Specht (2010) extended the list of challenges to seven, focusing on the learner, the device and the interaction between the technology and the learner; as a result, their taxonomy is close to the FRAME model. Their list also included a focus on the importance of situated learning and identified that varying perceptions around the implementation of mobile technologies among stakeholders can affect learning.

3.5.1 Cognitively Demanding Environment

Cognitive overload and the demands on working memory are key factors identified across studies. There are circumstances when mobile devices are used in a distracting situation, which results in the overload or stretching of the learner's cognitive resources (Deegan, 2015). Interaction complexity has an impact on students' learning performance and mental effort in mobile learning (Wang, Fang & Miao, 2018). Researchers like Chu (2014) highlighted that for mLearning to be effective consideration has to be given to the learning tasks. In his experimental study with two classes of fifth-grade students studying the indigenous culture in their social studies course in an elementary school in Taiwan, he found that students who were given many tasks while using their mobile devices at the same time did not perform as well as peers who were not using mobile devices.

According to Terras and Ramsay (2012), there are five psychological challenges that are mainly related to distraction and discipline. The first challenge concerns less memory use due to mobility and changing contexts. In fact, remembering the learning context aids students in their learning, which may oppose the idea of mobility and changing contexts in mobile learning.

The second challenge is the finite cognitive ability of humans, which requires learners to be more attentive with mobile devices due to their distractive factors, notably environmental and social media.

The third challenge is related to students' cognition, which is not only distributed to the individual, but also to objects, networks and symbols. The complex learning environment, which is characterised with enormous resources, can be a challenge if the students do not have the digital skills to input or output with their learning.

The fourth psychological challenge of mobile learning is metacognition, in which students must be aware of the demands and risks of mobile devices. They should be aware of the outside interruptions and be able to manage their mLearning despite the aforementioned interruptions. The final challenge is the differences among students in using technology, particularly mobile devices. Students' capacities and understandings are different and so is technology, which is of multi-usage. Each student should realise how mLearning promotes his/her distinctive approach to learning and understand the diverse uses of technology.

These five challenges give an insight on the complex context that mLearning is situated in. They pose particular challenges in the way that the teacher needs to structure the learning to support metacognition.

3.5.2 Technical Problems

The challenges that the devices themselves can present cannot be overlooked: reliability with regards to battery life, data loss, compatibility, connectivity, and the limitations that the size of the screen poses (Kukulska-Hulme & Pettit, 2009; Naismith & Corlett, 2006) have all been discussed in the literature.

Brown and Mbati (2015) also investigated the challenges that might hinder the employment of mLearning, especially in rural areas. They found five technical challenges. Rural areas could be restricted to the use of resource-rich materials due to low bandwidth. On the other hand, high costs of data and voice services might limit connectivity for mobile learners. Moreover, learners are sharing mobile devices with other learners or with their families in many rural settings, which limits the ubiquity of mLearning. The fourth challenge involves the organisational difficulties with the concept of bringing your own device (BYOD), which increases IT resources and system security risks. This aspect may not always be relevant to school settings, where there is an expectation that devices will be provided by the school while at some schools BYOD is prohibited to minimise risks to student safety, reduce institutional pressures for access and compatibility, or simply because of the prohibitive cost to supply each student with a mobile device. The fifth and final challenge is the lack of software to enable seamless ubiquitous learning. As a result, the learning process is challenged at times when students try to access materials and activities that are not optimised for use on smartphones or mobile devices while navigating websites and accessing learning management systems becomes difficult (Farley et al., 2015).

3.5.3 Disruption and Distraction

Distraction is the main challenge that teachers face when employing mLearning during their lessons. Mobile devices "are generally seen as subversive and illicit tools" (Hartnell-Young & Heym, 2008, as cited in Aubusson, Schuck & Burden, 2009, p. 243). Students have been observed who are distracted during their lessons, surfing web pages that are not related to the content of the lesson. A study by Chou et al. (2012) showed that the students were distracted by looking at other websites unrelated to the tasks that they should be engaging with. However, there is the argument that distraction, and as a result disruption, is an issue of context rather than a problem of keeping discipline or an interruption of technology (Sharples, 2015). Sharples (2002) also argues that if schools and universities ban mobile devices because they disrupt lessons and lectures, they would fail to achieve the best use of these resources. He argues that educators need to create productive educational contexts and to enable productive learning with mobile devices. Moreover, Johnson (2010) suggests that 'savvy teachers will figure out how to change distraction to focus by using students' personal technologies to improve learning and teaching' (p.22).

Kolb (2008) argues that:

> *Instead of spending time, energy, and money creating policies to fight cell phone use in schools, educators could spend their time finding useful ways to integrate these devices as knowledge construction, data collection, and collaborative communication tools to help students become more competitive in the digital world. (p.2)*

Kolb (2008) further argues that teens are not aware of the etiquette of using mobile phones and need to be taught the appropriate digital 'etiquette' of how these devices should be used. Ethical challenges have been reported from capturing and disseminating classroom activities using mobile devices that have resulted in cyber-bullying of students or humiliating teachers (Burden, Aubusson, Brindley & Schuck, 2016).

Kolb proposes solutions to minimise classroom disruptions that mobile phones may pose, and although he is focusing on mobile phones hissuggestions can be applied to the use of other mobile devices. Kolb suggests taking control of the mobile phones by collecting them in one place until the time they are required to be used. The second solution is more about collaboration between teachers and students and focuses on setting up a social contract with students before starting any mobile learning activity. This social contract is an agreement

between the teacher and the students about when, where, how and why mobile resources will be used in the classroom and it is recognised in other studies (Aldrich, 2017). However, Bidin and Ziden (2013) report on the importance of teachers who use social media as part of their mLearning activities to align it with school policies that relate to online safety.

Wheeler (2015) referred to new technologies that cause change as 'disruptive technologies'. However, such disruption caused by introducing new technologies such as mobile devices can also be positive because it can lead to change and improvement in practice. Wheeler explained that mobile technologies are causing positive disruption because they are richly social, create location independent learning opportunities, encourage students to be more creative, and allow personalised learning to flourish within social contexts.

Johnson (2010) proposes activities that can restructure the educational process and turn distractive technologies into useful teaching tools. They suggest the importance of enquiry-based, problem solving learning opportunities that support student collaboration. They also discuss the importance of and opportunities for differentiation that mobile devices offer. For instance, access to video tutorials or links to online learning resources to support students' learning.

3.5.4 Teachers' Confidence

Mac Callum and Jeffrey (2014) refer to two aspects that have been reported consistently in the literature to impact lecturers' adoption of technology: the perceived usefulness of the new technology alongside the perceived effort needed to learn to use that technology (perceived ease of use) and the lecturers' existing digital literacy skills and understanding of how to integrate that technology into their teaching. While their study focuses on higher education, studies with school-based teachers (Cornelius & Shank, 2017; Crompton, 2013a; GSMA, 2011) have reported similar factors affecting teachers' adoption of mLearning.

Brown and Mbati (2015) describe the challenge of teachers' own digital literacy skills and the disparity that occurs when learners are more digitally literate in using mobile technologies than their teachers. Lack of teachers' confidence can also be attributed to the difficulty to change daily behaviours and teaching styles to incorporate mLearning in classroom tasks. The invasion of the new technologies into education has disrupted old practices and has caused stress for practitioners who were comfortable with their old practices (Wheeler, 2015). Crompton (2013a) maintains that one of the hurdles for incorporating mobile technologies in teaching and learning is the necessity to change teaching styles.

Naismith and Corlett (2006) also commented that lack of teacher training leads to reduced confidence that impacts on time and cost in using or not using mobile devices to their full potential. To raise the teachers' confidence, studies (GSMA, 2011; Pegrum, Oakley, & Faulkner, 2013) recommend providing time for more professional development (PD) of teachers, more focus on the pedagogy rather than just the technology in these PD opportunities and building a professional development network as a platform for teachers to collaborate.

Chou et al. (2012) consider that the lack of teacher-selected applications can also be an obstacle and recommend the need to provide more pedagogical examples of best practice. Mobile learning appears to be ideal to further teachers' PD as well, as it can provide access to resources and a process of learning beyond their school, especially if they do not feel confident disclosing their lack of digital literacy skills to their colleagues (Aubusson, Schucka, & Burden, 2009).

What is implied in all these studies about teacher confidence in the use of mobile devices and mLearning is the need for a wider institutional vision about the technical implementation and curriculum integration of mLearning, with teacher PD as part of that vision. Some studies explicitly refer to support by the headteacher or the local authority (Cornelius & Shanks, 2017) in implementing mLearning effectively to enthuse students and support teachers.

The introduction of digital technologies to an educational setting does not automatically bring about change in practice (Underwood & Dillon, 2011). While there is a growing literature around the pedagogical affordances of mLearning, it is also important to look at these studies and identify how challenges that may be related with mLearning can be considered further. Cornelius and Shanks (2017) suggest that technological implementation in mLearning may not always be a linear process of moving from assimilation (where new technology is used in the same ways as the old one) to accommodation (new technology changes practice), as originally suggested by Lebrun (2007). The changes may be sudden, such as distraction and disruption of current practices, or introduce new ways of practice to address technical challenges, for instance.

The challenges around mobile learning have been discussed under three headings that reflect all three aspects of the FRAME model: the device, the learner and the social aspects of using mLearning. Technical features and aspects of mobile devices may pose challenges in terms of connectivity, screen size and battery life. Distractions that online access offers and planning for the right learning input to avoid information overload can have impact on student

behaviour. The training of teachers and students in using the mobile devices and co-designing collaborative activities is also an important factor that can influence the implementation of mLearning. The challenges of using mobile devices for learning should be carefully considered before embarking upon a mobile learning project. Despite these limitations, mobile learning could be effectively implemented if mobile devices and learning activities are suitably designed for educational purposes.

3.6 Summary

The chapter explores mLearning in the research literature to identify the opportunities and challenges it offers, and as a result defines key factors that influence the implementation of mLearning in education settings. MLearning paradigms are discussed and among these the researcher chooses Koole's FRAME model (2009) as the basis for the theoretical framework for this research. The researcher expands the FRAME model to incorporate other stakeholders beyond the learners, such as teachers, and considers the range of teaching and learning activities the mLearning presents according to the SAMR model. As a result, the three elements suggested by the FRAME model, namely the device, learner and social aspect, inform the discussion on the mLearning literature in this chapter.

Learning with mobile technologies offers many pedagogical benefits for both teachers and learners. These include enhancing engagement and learning, supporting communication and collaboration through authentic learning scenarios, and situated learning opportunities where the user can learn anywhere. However, a number of challenges are also considered: information overload through the demands of accessing multiple tasks and apps, technical challenges such as battery life, weak internet connection, fears of possible classroom behaviour management disruptions, and lack of teachers' confidence to use the devices and implement mLearning.

Reviewing the literature revealed some empowering factors for the successful implementation of mLearning. They include the availability of educational resources, and technical support, as well as institutional support for curriculum integration, and teacher training, in addition to parental support and engagement for encouraging effective mLearning opportunities beyond the classroom.

Chapter 4: Methodology

4.1 Introduction

This chapter discusses the methodology adopted for this research. First, the main research paradigms are outlined, followed by a more in-depth look at the pragmatic concept of research. Then, the three research strategies are explained, and the mixed- methods approach is described, the latter being the strategy used in this research. After that, an exploration of case study research is presented. Then, the data collection methods are discussed, and the two main tools used in this research (questionnaires and interviews) are analysed. Subsequently, the data analysis methods are further discussed in depth followed by discussing the validity and reliability and the ethical considerations of the research. Finally, a clarification of the context and the study sample is provided.

4.2 The Research Paradigm

Each researcher will bring their own beliefs and philosophical assumptions to a study. These will depend upon the researcher's perspectives on the way they view the world, how they contextualise the topic that they wish to investigate within that reality, and how they are going to design their research to collect and analyse their data. As a result, ontology and epistemology represent important philosophical elements in the pursuit of knowledge. Ontology is defined by Crotty (1998, p.10) as 'the study of being'. Ontological considerations focus on the question, 'what is the nature of reality?' and establish what is real for the researcher when conducting a study (Mertens, 2010) and how social reality exists in relation to human understanding. Newby (2014) shares the same view and considers ontology as how researchers view the world.

Epistemology is the philosophy of knowledge (Trochim, 2000). It is defined by Newby (2014) as how the researcher can be sure that someone else's interpretation is correct. It closely relates to the choices about research design and methodology the researcher makes to explore their study. While ontology is focused on how researchers perceive "the existence of reality" (Wahyuni, 2012, p.69), epistemology is concerned with how we get to know that reality. Leavy (2017) views ontology as believing in the nature of the social world, and epistemology as believing in how research progresses and what is considered as the source of knowledge.

Both ontological and epistemological assumptions underpin the research paradigm, which refers to the researcher's worldview of and how it impacts on the nature of the research, including the methodology selected and the shaping of the research questions.

The research paradigm makes ontological assumptions. Specifically, the main beliefs concerning the nature of reality are represented through the perspectives of objectivism or positivism, subjectivism or interpretivism, and pragmatism, which combines a mixture of views of single and multiple realities (Mertens, 2010). While objectivism views human behaviour as "the result of forces acting out in the external world that people cannot control and find difficult to comprehend" (Huizing, 2007, p.93), subjectivism views social phenomena as mainly depending on individual perception, and interpretations of the world where "understanding, truth and meaning come from ongoing interaction with the physical environment and with other people" (Huizing, 2007, p.8). In subjectivism "the focus is on the subject, in objectivism the focus is on the structure" (Francine, 2017, p. 634). Turning to pragmatism, it "provides a middle position both methodologically and philosophically by offering a mix of quantitative and qualitative methods to answer research questions" (Onwuegbuzie & Johnson, 2006, as cited in Brierley, 201, p, 17).

The research paradigm necessarily makes epistemological assumptions, as it is concerned with the nature of the knowledge sought and what approaches and methods can be used to seek and interpret such knowledge. In the present study, the main knowledge and views sought concern the learning opportunities that the use of mobile technologies can create and the challenges that surround the introduction of such technologies in schools. Such knowledge and views lie in the minds of the headteachers, technicians, teachers, and students involved with the technologies and to this extent are subjective, although the participants also have knowledge that could be regarded as objective, for example, whether or not the students have mobile access to websites showing experiments being conducted. The research paradigm must therefore be able to elicit their knowledge and views with as little distortion as possible, and then interpret this as accurately as possible, to obtain trustworthy and valid knowledge.

These considerations have led the researcher to choose the pragmatic paradigm as her research paradigm. Pragmatists link the choice of approach directly to the purpose of and the nature of the research questions posed (Creswell, 2014). As the current research is exploring a range of stakeholders' views on mLearning using the multi-dimensional lens offered by the FRAME model, the researcher has adopted the pragmatic paradigm. The researcher does not

consider that social reality is objective and external to the participants' experiences and views; she believes that the participants' views on mLearning are shaped by interactions and the work they have engaged in and as a result she wants to engage in a dialogue with the participants and find out more about their experiences. She is not aiming to test a hypothesis, the result of which will be applied across all schools in Oman, without further consideration of the local priorities. She is aiming at using principles from both paradigms informed by the literature review and provide the most appropriate framework to address the research questions identified for this study; as a result, pragmatism is the philosophical stand selected for this study. The next section discusses this paradigm in more detail.

4.2.1 The Pragmatic Paradigm

This worldview arises from situations, actions and consequences, rather than from antecedent situations, such as those implied by post-positivism. Researchers advocating this paradigm focus on the problem and use all the available approaches to solve it, instead of concentrating on the approach itself. Pragmatism is not dedicated to any philosophical system, and this applies to the mixed methods approach where researchers draw assumptions from both qualitative and quantitative research. Thus, mixing methods and analysing the data to obtain answers for the research questions that are acceptable to others represents the pragmatic perspective. Consistent with this paradigm, researchers are free to choose research methods and procedures that best serve the research focus. Therefore, pragmatism is combining approaches and testing their adequacy first, then combining methods to construct convincing arguments (Creswell, 2013; Newby, 2010).

Morgan (2007) believes that, the emphasis in the pragmatic approach is on shared meanings and joint action. This refers to the degree to which two people (or two research fields) understand each other, and the degree to which they exhibit their shared meaning in working together. Pragmatism has been defined by Teddlie and Tashakkori (2011) as a paradigm that focuses on the methods that are used to answer the research questions and therefore supports the use of mixed methods research. In the current research the methods chosen reflected an understanding of the cultural and social parameters that the stakeholders operate in (for instance, the segregated school setting) and considered the mixed methods approach as a way of engaging with students and teachers in such ways that they could feel empowered and safe to share their views.

Creswell (2013) believes that pragmatists and mixed methods researchers do not see the world with a single perspective; they look for many approaches to collect and analyse data. Pragmatists believe that 'truth' is what works at the time, therefore it is imperative to use both the qualitative and quantitative data to better understand the problem in question. In this research, it was important to understand that the schools are at different stages of the mLearning implementation and to choose data collection approaches that will allow stakeholders to reflect on the process and development of mLearning implementation. Pragmatists also agree that research always arises in social, political, historical, and other contexts. They further believe in the independence of the external world, which is actually lodged in the mind. Mixed methods researchers also believe that pragmatism has opened the door to many methods, different worldviews, different assumptions and different forms of data collecting and analysis.

However, pragmatism has been accused of having a number of limitations (Bryman, 2006; Johnson & Onwuegbuzie, 2004). Johnson and Onwuegbuzie (2004) identify seven weaknesses for pragmatism. Firstly, applied research may receive more consideration than basic research because the former may seem to yield more direct and practical results. Secondly, pragmatism may encourage incremental change rather than structural, fundamental, or revolutionary change in society. Thirdly, pragmatic researchers do not always provide a reasonable answer for their fundamental question "who is a pragmatic solution beneficial for?" Fourthly, usefulness or workability can be unclear unless the researcher addresses it explicitly. Fifthly, pragmatic theories that are related to truth are struggling to deal with theories or propositions that are either useful but not true or not useful but true. Sixthly, many philosophers have not accepted pragmatism because of its rational failure to solve many philosophical disputes. Seventhly, some neo-pragmatists refuse any correspondence with truth and this creates difficulties for many philosophers in transmitting their ideas. Despite these possible limitations, for the current research the researcher considered that pragmatism, along with the associated mixed methods approach that it advocates, offers an appropriate framework for exploring stakeholders' perceptions of what they consider as opportunities and challenges in terms of mLearning based on their experiences.

Bryman (2006) took note that the quality of mixing qualitative and quantitative methods in pragmatism may be jeopardised in two ways, First, when researchers consider combining methods to be a "fashionable" procedure, this may not be appropriate for the research questions. Second, combining the two methods lacks a rationale.

Nevertheless, pragmatism is the appropriate philosophical approach for this study as it acknowledges that user perceptions on mLearning are important to record and analyse. It tries to bridge the traditional approaches of positivism and subjectivism through exploring participants' views alongside key points that are already reported in the literature around mLearning implementations. The research acknowledges the particular cultural context that the schools operate in and appreciates that incremental change may be appropriate for the Omani educational system.

From this standpoint, researchers are free to choose any method that can serve their analyses and answer their research questions. Therefore, pragmatism is firmly related with the mixed methods approach, which will be explained in the next section.

4.3 The Research Strategy

The choice of research design is influenced primarily by the research problem, the researcher's personal experiences and the participants included in the study. The researcher has to determine which research strategy to follow from the three basic methods: qualitative, quantitative and mixed methods. These will now be considered.

Qualitative research explores the meaning assigned by groups or individuals to a certain human or social problem. Data is collected from the contributors' setting and is analysed inductively while extracting and interpreting the meaning of the collected facts (Creswell, 2013).

Quantitative research is defined by Creswell as "a means of testing objective theories by examining the relationship among variables" (Creswell, 2013, p. 4). The variables in the research can be measured through instruments, so numerical data can be analysed statistically to draw conclusions. Hence, quantitative research uses numerical data as the base of its conclusions. The goal of quantitative research or positivism is to recognise and explain pattern and order (Creswell, 2013). Although other styles of research share the same goal, there are two characteristics that distinguish quantitative research from other types of research. On the one hand, it focuses on developing a theory, which is similar to science research in its observable and measurable conditions. The main purpose of quantitative research is to produce theory and enlighten truths about relationships and behaviour that are applicable in variable conditions. On the other hand, it aims at providing and establishing proofs related to a certain phenomenon or relationship for others. However, the results of educational research cannot be certain because it is an area that deals with people (Creswell, 2013; Newby, 2010).

The third strategy is the mixed methods approach, which combines both qualitative and quantitative methods and is explained extensively in the following section, as it underlies the design of this study. The reason behind choosing this method is its aim to provide a more comprehensive approach to addressing the research questions.

4.3.1 Mixed Methods Research

A mixed methods approach (MMR) combines both quantitative and qualitative methods. It originated in 1959 by Campbell and Fisk when they used multi-methods to explore the validity of psychological traits. By using a mixed methods approach, researchers can avoid limitations and bias arising from any single method used in isolation. Moreover, the problems investigated by social sciences are complex and the use of one approach is not adequate to meet this complexity. Creswell (2013) considered the combined methods stronger than either the quantitative or the qualitative method by itself because it is not only concerned with collecting and analysing both types of data but also includes the use of both methods at the same time. Moreover, this combination of methods can expand the understanding of research problems. Leavy (2017) adds that using MMR may lead to a more comprehensive understanding of the investigated phenomenon.

When defining MMR, it is first important to distinguish between mixed-methods and multi-method designs. Teddlie and Tashakkori (2009, p.711) referred to multi-method design as using more than one method but limited to one worldview, such as using two quantitative methods or two qualitative methods. They defined mixed methods studies as using qualitative and quantitative approaches in research methods, types of questions, and inferences. Creswell, Clark, Gutmann, and Hanson (2003) proposed a more detailed definition focusing on the process of the research, in which MMR is defined as collecting and analysing both quantitative and qualitative data concurrently or sequentially, and then integrating the data in one or more stages of the research. Alternatively, the focus of the definition provided by Johnson, Onwuegbuzie and Turner (2007) is the rationale or the purpose of MMR.

More recent definitions combine philosophy, research design orientation and methods. Creswell and Clark Plano (2011) define mixed methods research on the basis of its core characteristics. They argue that a definition for mixed methods should incorporate several perspectives. Moreover, it focuses on the important components for designing and conducting a mixed methods research.

Mixed methods research has many features that attract social researchers. Eight contemporary characteristics of mixed methods research are identified by Teddlie and Tashakkori (2011), which are displayed in Table 4.1. These characteristics are also emphasised using different wordings and in more detail by Johnson and Onwuegbuzie (2004). Such features lead us to highlight the advantages of choosing MMR over other research methods.

Table 4.1. Eight Contemporary Characteristics of Mixed Methods Research (Teddlie & Tashakkori, 2011)

N	Characteristics of Mixed Methods Research
1	Methodological eclecticism
2	Paradigm pluralism
3	Diversity at all levels of the research enterprise
4	Continua rather than a set of dichotomies
5	Iterative cyclical approach to research
6	Focus on the research question or research problem in determining any study's methods
7	Set of basic research designs and analytical processes
8	Tendency towards balance and compromise that is implicit within the "third methodological community"

There are several advantages of using MMR over the other methods. The researcher found five main advantages or strengths of MMR in the literature:

1) Triangulation

Triangulation of research methods is considered to be an advantage over the use of a single research method. Triangulation is defined by Cohen, Manion, and Morrison (2011, p. 195) as "the use of two or more methods of data collection in the study of some aspect of human behaviour". Newby (2010) stated that MMR can increase the possibility for triangulating evidence. Triangulation is more concerned with the correctness of the insight and interpretation than with the correctness of measurement. Cohen et al. (2011) also argued that by triangulating methods the researcher can avoid being bound to one method. In this study, the two methods are the questionnaire and the interview, which are both seeking to obtain the knowledge and views of the participants in regard to the research questions.

2) Addressing research complexity

Cohen et al. (2011) claimed that using multiple methods in the social sciences research can explain the complexity and richness of human behaviour when studying it from more than one angle. Furthermore, Newby (2010) argued that combining methods can unfold and explore the issue of unknown or not completely understood boundaries, internal relationships

and processes of many research situations. Teddlie and Tashakkori (2009, 2011) advocate that combining methods can answer research questions that other methods are unable to answer as it involves both numeric and meaning interpretations. In this study, the use of the questionnaire responded to in a private setting may allow more honest answers, while the use of the interview may encourage fuller answers.

3) Stronger inferences

Teddlie and Tashakkori (2009, 2011) argue that a mixed methods design is superior to single approaches because it can offer stronger inferences than the other approaches. This advantage might be due to applying more contrasting methods which would enhance the researcher's confidence about the research findings (Cohen et al., 2011). In this study, the researcher can be more confident about her findings if the questionnaires and interviews yield similar results.

4) Presenting different views

Teddlie and Tashakkori (2009, 2011) also establish that MMR provides an opportunity to present a variety of different views. As noted earlier, Creswell and Clark Plano (2011) view a core characteristic of the approach to be its allowance of several perspectives, which encourages a broad interpretation and consideration of the phenomenon under study.

5) Decrease the influence of philosophy

This approach decreases the influence of philosophy in favour of pragmatism because of the need to place the current focus on the problem being researched and on finding an answer to a specific question (Newby, 2010). This accords with this study, which is concerned to investigate the practical issue of the use of mobile devices in schools in relation to learning, with little direct focus on philosophy.

There are several reasons behind the choice to use mixed methods approach in social research. The first is because of its strength in combining both qualitative and quantitative research methods and decreasing the limitations of both methods (Creswell, 2013). Secondly, MMR can ensure a complete understanding of the research problems and questions. In fact, the combination of quantitative and qualitative data contributes to the complete understanding of the research problem rather than using one approach by itself. Moreover, the initial results of any study may need further explanation in order to fully understand the research problem (Creswell & Clark Plano, 2011; Creswell, 2013). Thirdly, a mixed-methods approach is so complex and sophisticated that it attracts those in the front position of new research methods (Creswell, 2013).

Fourthly, the typology of the research might be another reason for choosing MMR. Newman, Ridenour, Newman, and DeMarco (2003) highlight the connection between the typology of research and the mixed methods approach. They argue that research questions by themselves are not sufficient to determine the research methodology. Rather, researchers have to understand the purposes behind the questions, so they call for a typology of research purposes rather than a typology of research questions. Hence, they assert that having complex purposes generates multiple questions, and this necessitates a mixed methods approach.

Creswell and Clark Plano (2011) identify other reasons like generalising results, understanding a phase in the research, theoretical stance and understanding the research objective. First, investigators may need to generalise qualitative exploratory findings by collecting quantitative data. Second, studies may need to be enhanced with another method to understand certain phases of the research. Third, a theoretical stance provides a framework that needs both qualitative and quantitative data to be collected. Fourth, a research objective in multiple research phases projects the need to be understood through connecting several studies, which may involve gathering both quantitative and qualitative data.

Like all methods, along with strengths MMR has also weaknesses. The first weakness is more related to the researchers' views and beliefs about the ontological and epistemological origins of different methods. For example, Doyle, Brady and Byrne (2009) identified two weaknesses in this context. On the one hand, some researchers rely on the dichotomy of research methods and therefore quantitative and qualitative methods cannot be mixed in one study as they have different ontological and epistemological backgrounds. On the other hand, building the choices of methodology exclusively on pragmatics is insufficient as there is no answer to the question 'practical for whom and to what end?'

The second weakness is more related to the practicality of mixed methods. For example, Morse (2003) stated that MMR is challenged for being less rigorous than the multi-method approach, so researchers are advised to describe both methods and show the consistency between data sets. Doyle et al. (2009) also discussed the difficulty of conducting MMR by only one researcher and the extensive time and resources that sequential studies may take.

These weaknesses can be avoided by designing a complementary MMR and having enough knowledge of both quantitative and qualitative methods. Johnson and Turner (2003) argue that conducting MMR should follow the 'fundamental principle', which means mixing methods in a way that has complementary strengths and avoiding overlapping weaknesses. According to

them, this principle should be followed for three reasons: 1) obtaining corroboration or convergence of results, 2) minimising key probable explanations for conclusions elicited from the research data, and 3) explaining the divergent aspect of the phenomenon.

The rationale for choosing MMR for this study is to strengthen the findings and reduce the limitations of quantitative and qualitative methods.

In order to reduce the limitations of MMR, the researcher developed the research scope in a way that was manageable for a single researcher in the time available and the given resources that she had access to. The researcher also had to ensure that equal weight would be given to both methods (qualitative and quantitative) in terms of data collection and analysis. Furthermore, the different types of MMR approach have been studied in order to choose the appropriate design for this research.

4.3.1.1 Types of Mixed Methods Approach

This section discusses the three main designs for a mixed methods approach, as well as more advanced strategies that integrate these three main designs, as identified and discussed by Creswell, Clark, Gutmann, and Hanson (2003); Creswell (2013); Creswell (2014); and Creswell and Clark Plano (2011).

1) Convergent Parallel Mixed-Methods Design

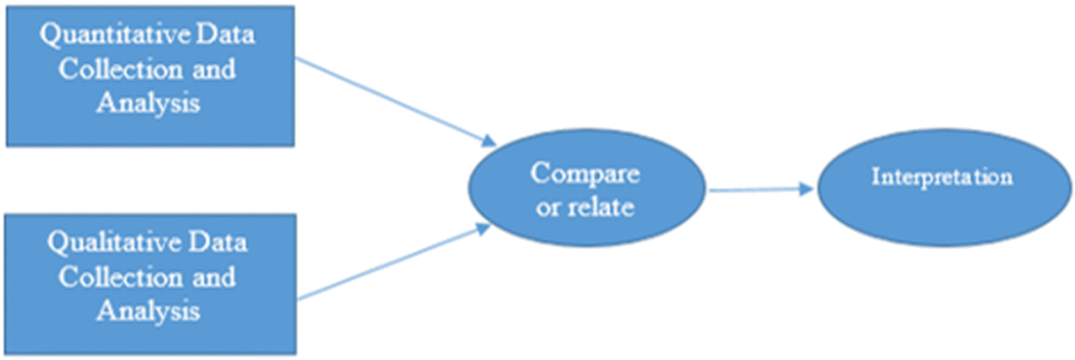

Figure 4.1. The convergent parallel design (Creswell & Clark Plano, 2011)

This approach is the most popular design of the mixed methods strategies. The researcher in this approach collects both qualitative and quantitative data, then analyses them separately. After that, results from the analysis are compared to see whether or not they correspond to each other. The key assumption of this method is that different types of data, qualitative and quantitative, can provide different types of information and produce the same results. The convergent parallel design is illustrated in Figure 4.1.

Data is collected from both qualitative and quantitative methods using the same variables or concepts. The same concept is measured quantitatively or qualitatively, but with different types of questions. The two databases are analysed separately then integrated. Merging the two databases can be achieved through side-by-side comparison. Here the researcher can report the quantitative findings then discuss the qualitative results that can either confirm or contradict the statistical results. Moreover, databases can be merged by using other methods, such as data transformation or display through tables or graphs.

Therefore, the interpretation of the results in this approach is achieved by comparing the results of the two databases, then highlighting the convergence or divergence between the two sources of information. When divergence occurs, researchers are advised to follow-up by returning to analyses in order to further explore and collect additional information that would solve any divergence. Validity can be threatened by using the convergent approach if the sample size is not equal for both the qualitative and quantitative methods. Both methods are using different variables or concepts, and there is a lack of following-up conclusions when divergence occurs between the results. The purpose of the convergent parallel design is to collect different data on the same topic to better understand the research problem. This design is useful when the researcher's intention is to triangulate the methods for validation purposes.

2) Explanatory Sequential Mixed-Methods Design

The explanatory sequential approach attracts researchers who have strong quantitative backgrounds or are new to the qualitative approach. This type of design involves two phases: the researcher first collects quantitative data, then analyses the findings and uses the results to plan for the second qualitative stage. The results of the quantitative stage form a database about the types of participants and questions for the qualitative phase. Thus, the purpose of this design is to use the qualitative data to explain the quantitative results. The usual procedure might include collecting survey data in the first stage, then analysing the data in addition to conducting interviews to explain the survey responses.

The explanatory sequential design is illustrated in Figure 4.2.

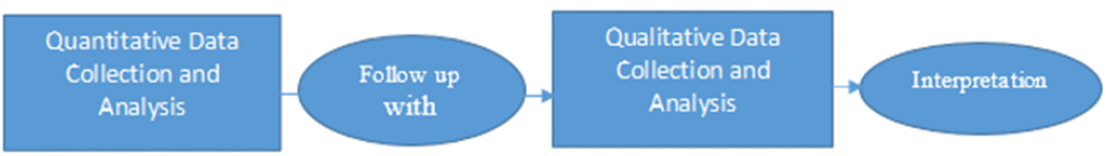

Figure 4.2: The Explanatory Sequential Design (Creswell & Clark Plano, 2011)

3) Exploratory Sequential Mixed-Methods Design

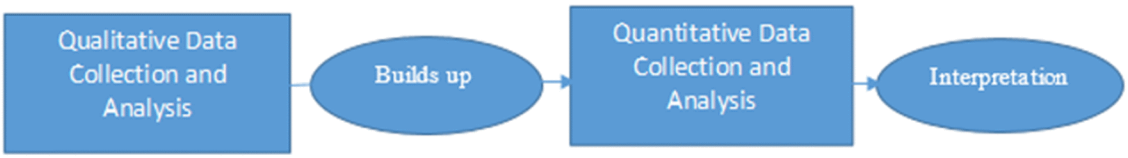

Figure 4.3: The Exploratory Sequential Design (Creswell & Clark Plano, 2011)

The exploratory sequential method is similar to the explanatory sequential method, yet it differs in the sequence of the phases. The exploratory sequential approach begins with a qualitative phase followed by a quantitative stage. Here, the researcher starts by exploring the qualitative data and its analysis, then uses the results during the quantitative phase. The purpose of this design is to develop better measurements to investigate whether the data form a small sample in the qualitative phase that can be used as a generalisation to a big sample population in the quantitative phase. For example, data can be collected and analysed from a focus group, resulting in an instrument that can be developed and administered to a larger sample. Hence, the researcher follows a three-phase procedure in this approach: exploratory; developing an instrument; and administering the instrument to a large sample. The exploratory sequential design is presented in Figure 4.3 (Creswell & Clark Plano, 2011).

The current study follows an explanatory parallel design to collect and analyse the data. The researcher chose this approach over convergent or exploratory mixed-methods design as she felt that administering the questionnaires first to a large pool of participants would help familiarise them with the research and give them the option to opt in for the qualitative stage. The interviews with the headteachers and the IT technicians took place at the same time as the other interviews, after the questionnaires were collected.

4.4 Case Study Research

Freebody (2003, p.81) defined case study methodology as the ability to "focus on one particular instance of educational experience and attempt to gain theoretical and professional insights from a full documentation of that instance". Recently, Yin (2013) proposed a twofold definition for case study research. The first part of the definition focuses on the scope of a case study, which is defined as an empirical inquiry that comprehensively examines a current phenomenon in its practical context. This investigation happens when the boundaries between context and phenomenon are unlikely to exist. The second part of the definition describes the features of the case study enquiry. The latter is characterized by coping with the technically distinct situation, notably when it has more variables than data points. It also depends on

several sources of evidence and benefits from the preceding theoretical development of propositions that can lead to collecting and analysing data.

Yin (2013) argues that case study research can include quantitative evidence and is not limited to qualitative evidence, as perceived by some researchers. He also stresses that case study research can include a combination of qualitative and quantitative methods, which can give more strength to the study.

According to Silverman (2013), four issues should be considered when designing a case study. First, the selection of cases is not based on statistical grounds but rather on testing a specific theory. Second, sampling does not involve individuals but focuses on the social relations that might involve documents and buildings. Third, theories can be tested by selecting extreme or deviant cases that can allow for generalisations, which is similar to statistical interpretations but without applying probability criteria. Fourth, it is useful sometimes to choose new cases during the conduction of a research because researchers are unable to estimate which and how many cases to include until the data analysis is fairly progressed.

The current study considered all four points and its two case studies were the two schools selected. While this selection was opportunistic, one can argue that it represented all the schools in Oman that had implemented mLearning at the time of the research, and as a result it could not include new cases at a later stage. The researcher also approached the participants with both open and closed questions to find out more about their perceptions on the topic; the inclusion of new cases, even if it was possible, could possibly minimise the voice of the two schools. The researcher wanted to ensure that both the quantitative and qualitative aspects of the data were given equal weight. The research considered individuals, technology and the social relationships that emerge as part of that interaction; in that way it tried to present a holistic picture of mLearning implementations at each school.

Selecting cases for research can be bound to convenience and accessibility. Random sampling cannot be used in case study research because it is usually suited to larger samples. Purposive sampling is another sampling method that can be used in case study research. This method of sampling necessitates thinking critically about the parameters of the population and carefully selecting the sample case. Researchers cannot choose every single case in their study, so they have to decide according to their time and resources (Silverman, 2013).

Case study research can investigate "how and why" inquiries emerge. One of its strengths is to observe effects in real contexts as they represent a powerful factor for causes and effects (Cohen et al., 2011). A case might constitute an individual, an institution or an event like projects and programmes. The case study research aim can be to explore a phenomenon or describe an issue in detail. The strength of such research is in its ability to enable the researcher to investigate a case intensively and to drill down, probe and reach its complexity (Ashley, 2012).

Case study research findings are criticised for not being generalised. Bassey (1999) believes that empirical research can yield three types of generalisation: scientific, statistical and fuzzy. Scientific generalisation is related to classical physics, while statistical generalisations are related to studies of samples like survey studies. Fuzzy generalisation represents prediction that arises from empirical research, which indicates that something may happen but without knowing any measurement of its probability. Such generalisation is qualified because it involves the idea of possibility and not certainty. Therefore Bassey (1999) believes that case study is an empirical research that can produce fuzzy generalisations.

Case studies are also accused of having restricted generalisability. However, Cohen et al. (2011) and Yin (2013) argue that generalisability can be extended by doing multiple case studies. Yin also claims that case studies are not aiming for statistical generalisation but for analytic or logical generalisation. Thus, case studies as viewed by Yin are able to contribute to expanding and generalising a theory, which can assist researchers with understanding similar cases or situations.

4.4.1 Types of Case Study Research

Case study research is classified into different types according to the purpose of doing case study research, or the number of cases involved in the research. For example, Freebody (2003) classified three types of case study research according to their purpose. The first type is the exploratory case study, in which data collection can produce research questions specification. The second type is the explanatory case study, in which multivariate case analyses strive to find patterns of practices to test competing theories. The third type is the descriptive case study that requires the research to begin with a descriptive theory. The implications of this type create hypotheses of cause and effect relationships.

Earlier, Bassey (1999) also described three types of educational case study according to their purpose. Theory-seeking and theory-testing is the first type where the researcher aims to reach fuzzy generalisations or fuzzy propositions. The second type is story-telling and picture-drawing, which involves narrative stories of educational events, programmes, institutions and systems. The evaluative case study is the third type, where the researchers enquire about the worthwhileness of educational projects, programmes or events.

Recent classifications focus on the number of cases and the type of phenomenon involved. For example, Yin (2013) described four case study research designs: single-case holistic designs, single-case embedded designs, multiple-case holistic designs, and multiple-case embedded designs. Choosing a single-case study is based on five rationales, which require the case to be (1) critical, (2) extreme, (3) common, (4) revelatory, or (5) longitudinal. On the other hand, selecting multiple-case designs can be justified by doing multiple experiments that can engender similar results (literal replication), or contrasting results (theoretical replication).

Determining holistic or embedded designs depends mainly on the type of phenomenon in the study and the research questions. Embedded designs may involve units of analysis, while holistic designs explore the global nature of a programme or organisation (Yin, 2013). Yin (2013) promotes multiple-case designs over single-case designs for several reasons. Single-case designs are vulnerable, whereas multiple-case designs have considerable analytic benefits, such as strengthening the research findings and avoiding the criticism and uncertainty of a single case design.

Based on the aforementioned reasons, and as this research design aims to explore the uses of mobile technologies in two private schools in Oman, which represent two cases in this study, the design adopted for this research is the multiple-case design. In addition to this, the cases studied are descriptive cases because the research started with a descriptive theory about mLearning with the aim to explore the relationship between users, technology and social interaction.

These two cases are explored using three significant research methods: questionnaires, semi-structured interviews and focus-group interviews, which are explained in detail in the next section.

4.5 Data Collection Methods

Table 4.2. The Research Design

Study	Research Objective	Data Collection Tool
Learning opportunities of mLearning	Determine the learning opportunities in using mobile technologies in these two schools	Questionnaires + semi-structured interviews + focus group interviews
Challenges of mLearning	Determine the challenges faced during the introduction of mobile learning.	Questionnaires + semi-structured interviews + focus group interviews

Table 4.2 shows the data collection methods used in this research for every research objective. Questionnaires, semi-structured interviews and focus group interviews are all used to collect data about the learning opportunities, challenges and the enabling factors for successful mLearning implementation. To explore the successful practices of mLearning, questionnaires and semi-structured interviews are used. Hence, it is significant to clarify the three methods used in this research in further detail.

4.5.1 Questionnaires

Questionnaires are widely-used instruments for gathering survey information. They represent a self-reporting strategy that is used to express attitudes, feelings and beliefs. Questionnaires are attractive to researchers because they provide numerical data, can be administered without the researcher's presence, and are often relatively straightforward to analyse. The major purpose of using questionnaires is to access the different views of a large number of people (Cohen, Manion, & Morrison, 2007; Cohen et al., 2011; Newby, 2010; Teddlie & Tashakkori, 2009).

When designing questionnaires, there are four goals that need to be considered: 1) capturing the respondents' interest; 2) building up the survey commitment; 3) making the questionnaire look easy for the participants; and 4) making them convenient to handle for the researcher. Likert scales are often used to measure the level of agreement or disagreement between the respondents, either by using a 5-point scale, the most popular of Likert scales, or a 4- or 6-point scale. After the questionnaire is designed, it is important to pilot it to check the validity and reliability of the questions. There are several ways to administer questionnaires, notably self-administration, post, face-to-face interview, telephone, and through the internet.

4.5.1.1 Structuring Questionnaires

The structure and layout of questionnaires are important because the aesthetic appearance will either encourage or discourage the respondents. Newby (2010) stated four targets that should

be considered when designing questionnaires. First, the respondents' interest should be captured by explaining the purpose and the possible research outcomes as well as the significance of their participation. Second, it is essential to build up the survey commitment by sequencing the questions. For example, easy questions can be put at the beginning while difficult questions can be placed towards the end of the questionnaire. It is also important to avoid placing open-ended questions at the beginning. Third, producing an attractive layout of the questionnaire is significant. This can be achieved by generating short, straightforward and precise questions. Fourth, the questionnaire should be easy to use for the researcher, which would generate the relevant data that would best serve the analytical techniques. For example, the researcher should consider the use of colour or codes to represent different groups in the questionnaire and should separate pages in order to maximise transparency.

Thomas (2013) raised five basic considerations when constructing a questionnaire. First, keeping everything concise as the number of respondents might decrease if the questionnaire is unnecessarily long. Second, being clear about what to ask and asking for one piece of information in each question. Third, it is fundamental to be precise with the questions because the respondents do not have enough room to elaborate their ideas and are bound by the pages of the questionnaire. Fourth, it is important to collect all the necessary details before collecting the questionnaires as it is difficult to return the questionnaires after they are completed. Finally, it is indispensable to be aware of "prestige bias" in posing the questions or interpreting the responses (Morgan, Cross & Rendell, 2015, p.208). The "prestige-bias" is important 'because specific payoffs are often hard to obtain, individuals have a general tendency to copy the decisions of those who have been successful' (Morgan, Cross & Rendell, 2015, p.220). In addition, Newby (2010) advises that questionnaires should be made simple for respondents by: matching the vocabulary and ideas with the respondents; keeping them short and simple; and avoiding using double negatives.

In fact, research questionnaires range from being highly structured to unstructured. The rule of choosing one of these characteristics depends on the sample size; the larger the sample, the more structured the questionnaire may need to be, while an open and less structured design may be appropriate for a smaller sample. Structured or closed questionnaires enable researchers to observe patterns and make comparisons. This type of questionnaire is time-consuming, especially at the beginning of the research but can be analysed rapidly after it has been set up. The semi-structured type of questionnaire allows the respondents to answer and comment on questions and statements. Therefore, the structure is clear; however, the format is

open-ended to enable the respondents to answer freely. Thus, the semi-structure sets the plan but presumes the nature of responses (Cohen et al., 2007).

There are two main types of questions: closed or open. However, most questionnaires incorporate a mixture of both. Closed questions, such as dichotomous, multiple choice, constant sum and rating scales, prescribe the responses that can be selected. They are useful because they can generate frequencies that are amenable to statistical analysis. Moreover, they allow for groups comparisons within a sample, are quick to analyse straight to the point and are more focused than the open-ended questions. If a case study is required, then less structured and open-ended questionnaires are more suitable because they can capture the details of a specific situation. When measurement is pursued, then a quantitative method is required. But when rich and personal data are pursued, a qualitative word-based approach is more appropriate (Cohen et al., 2007, 2011; Newby, 2010; Teddlie & Tashakkori, 2009).

Open-ended questions are beneficial if the questionnaire is exploratory and the possible answers are unfamiliar, or the response has many possible categories. They are also appropriate for exploring complex issues where answers cannot be provided (Cohen et al., 2007, 2011). Newby (2010) lists three reasons for using open questions. First, they are used to gain a richer picture of the investigated issue. Second, they are beneficial in ensuring that a significant response has not been omitted by the structured questions. Therefore, researchers use the category "other" for respondents to provide additional details. The third reason is that these types of questions allow researchers to use direct quotes of the respondents in order to reveal their varied visions and to give a distinct feature to the report.

Likert scales were used several decades ago to measure the level of agreement or disagreement of the respondents with a number of statements pertaining to a specific topic. The 5-point scale is the most popular of Likert scales, where responses vary from "strongly agree" to "strongly disagree". Nevertheless, other researchers prefer 4- or 6-point scales because the neutral option, "neither agree or disagree", is not used (Teddlie & Tashakkori, 2009).

The research questionnaire in this study consists of both closed and open-ended questions. The closed questions include multiple choice questions as well as Likert scale questions. Open-ended questions are designed to explore mLearning issues more deeply. The Teachers' questionnaires and headteachers' questionnaires are similar because they include four sections of the same questions; however, some questions in the teachers' questionnaires are not included in the headteachers' questionnaires. These questions are related to the teachers'

practices, as it is the case in question 3 part 4, which consists of writing about any successful use of mobile devices during their teaching career. Moreover, the statement of how effective the management leadership in the school is, in item 13 in part 3, is only included in the headteachers' questionnaires (see Appendices A & B).

On the other hand, students' and technical staff' questionnaires are simpler as they do not contain Likert scale questions. For example, school technicians are required to provide general information about the technical specifications and issues related to employing technology in the schools (see Appendix D). Therefore, the questions listed in the questionnaire require mainly the selection of correct and short answers. Similarly, students' questionnaires are composed of multiple choice and short-answer questions. The reason behind the researcher's intention to provide easy and short questions is the students' age. In fact, students at a younger age are usually not in favour of completing long questionnaires (see Appendix C).

The teachers' and the headteachers' questionnaires contain a 5-point scale for two questions. The second part of the questionnaire contains a scale that ranges from "strongly disagree" to "strongly agree", as shown in Table 4.3. The third part in the questionnaires consists of a scale that varies from "never" to "always", as presented in Table 4.4.

Table 4.3. Likert Scale for Question 2

Strongly Disagree	Disagree	Not sure	Agree	Strongly agree
1	2	3	4	5

Table 4.4. Likert Scale for Question 3

Never	Rarely	Sometimes	Frequently	Always
1	2	3	4	5

4.5.1.2 Piloting Questionnaires

Piloting the questionnaire is an important step to check the validity and reliability of the questions. Therefore, questionnaires should be tested to identify any faults and weaknesses. The pilot can begin by submitting the first draft of the questionnaire to experts in order to obtain their advice and clarification. After revision, the questionnaire can be distributed to some users that are not included in the actual sample of the research. This will help assess whether the questionnaire is straightforward or confusing; the researcher can go back to the pilot sample when required (Cohen et al., 2007, 2011; Newby, 2010).

The questionnaires in this research were piloted in a sample of 40 participants that included friends and teachers. First, questionnaires were given to ten PhD students to check their content, appropriateness and coherence. Then, questionnaires were handed out to 20 teachers, headteachers and technical staff (not from the sample) to check their understanding of the questions. Student questionnaires were also given to ten students (not from the sample) to check their unambiguity. Simple spelling and grammar issues were detected, then edited and proofread by the researcher.

4.5.1.3 Administering Questionnaires

There are several ways to administer questionnaires: self-administration, post, face-to-face interview, telephone, and internet. Self-administered questionnaires can either be completed remotely or in the presence of the researcher. It is helpful for the researcher to be present in order to address any queries and ensure a good response rate. However, the respondents may feel uncomfortable with this scenario and require more time to consider the questions. Therefore, the absence of the researcher enables the respondents to reply in more privacy and devote as much time as they like to complete the questionnaire (Cohen et al., 2007).

Newby (2010) identified four ways to administer questionnaires: bringing the respondents together; dropping off and collecting the questionnaires; and posting or distributing them online. The advantages and drawbacks of every method are summarised in Table 4.5. Choosing one of the methods is determined by the sort and size of the sample, in addition to the available resources.

Table 4.5. Questionnaire Administration Methods

Ways of administration	Advantages	Drawbacks
Single location	Common experience Better quality Good completion	Difficult to get everyone together Managing finishing times
Drop off and collect	Reasonable completion rates Help on return visit Target respondents	High surveyor costs
Post	Cheap Contact large numbers	Low response rates Costly to improve response Sampling issues
Computer assisted	Push or pull approaches Directly read into computer analysis	Sampling issues

The researcher dropped off the questionnaires at the administration office of the two schools and discussed with them the targeted sample and the time required to recollect them. The researcher allowed the participants one week to collect the questionnaires, so that they had enough time to fill them in. However, participants in one of the schools needed more time because the teachers were busy, and the researcher had to wait for more than two months to collect the entire sample. The times of dropping and collecting the questionnaires are clearly displayed in Table 4.7.

4.5.2 Semi-structured Interviews

Interviews are flexible tools for collecting data because they enable the use of multi-sensory channels: verbal, non-verbal, heard and spoken. The interviewer can control the interview, but the participants should be allowed more space in case spontaneous reactions and complex issues happen. Interviews can be compared with everyday conversations by being constructed, question-based and having a specific purpose. They provide an opportunity for the interviewers to request clarification of ambiguous answers (Cohen et al., 2007, 2011; Teddlie & Tashakkori, 2009).

Interviews and questionnaires are similar and different in several ways, which are summarised in Table 4.6 (Teddlie & Tashakkori, 2009).

Table 4.6. Similarities and Differences between Questionnaires and Interviews

Similarities	**Differences**
They seek to: **- Determine the respondents' attitudes, beliefs and feeling towards a topic.** **- Consist of the participants' self-reports.** **- Produce quantitative, qualitative and mixed methods data.** **- Use variable and sometimes overlapping formats.** **- If they are used together, they produce complex mixed data.**	-Questionnaires involve participants' self-report without the researchers' contact; interviews require face-to-face interaction. -Traditionally, questionnaires have used closed-ended formats more frequently; interviews have used the open-ended format more frequently. -Studies conducting interviews use fewer participants than studies involving questionnaires. -Interviews are more expensive to conduct than questionnaires.

The purposes of interviews are varied. In general, they are conducted in order to evaluate or assess a person, promote an employee, effect therapeutic change, test or develop hypotheses, gather data, and/or sample participants' opinions. However, interviews in research may serve three main purposes. First, interviews are used for gathering information that is related to the research objectives. Second, interviews are conducted to test or develop hypotheses; or to

explain and identify relationships and variables. Third, interviews can be used in combination with other data collection tools (Cohen et al., 2007, 2011).

The semi-structured interview combines the best of both structured and unstructured interviews. This type of interview has the advantage of structuring the list of topics to be covered with the freedom to expand points if necessary. It also has starter questions and guiding themes if these are not forthcoming from the interviewee. For these reasons, semi-structured interviews are more common in small-scale research, although they are not always the best type of interviews. The other two types may be more appropriate to a particular type of research (Newby, 2010; Thomas, 2013).

Likewise, semi-structured interviews also have several advantages and disadvantages. They have the advantages of reflecting the research questions, clarifying misunderstanding, allowing exploration and getting rich data. But conversely, they are time-consuming, require fully-trained interviewers, have a need for scepticism and are high in cost.

As for this research, the interview questions are divided into three main themes: perceptions, practices and policy. The researcher aims to explore the participants' perceptions about mLearning, their practices, and the policy behind implementation. Two open-ended questions in each category are forwarded to the interviewees (see Appendix E).

4.5.3 Focus Groups Interviews

Focus group 'interviews' are a type of group interview, but they depend mainly on the group interaction and discussion of a topic given by the researcher. The 'interviewees' in focus group interviews interact with each other but not with the interviewer. The data can emerge from the interaction and views of the participants (Cohen et al., 2011). Silverman (2013, p.212) argues that the researcher in the focus group is seen as an "outsider".

Check and Schutt (2012) report that most focus groups involve seven to ten participants, who usually do not know each other; however, some studies may include friends. Therefore, researchers may have different opinions about involving homogeneous or heterogeneous participants according to their research purposes. There are a number of advantages related to the focus group interviews. Gibbs (2012) reports a number of advantages such as enjoying discussing with others, feeling able to talk about sensitive topics, and feeling the potential to change either during the discussion or after it. However, several disadvantages may appear with the focus group interviews. Cohen et al. (2011) suggest some drawbacks like the

dominance of some members versus the non-participation of others, disagreement and conflict within the group, the limited number of topics covered, and the difficulty that could arise in analysing data.

Focus group interviews in this research consider three themes: perceptions, learning, and challenges (see Appendix F). In each theme, two questions are forwarded to the students' groups to enrich the conversation. The researcher used the Voice Memos application in an iPhone device to record the interviews, and an iPad device as a backup for the recordings in case of data loss. For transcriptions, the researcher used Voice Walker (http://voicewalker.software.informer.com/2.0/) to repeat the chunks of sentences as much as required because it was easier to type while hearing without being forced to stop the recording from time to time.

4.5.4 Data Collection Timeline

The researcher started collecting data for this research in August 2015, when teachers were returning to schools after the summer holiday. The entire data was collected up to the end of December 2015. It took the researcher about four months and a half to collect the required data for this research. The timings of data collection are shown in Table 4.7.

Table 4.7. Data Collection Timeline

Task	Time
Dropping off questionnaires to teachers, headteachers and technicians	16th August
Dropping off students' questionnaires	6th September
Collecting teachers', headteachers' and IT technicians' questionnaires	6th September –30th December
Collecting students' questionnaires	13th September –18th September
Conducting teacher and headteacher interviews	6th September –30th December
Conducting focus groups interviews	13th September –18th September

4.6 Data Analysis

A mixed methods approach involves the separate analysis of quantitative and qualitative data. Quantitative data is analysed using quantitative methods, while qualitative data is analysed through qualitative methods. The mixed methods analysis involves mixing the data and results of both. These techniques depend largely on the researcher's intention and decision about the chosen mixed methods design among the three different ones discussed previously.

Analysing both qualitative and quantitative data involves a similar set of steps as illustrated by Creswell & Clark Plano (2011). The steps involve: preparing the data for analysis, exploring, analysing, representing, interpreting, and validating the data. These steps are in a linear style in quantitative research but are concurrently and iteratively employed in qualitative research.

This research uses both quantitative and qualitative methods in analysing the data. Table 4.8 shows that for all the research objectives data is analysed using quantitative and qualitative methods.

Table 4.8. Data Analysis Methods

Study	Research objective	Data Collection Tool	Data analysis methods
Learning opportunities of mLearning	Determine the learning opportunities in using mobile technologies in these two schools.	Questionnaires + semi-structured interviews + focus group interviews	Quantitative + Qualitative
Challenges of mLearning	Determine the challenges they faced in the introduction of mobile learning.	Questionnaires + semi-structured interviews + focus group interviews	Quantitative + Qualitative

4.6.1 Analysis of Quantitative Data

Quantitative data analysis involves analysing numeric data using various statistical techniques. Teddlie and Tashakkori (2009) distinguish between descriptive and inferential statistics. Descriptive methods involve summarising data to discover trends and patterns. The results of these strategies are frequency tables, correlations and means. Inferential methods are produced after the descriptive results and they are used to test hypotheses or to confirm or deny the results. The t-test is an example of such statistics.

Descriptive statistics help with the research results' practical interpretation, as they are easier to be understood by non-technical people like the general public, policymakers, and educators. In most statistical programs, the user has to specify the type of variable, which is an important step to ensure that the variables are processed correctly during analysis. The researcher should know the conventional variable types in order to assign the correct variable type to the program. There are four types of conventional variables: nominal, ordinal, interval, and ratio. Nominal variables identify group membership only, where each subject is described by only one value without indicating any ranking. Ordinal variables also identify group membership, but they indicate an order or a ranking. Nominal and ordinal variables are classified as

categorical variables. On the other hand, interval variables have the feature of 'quantity' because there is an equivalent meaning for the intervals between values (Steedle, 2016).

Variables should be labelled correctly, as this will assist the researcher in interpreting the statistical results. Variable labelling refers to the process of signifying the meaning of categorical variable values (Steedle, 2016). The results of the analysis can produce tables of frequencies, percentages, means and standard deviations. The mean represents the sum of the scores divided by the number of scores, while the standard deviation is the variance square root, which is more useful than the variance in measuring variability because it is stated in the same unit as the original data. The standard deviation gives a clear picture of data distribution (Goos & Meintrup, 2015; Martin & Bridgmon, 2012).

The researcher used SPSS software to analyse the quantitative data. Data was analysed using the descriptive technique to explore trends and patterns rather than inferential methods. First, data is entered in the program, then frequencies, means and standard deviations are calculated. Finally, tables of frequencies, means and standard deviations are created. Therefore, the results of the analysis are mainly frequencies, tables, and means.

4.6.2 Analysis of Qualitative Data

Unlike quantitative data, qualitative data analysis entails organising and explaining the data and this involves observing patterns, categories and themes. Cohen et al. (2011, p.537) hold that there is no unique or correct method to analyse qualitative data as this depends entirely on the "fitness for purpose". Interviews are one of the sources of qualitative data and they may involve multiple interpretations. The researcher should decide whether to transcribe interviews or not according to the requirements and benefits of the research. Transcribing the interview data can provide a detailed record of the interview; however, transcription can neglect non-verbal aspects, what happens before or after the interview, and the contextual features of the interview (Cohen et al., 2011).

There are two main approaches of analysing qualitative data: inductive and deductive. The inductive approach is based on extracting meaning from the data without any influence from the literature, preconceived notions or personal bias, or theoretical lenses. This approach is a bottom-up or specific-to-general technique to coding and analysing. On the other hand, the deductive approach uses codes and themes that are derived from the preconceived notions, or from previous studies reviewed, or from the theoretical framework of the study. This approach uses the top-down or general-to-specific technique to coding (Burnard, Gill, Stewart, Treasure & Chadwick, 2008; Kawulich, 2016).

The common strategy used in analysing qualitative data is by creating themes or categories. Teddlie and Tashakkori (2009) name this strategy as 'categorical strategy', where data is broken down and rearranged to generate categories that can facilitate comparisons. It is also called 'thematic analysis', in which data is sorted and categorised to identify themes or patterns (Kawulich, 2016). Thematic content analysis is the same whether it is used through computer programs or is analysed by hand (Burnard et al., 2008). The process involves making notes in the margins of the transcripts, which is referred to as open coding. This is followed by a reduced number of categories that aim at refining the themes. After that, coloured pens or specific programs are used to allocate a different colour for each category. Finally, these categories are cut and archived in files to be used later on by the researcher.

There are five main steps that most approaches use to analyse qualitative data: 1) documenting the data and the data collection process; 2) categorising and organising the data into concepts; 3) identifying relationships between the concepts; 4) validating conclusions by disconfirming evidence, evaluating other explanations and finding negative cases; and 4) reflecting on the analysis process (Check & Schutt, 2012).

Coding is the process of making sense of qualitative data. It facilitates interpretation of data by labelling and organising them (Kawulich, 2016). Coding consists of assigning names or labels to a piece of a text that includes useful information. It allows the researcher to find similar information and to search and retrieve the information that has the same code. Codes can be viewed as a categorising or indexing system in a book, which offers all the references that are related to that index entry. A code can be an abbreviation or a word that is describing a meaning that the researcher can understand. For example, the code "power" might refer to the situation that shows the power of a person (Cohen et al., 2011).

There are a number of computer software programs, such as NVivo and ATLAS, that can assist researchers with analysing their qualitative data. These software programs are advantageous because they can cope quickly with large quantities of data without computation and retrieval errors. They represent a relief for researchers as they exempt them from dealing with mechanical tasks. However, these programs do not analyse the data by themselves, but rather manage the data and this will make it easier to handle large chunks of data. They can help to sort, organise, store, annotate, retrieve text, locate words and segments, make diagrams and extract quotes (Burnard, Gill, Stewart, Treasure & Chadwick, 2008).

These programs have many capabilities with regards to words, phrases, nodes, codes and categories. They are able to: 1) search and return text, nodes, codes and categories; 2) search for precise codes and terms; 3) filter text; 4) return amounts; 5) display the group of data according to the chosen criterion across and within texts; 6) make the qualitative equivalent in statistical analysis; 7) build dendrograms or tree structures of codes and nodes relations; 8) display data in sequences; 9) arrange and find similar passages of text; 10) search for negative cases; 11) search for terms in context; 12) choose text of combined criteria; 13) allow for analyses of similarities, differences and relations between texts; and 14) allow for text annotation and writing memos (Cohen et al., 2011).

The qualitative data in this research was analysed using NVivo software (see a sample of qualitative data analysis in Appendix K) to discover the common themes in the interviews. First, transcripts are uploaded in the program. Then, nodes are created and specific texts related to these nodes are highlighted and saved under these nodes. Finally, the themes and their related texts are specified and used in the findings chapter.

4.7 Validity and Reliability

4.7.1. Validity and Reliability in Questionnaires

Validity refers to what extent a measure is accurately representing the concept it is claiming to measure (Punch, 1998). Reliability can be defined as the consistency of results (Leavy, 2017) or how far a specific tool like a questionnaire will yield similar results in different situations (Roberts, Priest, & Traynor, 2006). Validity asks the question: Do research tools measure the phenomenon that they are ought to measure? Whereas reliability asks the question: If the same measure is used today and employed later on the same population, will the same results be achieved? (Hesse-Biber, 2010).

Cohen et al. (2011) regarded questionnaires as more reliable than interviews because they are anonymous, which would create more honesty. Questionnaires need to be piloted to test and refine their wordings and content. The significant issue in their reliability and validity is the sampling. If the sample is not representative and too small, it can misrepresent the data and hinder statistical analysis.

Reliability can be checked by assessing the internal consistency of the questionnaire. Internal consistency refers to the relationship between all the results produced from a survey or a test. In a questionnaire, data can be measured using statistical measures such as Cronbach's alpha

coefficient. On the other hand, content validity can be accomplished through conducting a pilot study with a sample similar to the actual sample of the study (Roberts, Priest & Traynor, 2006).

The validity of the questionnaires in the research is established through translating the questionnaires to Arabic because the sample forms a mixture of English and Arabic languages. In addition, three bilingual editors along with the researcher, who had previous experience in translating from English to Arabic and vice versa, checked the translation to ensure both Arabic and English versions conveyed the same content.

The validity of the questionnaires was also checked by piloting them in a sample of 40 participants of friends, and teachers. First, questionnaires were given to ten PhD students to check their content, appropriateness and coherence. Then, the questionnaire was distributed to 20 teachers, one headteacher, and technical staff who were not included in the sample to check their understanding of the questions. Student questionnaires were also given to ten students outside the sample to check their unambiguity. Simple spelling and grammar problems were detected and then were edited and improved by the researcher. Piloting the questionnaires was also helpful in gaining the experience of collecting data and inspecting issues like the sample size due to the small number of the fully-answered questionnaires.

4.7.2 Validity and Reliability in Interviews

In qualitative research, reliability is the trustworthiness of the collected data; while validity is the trustworthiness of interpretations or inferences from the results (Stiles, 1993). Validity can also refer to the credibility, the trustworthiness or the quality of the project (Leavy, 2017). In qualitative research, many researchers have established their own concepts of validity and reliability and have adopted other terms, such as rigour, quality and trustworthiness, which are considered more appropriate for qualitative methods (Golafshani, 2003).

Reliability can be increased by ensuring accuracy when recording and transcribing the data (Roberts, Priest & Traynor, 2006). On the other hand, validity can be established through the triangulation of methods (Leavy, 2017; Roberts, Priest & Traynor, 2006).

The possible difficulty in establishing validity in qualitative research like interviews is the researcher bias, which arises from the selection of the collected and recorded data or personal interpretations (Roberts, Priest & Traynor, 2006). Validity for interviews can be achieved through minimizing the amount of bias. Cohen et al. (2011) stated that bias can originate from the characteristics of the interviewer, interviewee and the content of the questions. These can include:

The interviewer's opinions, attitudes and expectations;

The interviewer's tendency to see the respondent in his or her image;

The interviewer's tendency to look for answers that support his or her views;

Misperceiving the respondent's answers (interviewer);

Misunderstanding the questions asked (respondent).

Hence, to reduce bias in interviews, the researcher should be careful about how to formulate clear questions, have enough training, choose probability sampling and try to match the interviewer characteristics with the respondents (Cohen et al., 2011).

To ensure reliability and validity of the interviews in this research, the researcher practised the interview questions with family and friends to check their clarity. During the interviews, the researcher used two recording devices (iPhone and iPad devices) to ensure the sound clips were not lost. To avoid misinterpretation of the audio content, if done by an external translator, the researcher transcribed and translated the audio clips to English. Moreover, the researcher used a coding program (NVivo) to ensure that the transcripts are coded in the correct procedures.

4.8 Ethical Considerations

Ethics refers to the study of the good, right and virtuous actions. In research, ethics focuses on the context of planning, communicating, conducting and following up research (Punch, 2013). The ethics of educational research and social research in general involve moral issues (Gregory, 2003). Social scientists had previously based their ethics' decision according to their personal judgements, but it is acknowledged that researchers have to gain approval to conduct their research from their institutions (Love & Pole, 2012).

The foundation of ethics is based on three theories: consequentialism, virtue ethics, and deontology. The latter, which is based on rights, principles and duties, has more institutional influence on social research ethics. The main concern of deontology is the duty towards us and the others about what is right and what is wrong. There are two basic principles when applying the deontological approaches to ethics: obliging the researcher to treat the participant as s/he would like to be treated and the right of the research participant to be informed about the research nature, impact and consequences and whether the subjects agree to participate in the research (Love & Pole, 2012).

Almost every social sciences institution has adopted a professional code of ethics, which provides general principles and orientations for ethics in research. Examples of such codes are the American Anthropological Association (AAA, 1998), the International Sociological Association (ISA 2001), and the British Sociological Association code (BSA 2002) (Paoletti, Tomás, & Menéndez, 2013).

Several ethical standards should be followed by researchers when conducting research. The researchers should give proper identification of themselves, give clear information about the research in general, show awareness about the respondents' welfare like hazards and risks to their safety, obtain the respondents' consent to take part in the research, insure the participants' privacy, confidentiality and being anonymous in the research (Sarantakos, 2012). The ethical dimension should be also considered before and after the data collection occurs. This includes acquiring informed consent from the participants, informing participants of their right to withdraw at any stage of the research, guaranteeing the anonymity of the information given, and guaranteeing that there will be no harm in participating (Cohen et al., 2007, 2011).

In this research, the researcher applied for ethical approval to the Ethical Committee at the Institute of Education and subsequently gained approval (see Appendix J). The submission included: sharing the aims of the research, submitting a copy of the data collection instruments (the questionnaires and the interview questions) as well as the information sheets for the participants. Information sheets and consent forms were attached with all the distributed questionnaires to ensure that all the participants were aware of their rights when taking part in this research (see Appendix H). Students' questionnaires were enclosed with information sheets and consent forms for their parents (see Appendix I). After the data analysis, questionnaires were kept in a safe and locked cabinet.

Prior to each interview, the participants were given consent forms to sign and were asked for their permission to be recorded. The interviewees were also assured that any information given would be kept confidential and only used for the research purposes. Parents' consent forms for the students' interviews were enclosed with the questionnaires; the forms also included the researcher's request for permission to record (Appendix I). The researcher emailed the interview transcription back to the interviewees to seek approval on the final draft or to add or amend any comments or thoughts; the researcher received no further comments. The researcher approached the schools via the Ministry of Education and did not have

working connections with either school that would affect gaining permission or bias towards the data collection process.

The researcher informed the participants that the school, the teachers or the students would not be identified, and pseudonyms would be used in any publication produced as a result of the study. The researcher appreciates that the fact that there were only two private schools in Oman that had implemented mobile learning may pose some risks in identifying the schools. The researcher removed any references during the description of each school (see sections 4.9 and 4.10).

4.9 Context of the Study

The aim of this study is to investigate the use of mobile devices in schools in Oman. The researcher aims to collect data from two private schools in Muscat, the only ones at the time of the study that had implemented mobile learning for more than two years. The two schools involved in this study are referred to as School H and School S.

School H is a bilingual mixed gender school that is supervised by the Ministry of Education in Oman. In the academic year 2015/2016, the school had 26 classes of 531 students. There were about 40 teachers of different nationalities in the school. Mobile technologies were introduced in 2005, when students of grade 5 were provided with laptops. After a few years, the school administration found out that mLearning was not suitable for this year group, so they decided to start it with grade 7 classes upwards. There are five classes, four grade 7s and one grade 8, included in this program in the year 2015/16. Grade 7 classes include two boys' classes and two girls' classes, while grade 8 class is solely for boys. There were 11 teachers teaching these mLearning classes.

School S is a bilingual mixed gender school that is supervised by the Ministry of Education in Oman. The school goals are to provide high quality international education and to promote the traditional values of the Omani culture. The school is composed of four buildings: the administration building, the kindergarten building and two opposite buildings - one for boys and one for girls. There were about 56 classes of 1,250 students during the academic year 2013/14, who were mostly Omanis; 170 teachers from 30 different countries were teaching in this school at the time of this research. The school applies an international programme for its curriculum in addition to the curriculum of the Ministry of Education. The following programmes are applied:

Primary Years Programme (PYP) for kindergarten 1&2 and primary grades 1 to 6.

International Middle Year Curriculum (IMYC) for grades 7 and 8.

International General Certificate of Secondary Education (IGCSE) for grades 9 and 10.

General Education Diploma (GED) for grades 11 and 12.

The school started mLearning in the academic year 2013/2014, with grade 7 students who were all given iPads. In the next academic year, grade 6 students were also given iPads. Students in these classes moved with their devices to the next academic years. For example, the first group of grade 7 students had the same iPad devices until the time this research was conducted (when they reached grade 9). In the year 2015/16 347 students had iPads in 16 classes starting from grade 6 to grade 9. Table 4.9 outlines the relevant information and numbers about the two schools.

Table 4.9: Context of the Study

	School H	**School S**
Number of Students	531	1250
Number of Teachers	40	170
Number of Classes	26	56
When mLearning started	2005/2006	2013/2014
Number of mLearning classes	5	16
Grades involved in mLearning	Grade 7 & 8	Grade 6, 7, 8 & 9
Number of boys mLearning classes	3	8
Number of girls mLearning classes	2	8

4.10 Study Sample

Choosing the right sample for a study is an important stage that should be considered in any research. Researchers should consider two important criteria when choosing a sample: the participants' willingness to take part and generalisability (Vogt, Gardner & Haeffele, 2012). There are two main sampling methods or procedures in social and behavioural sciences: probability and purposive. Probability is mainly used in quantitative research and its main target is to represent the entire population. It is based on theoretical sampling distributions, notably the normal curve, which is the most known distribution (Teddlie & Yu, 2007). In probability sampling, each participant has a known inclusion probability of being selected in a study. Here, inferential statistics are used to make generalisation about the population (Vogt et al., 2012).

The second sampling method is purposive sampling, which is primarily used in qualitative research and involves selecting specific units or cases for a specific purpose (Teddlie & Yu, 2007). In this type of sampling, the probability of inclusion is not known and inferential statistics for generalising is not appropriate (Vogt et al., 2012). Purposive sampling is used when the goal is not to generalise for a population but to understand phenomena, people, or events, Hence, the researcher purposefully selected individuals, groups or sites to understand and learn certain phenomena (Creswell, 2014; Onwuegbuzie & Collins, 2007).

Choosing the right sampling technique, probability (random) or purposive (non-random), depends mainly on the objective of the study. In mixed methods research, sampling methods are not only chosen for their appropriateness for each component in the design, but also for their compatibility or their appropriateness for a combinable data collection (Vogt et al., 2012). Purposive sampling is the most common technique used in both quantitative and qualitative research. Furthermore, researchers using the mixed methods approach prefer deploying purposive sampling for both quantitative and qualitative data collection (Onwuegbuzie & Collins, 2007).

The size of the sample is informed by the research objectives, questions and design. For example, Creswell (2014) specifies that the minimum sample size for case study research is from 3-5 participants. There is a common belief that large samples are related to quantitative studies, while small sample sizes are linked to qualitative studies. However, Onwuegbuzie and Collins (2007) argue that it is sometimes appropriate to use small samples in quantitative research and large samples in qualitative research.

This study selected a sample of teachers, headteachers, technical staff and students who are involved in mLearning practices in the two private schools. The two schools were selected because they were the only schools implementing mLearning in Oman according to the researcher's knowledge. A purposive sampling was chosen because it targets the teachers who practise mLearning in their classes and the students who are exposed to mLearning at least for one year. This sample was selected according to the participants' consent and willingness to take part in this study.

The researcher distributed 11 teachers' questionnaires, 16 students' questionnaires, one headteachers' questionnaire and one technicians' questionnaire to School H. In addition, the researcher distributed 30 teachers' questionnaires, 300 students' questionnaires, two headteachers' questionnaires and two technicians' questionnaires to School S. The number of

questionnaires distributed was estimated by the schools' administrations. The researcher received 9 teachers', 9 students', one headteachers' and one technicians' questionnaires from School H; plus 7 teachers', 228 students', one headteachers' and one technicians' questionnaires from School S. The numbers of the sample from both schools are shown in Table 4.10 and the completion rates are shown in Table 4.12.

Due to the limited number of teachers involved in mLeaning in the two schools, in addition to some teachers' dislike of face-to-face interviews, the researcher decided to use questionnaires to ensure that data is collected from other sources. It is justified by Onwuegbuzie and Collins (2007) that it is appropriate to use a small sample in quantitative research. The sample of students in School H is also small because four classes were excluded, as they were only exposed to mLearning for less than one month. The researcher had limited choices as there were no other schools employing mLearning in Oman, at the time of data collection, except the above mentioned two schools.

Table 4.10: Questionnaires' Sample

	School H	School S
Headteachers	1	1
Teachers	9	7
Technicians	1	1
Students	9	228

The reason behind having a small number of sample students from School H is due to the limited number of students owning mobile devices in this school. The school provided four classes of grade 7 and one class of grade 8 with mobile devices, as mentioned earlier. The four classes of grade 7 started to use their devices in September, the same month the researcher was collecting the data. Therefore, the researcher decided to exclude this grade, due to the lack of time for mLearning exposure. In the end, the researcher was left with only 16 students from grade 8.

The 228 sample students from School S represent students from grades 7, 8, and 9. Grade 6 students were excluded from the sample as they did not have enough exposure to mobile devices. The sample of the students from both schools is displayed in Table 4.11. The uneven number of the students' sample was not expected, and the researcher knew this at the time of collecting the data.

Table 4.11. Students' Questionnaire Sample

	Grade 7		Grade 8		Grade 9	
	Male	Female	Male	Female	Male	Female
School H			9			
School S	19	49	35	44	35	46

Table 4.12. Questionnaires Completion Rates

	School H			School S		
	Distributed	Received		Distributed	Received	
Headteachers	1	1	100%	2	1	50%
Technicians	1	1	100%	2	1	50%
Teachers	11	9	82%	30	7	23%
Students	16	9	56%	300	228	76%

The interview sample was taken from the same sample of the questionnaires; however, the number of interviews was well below the number of the collected questionnaires.

The researcher asked the questionnaires' participants, including the headteachers and the teachers, to write their contact information if they were willing to be interviewed by the researcher. Ultimately, the researcher conducted interviews with three teachers and one headteacher assistant from School H, in addition to four teachers and one headteacher from School S. The interview sample from each school is presented in Table 4.13.

Table 4.13. Interviews Sample

	School H	School S
Headteachers	1	1
Teachers	3	4

Students' questionnaires for both schools were enclosed with information sheets about the study as well as parents' consent forms for questionnaires and interviews. The researcher was able to conduct one focus group interview with seven male students from grade 8 of School H, and two focus groups with three female students from each grade 7 and 9 of School S. The numbers and gender of the students' focus group sample are shown in Table 4.14.

Table 4.14. Students' Focus Group Sample

	Grade 7		Grade 8		Grade 9	
	Male	Female	Male	Female	Male	Female
School H			7			
School S		3				3

4.11 Summary

This chapter examines the methodology adopted in this research. First, an overview of the research paradigms is presented, and of the pragmatic paradigm is then exploredin more detail. Then, a comprehensive explanation of the mixed methods strategy is provided. Next, the case study research is explored and the three methods of data collection, questionnaires, semi-structured interviews and focus group interviews, are illustrated. Following that, the validity and reliability is established, and data analysis methods clarified. Then, ethical considerations are addressed, the context of the study is described, and the sample of the study described.

Chapter 5: Analysis of the Questionnaires

5.1 Introduction

This chapter presents the analysed data from the headteacher, technician, teacher, and student questionnaires. The results are presented in tables which include mainly descriptive statistics like frequencies, means, and standard deviations.

This chapter analyses the questionnaires answered by all the participants in this study. First, the characteristics of the participants are analysed. Second, the pedagogical benefits from headteachers, teachers and students are examined. Finally, the challenges of mobile learning employment are analysed and debated.

5.2 Characteristics of the Participants

In this section, all the participants' characteristics are discussed and are analysed in the following order: headteachers, technicians, teachers and students.

5.2.1 Headteachers

One questionnaire was handed to a member of the senior management team from each school. The assistant headteacher of School H has considerable experience with the mobile learning project in the school. School S has two headteachers, as they have two separate buildings for girls and boys, but only the male headteacher from the boys' school responded to the questionnaire. The details for the headteachers who participated in the study are presented in Table 5.1 and the questionnaire shared with them is attached in Appendix B.

Table 5.1. Headteacher Questionnaire Sample

	School H	**School S**
Gender	Female	Male
Experience	More than 20 years	10-20 years

School H has been using mobile technologies for more than 6 years, whereas school S has implemented mobile technologies in its classes for 2 to3 years.

The responses of the assistant headteacher of School H showed that not all the classes have mobile devices, as shown in Table 5.3. Only grades 7 and 8 employ mobile devices in their classrooms. In School S, on the other hand, a wider range of grades, namely grades 6, 7, 8 and 9 use mobile technologies in the classrooms, according to the headteacher's response to the questionnaire.

The questionnaire data also revealed that both schools are following a one-to-one ratio approach, which means one device is provided for each student. The mobile technology funding in School H comes from the parents, while the funding of the devices in School S originates from both the school and parents. Classes, ratio and funding are presented in Table 5.2.

Table 5.2. Classes, Ratio and Funding of Mobile Technologies

	School H	School S
Classes	Grades 7 & 8	Grades 6,7, 8 & 9
Ratio	1:1	1:1
Funding	Parents	School & Parents

5.2.2 Technicians

Table 5.3. Technicians' Sample

	School H	School S
Sample	1	1
Gender	Male	Male
Experience as a technician	1-2 years	More than 10 years
Experience in school	1-2 years	7-8 years

The researcher distributed three questionnaires for technical staff in both schools. Two questionnaires were only received, one from each school. School H has only one male technician, who had been working in this job for one to two years and his experience was limited to this school. School S has two technical members of staff. The male technician who answered the questionnaire had over a ten-year experience in this job. He had been working in this school for seven to eight years. The demographic information about the technicians' sample is illustrated in Table 5.3.

School H provides students with small laptops, which work on the Microsoft Windows platform. The technician reported that there were some technical issues that were related to the SharePoint software. According to his answers, the school was facing difficulties in implementing mLearning, but no instances of such difficulties were mentioned. The technician spent between 40% to 60% of his working time supporting mobile technologies. He believed that one technician was sufficient to support mLearning in his school.

As for School S, it provides students with iPads, which work on the IOS platform. The technician stated that there were some technical issues with the mobile devices such as security alerts and the breaking down of devices. He believed that there were no difficulties in employing mobile technologies in the school. The technician spent 10% to 20% of his

working time supporting mobile devices. He believed that two technicians were sufficient for supporting mLearning in the school.

5.2.3 Teachers

Table 5.4 shows the demographic information of the teachers participating in this study. Eight male teachers and eight female teachers were involved in the questionnaire. This small number means that any apparent differences between the males and females may simply be due to chance. There were nine participants from School H and seven participants from School S. The teachers have different levels of experience, though most of them have a teaching experience that ranges between 7 to10 years. Furthermore, four of the participants, who account for 31.3% of the teachers, have more than ten years of experience in using mobile devices.

Table 5.4 Gender Differences in Demographic Information

School	Gender		Total
	Males	Females	
School H	4	5	9
School S	4	3	7
Total	8	8	16
Years of Experience			
1-2 years	0	0	0
3-6 years	3	0	3
7-10 years	1	5	6
10-20 years	1	2	3
More than 20 years	2	1	3
Missing	1	0	1
Total	8	8	16
Experience in using mobile devices			
1-2 years	1	1	2
2-3 years	1	0	1
3-4 years	1	0	1
4-5 years	0	1	1
5-6 years	0	0	0
6-7 years	2	1	3
7-8 years	0	0	0
8-9 years	1	0	1
9-10 years	1	1	2
More than 10 years	1	4	5
Total	8	8	16

Table 5.4 shows the gender differences in both schools which contain the sample of both male and female participants. There is a slight difference in the number of male participants compared to the number of female participants. The latter is higher than the number of male participants in School H, which is higher than its female counterpart in School S, although the entire sample of both schools is composed of an equal number of females and males (8 each), as shown in Table 5.4.

Table 5.5 Teachers' Expertise in Using Mobile Technologies

Expert in using mobile devices?		
	N	**%**
Yes	6	37.5 %
No	7	43.3 %
Not sure	2	12.5 %
Missing	1	6.3 %
Total	16	100 %

The teachers were asked if they consider themselves experts in using mobile devices, as shown in Table 5.5. They were given three answers to choose from (yes, no, not sure). The results reveal that 37.5% of the participants consider themselves experts in using mobile devices, whereas 43% do not consider themselves as experts, and 12.5% are not sure.

Table 5.6. Teachers' Use of Mobile Devices at Home

Using mobile devices at home		
	N	**%**
Frequently	14	87.5 %
Sometimes	2	12.5 %
Never	0	0 %
Total	16	100 %

Teachers frequently use mobile technologies at home, as shown in Table 5.6. The majority of the participants, accounting for 87.5% of their total, use mobile devices frequently at home. The data also implies that all the teachers use mobile devices at home; however, their usages range from "frequently to sometimes".

Table 5.7. Using Mobile Devices at Work

Using mobile devices at work		
	N	**%**
Frequently	11	68.8 %
Sometimes	5	31.3%
Never	0	0 %
Total	16	100 %

All the teachers in this study use their mobile devices at work, as shown in Table 5.7. The majority, which represents 69% of them, use their mobile devices frequently at work while 31% of the participants sometimes use their devices.

Table 5.8. Teachers' Mobile Activities in School

Administrative work		Planning		Teaching	
N	%	N	%	N	%
2	12.5 %	4	25%	7	43.8 %

The teachers' responses for the activities where they use mobile technologies in school were classified into three main areas: administrative work, planning, and teaching. Table 5.8 shows that seven teachers from the sample are using mobile devices for teaching, four for planning, and two for administrative work. The result reveals that 43.8% of the teachers are using mobile devices for teaching.

5.2.4 Students

Table 5.9. Students' Data Description

School		
	N	%
School H	9	3.8 %
School S	228	96.2%
Total	237	100 %
Gender		
Male	98	41.4 %
Female	139	58.6 %
Total	237	100 %
Grade		
Grade 7	68	28.7 %
Grade 8	88	37.1 %
Grade 9	81	34.2 %
Total	237	100 %
Years of using mobile devices in school		
1-2 years	109	46 %
2-3 years	115	48.5 %
3-4 years	7	3 %
More than 4 years	5	2.1 %
Missing	1	0.4 %
Total	237	100 %

Table 5.9 describes the sample collected from the students' questionnaires. The 237 participants are male and female students from two private schools in Muscat: School H and

School S. The study involves 228 students from School S and 9 students from School H, so much the larger proportion is from S School. The significant difference in numbers is related to the size of the schools and the number of classes involved in mLearning. School H is smaller and has five mLearning classes only, four of which were excluded by the researcher due to their pre-involvement with mobile devices prior to the period of data collection. The nine students from School H are all in grade 8, whereas the School S students are in grades 7, 8 and 9. There is no big difference between the numbers of participants from each grade; 68 students from grade 7, 88 students from grade 8, and 81 students from grade 9. The students who participated in this study have the experience of using mobile technologies in school for 1to 3 years. Table 5.9 shows that 46% of the participants had used mobile devices for 1 to 2 years, and 48.5% students had used them for 2 to 3 years.

Table 5.10. Students' Gender Differences

School	Gender		Total
	Males	Females	
School H	9	0	9
School S	89	139	228
Total	98	139	237
Grade			
Grade 7	19	49	68
Grade 8	44	44	88
Grade 9	35	46	81
Total	98	139	237
Years of Using Mobile devices in School			
1-2 years	50	59	109
2-3 years	36	79	115
3-4 years	6	1	7
More than 4 years	5	0	5
Missing	1	0	1
Total	97	139	237

The students' gender differences are illustrated in Table 5.10, which shows that only male students from School H are involved in mLearning. In addition, the number of female students exceeds its male counterpart in School S. It also shows that there are more female students than male students in grade 7 and 9; however, there are equal numbers of male and female students in grade 8. Moreover, the number of male and female students who have the experience of 1-2 years of using mobile devices is similar. However, female students represent 69% of the students who have the experience of 2 to 3 years.

Table 5.11. Using Mobile Technologies at Home

Using mobile devices at home		
Frequently	109	46 %
Sometimes	110	46.4 %
Never	9	3.8 %
Missing	9	3.8 %
Total	237	100 %

The results of this study also indicate that most students use mobile devices at home. Table 5.11 shows that 46% of the sample students use mobile devices frequently at home, and 46.4% are sometimes using mobile devices. Only 3.8% do not use mobile devices at home.

Table 5.12. Using Mobile Technologies for Assignments

Using for assignments		
	N	**%**
Yes	206	86.9 %
No	20	8.4 %
Missing	11	4.6 %
Total	237	100 %
What activities?		
Browsing for information	168	78.5%
Communicating with classmates	60	25.3%
Preparing presentations and projects	17	7.2%
Using for translation	9	3.8%
Using for calculations	2	0.8%
Looking for pictures	2	0.8%

The results in Table 5.12 convey that the majority of the sample students, that is 87%, use mobile technologies to complete assignments at home. Most of the sample students use mobile devices to browse for information (78.5%) and communicate with classmates (25.3%). Students also use mobile devices to prepare presentations and projects, for translation and calculations purposes, and to look for pictures.

The results in this study are similar to the Ott et al. (2014) study, where students used mobile devices at home to accomplish school work for several purposes such as communicating and cooperating with classmates, browsing for information, checking the calendar, looking for pictures, translation, and calculations.

Table 5.13. Receiving Support

Do they receive enough support?		
	N	**%**
Yes	188	79.3 %
No	42	17.7 %
Missing	7	3 %
Total	237	100 %
Who supports them?		
Peers	113	47.7 %
Teachers	110	46.4%
Parents	90	38 %
School headteacher	19	8 %

Most of the sample students receive enough support from the people around them, as presented in Table 5.13. While 79.3% of the sample receives enough support, 17.7% do not receive sufficient support. 47.7% of the students receive support from their peers, 46.4% from their teachers, while 38% from their parents and finally 8% from the school headteacher.

5.3 Pedagogical Benefits of mLearning

Headteachers and teachers were asked (open-ended questions) to provide examples of how mobile learning was used successfully in classrooms. Analysing the examples of successful implementation of mLearning reveals that headteachers in both schools believed that mobile learning had been effectively practised in science lessons. The headteacher of School H reported that students could access online experiments websites to watch and do experiments. The headteacher of School S encouraged students in science lessons to answer questions via an app on their mobile devices so teachers could monitor their understanding based on who was getting wrong or right answers.

Table 5.14. Mobile learning employment

Activities	**N**	**%**
Presenting material	7	43.8%
Displaying videos	7	43.8%
Research purposes	4	25%

The researcher classified the teachers' answers into three categories: presenting material, displaying videos and research purposes, as shown in Table 5.14. Most of the sample teachers employ mobile technologies to present materials and display videos. 43.8% of the sample use mobile technologies effectively to present materials and the same percentage use the devices to display videos.

Table 5.15. Teachers' Favourite Applications

N	Applications	N	%	Type	%
2	Edmodo	3	18.75%	Classroom Management	50%
4	Moodle	2	12.55%		
5	Google Drive	1	6.25%		
8	Microsoft SharePoint	1	6.25%		
12	Class Dojo	1	6.25%		
1	Microsoft PowerPoint	4	25%	Presentation	31.25%
7	Keynote	1	6.25%		
9	Microsoft Journal	1	6.25%	Tools	18.75%
10	Calculator	1	6.25%		
11	Dictionary	1	6.25%		
3	Microsoft Word	2	12.5%	Word Processing	12.5%
6	YouTube	1	6.25%	Multimedia	6.25%

The sample teachers prefer mobile applications that assist them in their teaching, as shown in Table 5.15. Approximately 50% like classroom management applications, and around 31% of the sample preferred presentation applications like Microsoft PowerPoint and Keynote.

Students are in favour of collaborative applications, as shown in Table 5.16. About 57% of them like classroom management applications where they can share and exchange knowledge and assignments with other students and teachers. The results also show that 36% of the sample like multimedia applications where they can edit photos and videos.

Table 5.16. Students' Favourite Mobile Applications

N	Applications	N	%	Type	%
1	Edmodo	79	33.3%	Classroom Management	57.4%
2	Google Drive	35	14.8%		
6	Google Classroom	18	7.6%		
15	Microsoft SharePoint	4	1.7%		
5	iMovie	20	8.4%	Multimedia	36.2%
8	PicsArt	15	6.3%		
10	Cute Cut	8	3.4%		
4	Safari	24	10.1%	Search Engines	16.8%
7	Google Chrome	16	6.7%		
3	YouTube	32	13.5%	Video	13.5%
9	Keynote	15	6.3%	Presentation	6.3%
11	Pages	8	3.4%	Word Processing	5.5%
14	Microsoft Word	5	2.1%		
13	Sketchbook	5	2.1%	Sketching	3.8%
16	SketchUp	4	1.7%		
12	Google Docs	6	2.5%	Documents Sharing	2.5%

5.3.1 Benefits for Headteachers

The reasons for adopting mLearning are elicited in the headteachers' questionnaires. The assistant headteacher's response from School H shows that adopting mobile learning in the school is used for innovative purposes and for improving the learning and the teaching process to develop their students' level. The headteacher of School S reported that employing mobile technologies helps to access information quickly. Moreover, such employment is considered a resource tool for learning, as it is the case of dictionaries. According to him, these devices facilitate communication between teachers and students.

The headteachers were also asked about the usefulness of mLearning usefulness for teaching and learning. The headteacher at School H claimed that learning via mobile technologies is helpful for teaching and learning for three reasons: easy access to information from different sources, exploring alternative opinions and experiences through online resources, and effective communication with teachers to develop ideas and learning. On the other hand, the headteacher of School S is divided on the usefulness of mobile devices for teaching and learning. He believes that mobile technologies are useful for quick search and for posting assignments; however, it is difficult to monitor each student's engagement during mLearning tasks.

5.3.2 Benefits for Teachers

Table 5.17. Impact of Mobile Learning

	N	%
Enhance learning	10	62.5%
Positive attitudes towards learning	4	25%
Negative impact on students	2	12.5%

The teachers' questionnaire included an open-ended question about the impact of mobile technologies on learning. The results show that the impact of mobile technologies on learning is mainly positive. Table 5.17 shows that 62.5% of the sample teachers believe that mobile technologies enhanced learning and 25% believe that students have positive attitudes towards learning. Other studies found that mobile technologies enhance positive attitudes towards learning, for example, Al-Fahad (2009), Shih et al. (2011a) and Yang (2012). However, on the other hand, about 12.5% of the teachers in this study thought that mobile technologies had a negative impact on students' thinking skills as they readily referred to their devices when faced with any question. The depth of learning and thinking is also found by Kukulska-Hulme and Pettit (2009) to be one of the drawbacks of using mobile devices for learning.

Table 5.18. Is Mobile Learning Helpful?

Is mobile learning helpful?		
	N	**%**
Yes	14	87.5 %
No	0	0 %
Not sure	2	12.5 %
Total	16	100 %
Why helpful?		
Offers vast resources	13	81.2%
Enhances learning	11	68.6%
Enhances communication	1	6.3%

The teachers were also asked if they believe that mobile learning can be helpful for teaching and learning. They were given three answers to choose from (yes, no, not sure). They were also given space to write the reason for their answer.

Most of the teachers in the sample believe that mobile learning is helpful, as shown in Table 5.18. 87.5% of the sample consider mobile learning helpful for learning and teaching. Their reasons were categorised into three main themes: offering increased resources, enhancing learning and developing communication. 81.2% of the teachers believe that mobile learning offers increased resources, 68.6% of the sample believe that mobile learning promotes learning, and 6.3% believe that mobile learning enhances communication. The results of this study are similar to Naismith and Corlett (2006) and Rainger (2005), in finding that mobile learning enhances the students' motivation for learning and accessing information and materials.

Table 5.19. Mobile Helpfulness and School

	School H		**School S**	
Yes	9	100%	5	71.4%
No	0	0	0	0
Maybe	0	0	2	28.6%
Total	9	100%	7	100%

The difference of teachers' perceptions about mLearning between the two schools is shown in Table 5.19. It is clear that teachers in School H perceive mLearning more positively than those in School S. While all the sample teachers from School H believe that mLearning is helpful for teaching and learning, only 71% of School S teachers have the same perception.

Table 5.20. Mobile Helpfulness and Gender

	Male		Female	
Yes	7	87.5%	7	87.5%
No	0	0	0	0
Maybe	1	12.5%	1	12.5%
Total	8	100%	8	100%

There is no gender difference in teachers' perceptions about mLearning. Table 5.20 indicates that 87.5% of both male and female teachers perceive mLearning positively.

5.3.3 Benefits for Students

Table 5.21. Benefits of Mobile Learning

Benefits	N	%
Learning	142	59.9%
Resource	55	23.2%
Communication	48	20.3%

The students were asked if using mobile devices helps them in their learning. The students' responses to the benefits of using mobile technologies for learning were classified into three themes: learning, resources and communication. Table 5.21 shows that the majority of the students, about 60%, gain learning benefits when using mobile technologies. They learn better through these devices. In addition, 23.2% benefit from their resources, and 20.3% enhance their communication through mobile devices. The result of the communication benefit is similar to Passey (2010), who stated that mobile technologies enable conversation, discussion and sharing ideas. It is also similar to Naismith and Corlett (2006), who found that collaboration is one of the positive impacts of mobile learning,

Table 5.22. Students' Enjoyment of Mobile Learning

Do they enjoy mLearning?		
	N	**%**
Yes	152	64.1 %
No	8	3.4 %
Sometimes	70	29.5 %
Not sure	6	2.5 %
Missing	1	0.4 %
Total	237	100 %
Why do they enjoy mLearning?		
Technical reasons	53	22.4%
Entertainment reasons	46	19.4%
Communication reasons	18	7.6%
Psychological reasons	10	4.2%
Physical reasons	6	2.5%

The students were asked if they find using mobile devices for learning enjoyable. They were given two options to choose from: yes and no. They were also given space to write three reasons for their enjoyment.

The results in Table 5.22 revealed that most students in this study enjoyed learning with mobile technologies. The majority of the students, representing 64%, enjoyed using mobile devices with learning, and 29.5% have sometimes enjoyed using the devices for learning. Their reasons for enjoyment were classified into five themes: entertainment, technical, communication, psychological and physical reasons. Technical reasons involve the easiness in using the devices. Most students enjoy using mobile devices for technical reasons at 22.4% and entertainment reasons at 19.4%,

Table 5.23. Enjoyment and Grade

	Grade 7		Grade 8		Grade 9	
Yes	54	79.4%	65	73.9%	33	40.7%
No	0	0	1	1.1%	7	8.6%
Sometimes	11	16.2%	21	23.9%	38	46.9%
Not sure	3	4.4%	0	0	3	3.7%
Total	68	100%	88	100%	81	100%

Table 5.23 shows that grade 7 enjoyed mLearning more than grade 8 and 9. The results revealed that 79% (54 students) enjoyed learning with mobile devices, and 74% (65students) of grade 8 enjoyed mLearning. Grade 9 least enjoyed mLearning at 41% (33 students).

Table 5.24. Enjoyment and School

	School H		School S	
Yes	7	77.8%	145	63.6%
No	0	0	8	3.5%
Sometimes	2	22.2%	68	29.9%
Not sure	0	0	6	2.6%
Total	9	100%	228	100%

Most of School H students enjoy mLearning, as shown in Table 5.24. While 63% of School S students enjoyed learning with mobile devices, the students at School H enjoyed learning with mobile devices at 78%. It was difficult to compare the sample between both schools due to the higher number of students in School S. However, it is evident that most students in School H enjoyed mLearning.

Table 5.25. Enjoyment and Gender

	Male		Female	
Yes	64	65.3%	88	63.3%
No	4	4%	4	2.9%
Sometimes	27	27.5%	43	30.9%
Not sure	2	2%	4	2.9%
Total	98	100%	139	100%

Gender is another differentiating factor in technology; however, the results in Table 5.25 show that there is almost no difference between female and male students' enjoyment of mobile learning.

Table 5.26. Easiness of Using Mobile Technologies

Do they find mobile devices easy?		
	N	**%**
Yes	186	78.5 %
No	5	2.1 %
Sometimes	40	16.9 %
Not sure	5	2.1 %
Missing	1	0.4 %
Total	237	100 %
Why are they easy?		
Educational reasons	76	32.1%
Technical reasons	63	26.6%
Experience	32	13.5%
Physical reasons	8	3.4%

The students were also asked if they find using mobile devices an easy learning resource. They were given two options to choose from: yes and no. They were also given space to write three difficulties for using mobile devices.

The students in this study considered using mobile devices easy, as shown in Table 5.26. Around 78.5% of the students participating in this study found it easy to use mobile devices, and 16.9% faced difficulties in using mobile devices occasionally. The reasons for their answers were categorised into four themes: educational, technical, experience and physical reasons. Most of the students find mobile devices easy for educational and technical reasons. Furthermore, 13.5% of the sample have experience in using these devices at home without facing any difficulties.

5.4 Challenges of Mobile Learning

5.4.1 Challenges for Headteachers

The challenges of employing mLearning have been analysed in the questionnaires. The results showed School H challenges, as reported by its headteacher assistant, arise for three reasons: insufficient parents' support and understanding, the weakness of the network because of the school location, and the students' misuse of the devices. The response of School S headteacher revealed that the school faces the challenges of misusing the devices, difficulty in monitoring all the students, and the variation of accessibility because not all the students are able to purchase the new versions.

Table 5.27. Factors of Successful Mobile Learning

	Factors	School H	School S
1	Regular internet access should be available.	5	4
2	Teachers have enough access to mobile devices for their classes when needed.	5	5
3	Technical support should be available in school when needed.	5	4
4	Technical support should exist in the region or the educational district.	5	3
5	Specific training should be provided to teachers to use mobile learning.	5	4
6	Students have sufficient knowledge and skills to use mobile devices.	5	4
7	Teachers need to be given additional planning time to integrate the use of mobile learning in their practice.	5	3
8	Mobile learning should be receiving enough support from the policy makers.	5	3
9	Parents should support mobile learning integrating at home.	5	3
10	Use of mobile learning teaching methods should be recognised and rewarded by senior managers.	5	3
11	Leaders should regularly encourage mobile learning practices.	5	3
12	Mobile learning activities should be integrated with the curriculum.	5	3
13	Mobile learning activities should be supplementary to the curriculum.	5	4
14	Head leaders should have an input in mobile learning.	5	4
15	Policy leaders should make mobile learning a priority in education as reforms.	5	3

Note: 1= Strongly Disagree, 2= Disagree, 3= Not Sure, 4= Agree, 5= Strongly Agree

The researcher explores the headteachers' views of what should be in place for effective mLearning implementation to avoid the possible challenges. A 5- point Likert scale was provided when asking the headteachers to tick the factors for successful mLearning employment. Their responses revealed a number of factors for successful mLearning, as shown in Tables 5.27 and 5.28. Table 5.27 shows the headteacher of School H strongly agrees with all the factors of successful implementation of mLearning. However, the headteacher of School S agrees that factors 1, 2, 3, 5, 6, 13 and 14 were necessary for successful implementation, while he is not sure about the factors 4, 7, 8, 9, 10, 11, 12 and 15.

Table 5.28. Successful Implementation of Both Schools

	Factor	School H	School S
1	Availability of internet access	5	5
2	Access to mobile devices by teachers	5	4
3	Availability of technical support	5	4
4	Training opportunities for teachers	5	4
5	Adequate time for teacher training	5	4
6	Adequate time for teacher planning	5	4
7	Enough time for teachers to evaluate mobile learning in their practice	5	3
8	Effective support from school	5	4
9	Effective support from policy makers	5	3
10	Effective support from parents	4	3
11	Frequent motivation and encouragement by school leaders	4	3
12	Integration into the curriculum	5	3

Note: 1=Never, 2=Rarely, 3=Sometimes, 4=Frequently, 5=Always

Table 5.28 illustrates that most factors for successful implementation of mLearning are always available in School H, according to the responses of the headteacher's assistant. Moreover, effective support from parents (item 10) and frequent motivation and encouragement by school leaders (item 11) is available. On the other hand, the availability of these factors in School S is less apparent. According to the headteacher's responses, internet access is always available (item 1), and access to mobile devices, technical support, training for teachers, enough time for training and planning and effective support from school (items 2, 3, 4, 5, 6, 8) are frequently available. In addition, adequate time for evaluation, support from policy makers and parents, motivation from school leaders and integration into the curriculum (items 7, 9, 10, 11, 12) are sometimes available. The headteacher of School S suggests that suitable mobile educational applications that are subject specific and compatible with most mobiles should be available to ensure the success of implementation. On the other hand, the School H headteacher assistant does not suggest this.

5.4.2 Challenges for Teachers

Table 5.29. Challenges for Teachers

Are they facing challenges?		
Frequently	2	12.5%
Sometimes	12	75 %
Never	0	0 %
Missing	2	12.5%
Total	16	100 %
What challenges?		
Technical problems	9	56.3%
Distraction & Discipline	7	43.8%
Confidence	2	12.5%

The teachers were asked if and how often they face any challenges while employing mobile learning for teaching and were given three options (frequently, sometimes, never). They were also asked to write three challenges they face when employing mLearning. The results in Table 5.29 reveal that the majority of the sample teachers do face challenges when employing mobile learning. There was a difference in how often they face these challenges, with 75% sometimes facing challenges, and 12.5% frequently facing challenges.

The sample teachers' responses to the challenges they face in employing mobile learning were classified into three categories: technical problems, discipline, communication and confidence. Most of the sample faced technical and discipline challenges, as shown in Table 5.29. Discipline challenges include distraction and classroom control. The results above are similar to those of Naismith and Corlett (2006), who found that mLearning projects mainly faced technical problems like battery life, data loss, connectivity and compatibility.

Table 5.30. Successful Factors of Mobile Learning

	Factors	**Mean**	**SD**
1	Regular internet access should be available.	4.47	1.125
2	Teachers have enough access to mobile devices for their classes when needed.	4.33	.724
3	Technical support should be available in school when needed.	4.44	1.209
4	Technical support should exist in the region or the educational district.	3.81	1.223
5	Specific training should be provided to teachers to use mobile learning.	4.50	1.033
6	Students have sufficient knowledge and skills to use mobile devices.	4.00	.894
7	Teachers need to be given additional planning time to integrate the use of mobile learning in their practice.	4.25	1.065
8	Mobile learning should receive sufficient support from the policy makers.	4.44	1.094
9	Parents should support mobile learning integrating at home.	4.25	.931
10	Use of mobile learning teachers should be recognised and rewarded by senior managers.	4.19	1.167
11	Leaders should regularly encourage mobile learning practices.	4.13	1.025
12	Mobile learning activities should be integrated with the curriculum.	4.31	.793
13	Mobile learning activities should be supplementary to the curriculum.	4.44	.629
14	Head leaders should have an input in mobile learning.	4.31	.701
15	Policy leaders should make mobile learning a priority in education as reforms.	4.31	.602

Note: 1= Strongly Disagree, 2= Disagree, 3= Not Sure, 4= Agree, 5= Strongly Agree

The teachers were also asked to tick the factors that are prerequisite for the successful implementation of mLearning. These factors might hinder the difficulties of mLearning implementation. A 5-point Likert scale was provided when asking the teachers to tick the factors for successful mLearning employment. Table 5.30 shows that the sample teachers agree with all the successful factors for mobile learning. The mean scores of agreement with the statements range from 3.81 to 4.47; the standard deviations range from 0.602 to 1.223. These values reveal a fairly low degree of variation and indicate that the teachers agreed with all 15 factors, often expressing agree or strongly agree, with few expressing any disagreement.

Table 5.31. School H Successful Factors

	Factor	Mean	SD
1	Availability of internet access	4.44	.726
2	Access to mobile devices by teachers	3.89	1.167
3	Availability of technical support	4.22	.833
4	Training opportunities for teachers	3.67	1.000
5	Adequate time for teacher training	3.44	1.014
6	Adequate time for teacher planning	4.00	.707
7	Enough time for teachers to evaluate mobile learning in their practice	3.44	1.130
8	Effective support from school	4.44	.726
9	Effective support from policy makers	4.22	.972
10	Effective support from parents	3.67	1.118
11	Frequent motivation and encouragement by school leaders	4.00	1.323
12	Integration into the curriculum	4.33	.866
13	School management provides effective leadership	4.33	.707

Note: 1=Never, 2=Rarely, 3=Sometimes, 4=Frequently, 5=Always

Table 5.31 reveals that School H is successful in implementing all the factors. The teachers there agree that all the successful factors are implemented in their school, although their answers range from sometimes to always. The means range from 3.44 to 4.44, reflecting that most responses are between frequently and always, and only two items were implemented sometimes (items 5 & 7). The standard deviations were between 0.707 and 1.323 , showing a fairly low amount of variation and implying that the majority of the teachers were expressing sometimes, frequently or always to most of these items.

Table 5.32. School S Successful Factors

	Factor	Mean	SD
1	Availability of internet access	4.14	1.069
2	Access to mobile devices by teachers	3.71	1.113
3	Availability of technical support	3.71	.756
4	Training opportunities for teachers	3.43	.976
5	Adequate time for teacher training	3.38	.951
6	Adequate time for teacher planning	3.63	1.215
7	Enough time for teachers to evaluate mobile learning in their practice	3.31	.690
8	Effective support from school	4.19	1.069
9	Effective support from policy makers	4.06	1.069
10	Effective support from parents	3.56	1.272
11	Frequent motivation and encouragement by school leaders	3.88	.756
12	Integration into the curriculum	3.87	.983
13	School management provides effective leadership	4.13	.900

Note: 1=Never, 2=Rarely, 3=Sometimes, 4=Frequently, 5=Always

Teachers in School S also agree that all the successful factors are implemented in their school, as can be seen in Table 5.32. The means of their responses range from 3.31 to 4.19, corresponding to between sometimes and frequently; the standard deviations vary between 0.690 and 1.272 , indicating the responses showed a fairly low degree of variation and that the majority of teachers were responding with sometimes, frequently or always to the 13 factors The teachers believe that training opportunities for teachers, time for teacher training and evaluating their practice (items 4, 5 & 7) receive less consideration than the other factors.

5.4.3 Challenges for Students

Table 5.33. Mobile Learning Challenges for Students

Challenges	N	%
Technical	96	40.5%
Learning	29	12.2%

The students were asked if they faced any challenges in using mobile devices in their learning. Their replies to these challenges were classified into four themes: technical, learning, physical and personal behaviour challenges, as shown in Table 5.33. The results show that 40% of the students in this study face technical challenges and 12.2% face problems with learning via these devices. The results of this study are similar to Kukulska-Hulme and Pettit (2009), where the learners were mainly facing technical problems like battery life and losing files.

5.5 Summary

This chapter presents the analysed data from the headteacher, technician, teacher, and student questionnaires. The results are presented in tables which include mainly descriptive statistics like frequencies, means, and standard deviations.

The results of the headteachers' questionnaires reveal that mLearning is adopted in both schools for innovation purposes. The two headteachers believe that mLearning is helpful for several reasons, for example, offering increased resources and engaging students into learning. They face a number of challenges such the weak network.

The results of the technicians' questionnaires reveal that the number of technicians in both schools was sufficient to support mLearning. The results of the teachers' questionnaires demonstrate that 87% of the sample used their mobile devices at home. In addition, a large segment of the sample (43%) shows that they do not consider themselves experts at using mobile technologies. About 70% of the sample frequently uses mobile devices at work and 43% of them use the devices for teaching. The teachers agreed with all the successful factors, but School H applied them more successfully than School S. The successful practices at School H were mainly due to presenting materials with mobile devices. The results also show that teachers are in favour of classroom management applications. The majority also believe that mLearning is helpful, giving different reasons for this, such as promoting learning and helping to teach. Most of the sample are sometimes faced with challenges like technical and discipline problems.

The findings from the students' questionnaire demonstrate that most students enjoy learning with mobile devices, as they are easy to use and help them learn faster. The majority of the sample students use their mobile devices at home to browse for information and see the benefits of this in their learning. However, a greater part also face difficulties when using these devices, but also believe they have sufficient support to use mobile technologies, such support usually being provided by their peers first and then their teachers. Moreover, most of them like classroom management and multimedia applications.

Chapter 6: Analysis of the Interviews

6.1 Introduction

This chapter analyses the teachers', headteachers', and the students' focus groups interviews, using NVivo software. The different themes presented emerged from the analysed data and are classified under the appropriate research question. For example, student learning and engagement, and authentic and situated learning opportunities were revealed from the interviews with the headteachers, and subsequently classified under the pedagogical benefits of mLearning.

The interviewees will be identified in the following section of this chapter, followed by the analysis of the pedagogical benefits for all the participants. Then, the challenges of employing mLearning from all the interviewees will be determined.

6.2 Who Are the Interviewees?

The researcher conducted an interview with the headteacher's assistant and the mLearning project manager at School H. The researcher also conducted an interview with one of the headteachers of School S, who is responsible for the boys' section.

The researcher further conducted seven interviews with teachers from both schools. Three teachers are from School H and four from School S. The researcher conducted three focus group interviews with the two schools. One focus group consisted of seven male students in grade 8 from School H. The other two consisted of three female students from grade 7 and three female students from grade 9 from School S.

6.3 Pedagogical Benefits of Mobile Learning

6.3.1 Headteachers

The analysis of the interviews with the headteachers produced two themes: student learning and engagement, and authentic and situated learning opportunities.

6.3.1.1 Student Learning and Engagement

The headteacher's assistant at School H has positive perceptions about mLearning and believes that students are benefiting academically: *There is a benefit in using mobile devices*

and the students are improving academically. (Headteacher assistant, School H, semi-structured interview)

The assistant points out that some of the students who use mobile devices enjoy learning more and achieve better results than those learning without mobile technologies. This is clear in her statement:

If we compare the learning results of the students who graduated with the traditional method with the students who used mobile technologies, I can say that some of them really enjoyed mobile learning and achieved more since 2005. (Headteacher assistant, School H, semi-structured interview)

The assistant adds that weak students enjoy learning with mobile devices and learn better via these devices: *We controlled the weakness in some students because weak students liked using the technology and their learning improved.* (Headteacher assistant, School H, semi-structured interview)

On the other hand, the headteacher of School S does not report mLearning impact on achievement. Heinds that mobile technologies enhance presentations because they can be connected promptly to Apple TV:

The presentations have improved a lot because we have Apple TV and so on, they can connect the devices straightaway rather than fiddling with the computer. (Headteacher, School S, semi-structured interview)

6.3.1.2 Authentic & Situated Learning Opportunities

The headteacher of School S emphasized that students can instantly access research and information: *The main advantage that they get is the instant access to research.* He also added that students could access dictionaries that can help them understand and pronounce the words: *They have instant access to dictionaries and the opportunity to find out how words are pronounced using certain software on iPads* (Headteacher, School S, semi-structured interview)

6.3.2 Teachers

Several advantages of learning via mobile technologies were elicited from the interviews. Seven themes emerged from the analysis of the teachers' interviews: immediacy, saving time, addressing different levels, learning everywhere, increased resources, showing understanding,

and technological advancement. The researcher decided to classify these themes under two main themes: student learning and engagement, and authentic and situated learning.

6.3.2.1 Student Learning and Engagement

Teacher SH believes that using mobile technologies in class is an advantage for the less able students because it encourages them to show more interest and participate more:

They gain interest on the subject and actually enjoy participating because it requires only a mouse click and nowadays, every child at home uses a computer. So, they don't feel they are doing a new thing. They try to become familiar with it and they try to participate in the class which is very important in the learning process (Teacher SH, School H, semi-structured interview)

She also adds that all levels of students, weak, average and outstanding, are benefiting from using mobile devices for learning:

I say that the weak students can benefit, the average students will try to improve a lot and for the outstanding students it will be the biggest gift for them if the school adapts to the internet and all methods of mobile technologies. (Teacher SH, School H, semi-structured interview)

Teacher VM considers mobile learning an important factor that allows students to show their understanding in different ways:

Mobile learning also allows students to communicate and present their knowledge and understanding in different ways and that's considered to be beneficial to some students. (Teacher VM, School S, semi-structured interview)

6.3.2.2 Authentic and Situated Learning Opportunities

Most teachers consider mobile technologies a resource for information, visual and audio materials that students and teachers extremely benefit from. SH considers a mobile device as a visualising tool that brings everything into the classroom:

Using mobile technologies is the biggest advantage that we are getting. We can bring ...we can visualize everything from any corner of the world inside the classroom, so they can grasp the subject very quickly. (Teacher SH, School H, semi-structured interview)

In addition, SO states that students do not have to carry textbooks because they have all the course materials in their devices: *Of course, it has advantages because the course materials are readily available in the device, so they don't have to carry the textbooks and things like that. (Teacher SO, School H, semi-structured interview)*

A male teacher (VM) felt that mobile technologies are valuable tools that can be used to instantly share content between teachers and students:

They're valuable because I use online learning sites like Edmodo and so I provide PowerPoint and all the information for students online which they can access on their phones. (Teacher VM, School S, semi-structured interview)

SM also considers that mobile devices are a helpful resource for students when working on their social studies' projects:

Before, we had limited resources like the library and books. It's only presenting information from a book. Now, when I ask them to write a report on social studies, I ask them to work in groups. They can access different sources of information not only from the books available in school. (Teacher SM, School H, semi-structured interview)

A female teacher from School H (SO) states that students have increased mobility with their mobile devices, which creates opportunities for them to learn everywhere:

Also creating opportunities for students to carry with them when they move around, they are able to take it with them and are able to move around, especially when it is a small set like this it is easy for them. (Teacher SO, School H, semi-structured interview)

Students are getting information immediately whenever they want. Teacher AG pointed out that students nowadays are living in a world of immediacy because they can look up information easily by clicking on the screen:

The students, I think, benefit. They can see the use of technology in the classroom plays in the sense of immediacy that we're as a human race becoming used to because of mobile devices. As a human race we look up something immediately, it's all there, your Facebook, Twitter, it's all available at a click of your finger, and I think today students were almost born in this world of immediacy (Teacher AG, School S, semi-structured interview)

VM also believes that students could search for information or answers quickly with their mobile devices:

They find it useful looking up things, 'can I quickly find out the answer to this because I don't have the answer to every question' they ask, and I encouraged them that if you don't know an answer, quickly look it up and see what you find, and we can discuss then. (Teacher VM, School S, semi-structured interview)

Mobile technologies are speeding up the process of the learning, as mentioned by two teachers. SS highlights that mobile devices are saving time for teachers and students: *The idea is that it's shortening the teaching time for the teachers and the students. (Teacher SS, School H, semi-structured interview)*

SH stated that mobile devices help students' comprehension of concepts and this speeds the learning process: *They can understand the concept and it speeds the process of learning. (Teacher SH, School H, semi-structured interview)*

VM believes that students could access information easily and teachers could save time in lessons:

Given that it's making it easy to access information, students do not need to rely on anyone. They arrive, and the lesson can proceed more efficiently with less of time wasting and to me that's one of the important things, as it gives me more time to help the students. (Teacher VM, School S, semi-structured interview)

He also adds that students could use their mobile devices to take photos of important things written on the board, which saves time in lessons that could be devoted to other activities:

One of the things students do quite a lot when I'm showing something on the board is come up and take a photo and they get that in front of them and they use that as a resource. It means that they don't write and have to spend time writing in the classroom which creates time to do other things you know, discuss and do other activities. (Teacher VM, School S, semi-structured interview)

The interviews reveal that teachers encourage learning with mobile technologies to keep pace with technological advancements. For example, a male teacher (SS) from School H believes that mobile learning should be implemented in schools because it reflects the future and people cannot ignore that. He states that: *Mobile learning reflects future vision because the entire world is directed towards electronic learning and soon we will be joining in the ranks (Teacher SS, School H, semi-structured interview)*

A female teacher (AG) from School S encouraged using mobile technologies and felt lucky to teach in such a technological environment:

I do feel very lucky that I'm teaching in a time where there has been such drastic change and advancement and I'm looking forward to seeing what's to come (Teacher AG, School S, semi-structured interview)

6.3.3 Students

Students reported that mobile technologies are helpful for learning. The interviews with the students reveal the following themes: enjoyment, easiness, responsibility, learning better, enhancing communication, saving time, and mobile devices are lighter than books. These themes were put under three main themes: student learning and engagement, authentic and situated learning, and enhancing communication and collaboration.

6.3.3.1 Student Learning and Engagement

Most students enjoy using mobile technologies for learning in school. A female student in grade 7 (G7/3) enjoys using mobile devices because of easiness: *It's making things easier, so that's why we enjoy it. (Student* G7/3, *School S, focus group interview)*

While another female student in grade 9 (G9/1) finds it boring when teachers used mobile devices only for searching for information:

The problem is that teachers only use them when asking to search for projects. It's really boring because mobile devices are constantly used for the same thing. (Student G9/1, *School S, focus group interview)*

Most students find it easy to use mobile technologies for learning. They say that they are already using mobile devices at home and this is the reason why they find them easy to use in school. A male student in grade 8 (G8/1) reports that these devices are easy to use because students use mobile devices at home: *We are using devices like mobiles and tablets at home; I find them easy to use. (Student* G8/1, *School H, focus group interview)*

A student in grade 7 (G7/2) says that using mobile devices is easy and they discover things easily because they are used to such touch devices at home:

These devices are becoming essential in our life, we're using them at home, and it's easy to discover things. Most students already have iPads at home and are familiar with touch screen

and the new applications. You get used to using the new applications because we already know how to use the devices. (Student G7/2, *School S, focus group interview)*

Most students report that they learn better through mobile technologies. A female student from grade 7 (G7/2) states that she likes learning from a mobile device more than a book because she gets bored with books: *I usually get bored from reading from books. I like to use the iPads. (Student* G7/2, *School S, focus group interview)*

G7/2 also thinks that learning from her mobile device was better because she can check the meaning of the words quickly and she does not have to refer to a dictionary:

I think it's better to learn from iPads. If I have homework like a worksheet and I don't understand some words, I just open my iPad and find the meaning. Without the iPad, you have to have a dictionary. With iPads, it's faster and you don't feel lazy to do the search. (Student G7/2, *School S, focus group interview)*

Another female student in grade 7 (G7/1) says she can understand better through mobile devices and that she is excited to learn: *I understood more things. I also feel more excited and it encouraged me to learn. (Student* G7/1, *School S, focus group interview)*

A male student in grade 8 (G8/6) states that mobile technologies help him to understand social studies lessons, notably when he looks at the mind map sent by his teacher:

If I don't understand a lesson in social studies, I look at the mind map that the teacher sent. So, it takes less time to study from the book because I have understood the lesson from the mind map. (Student G8/6, *School H, focus group interview)*

6.3.3.2 Authentic & Situated Learning Opportunities

Students also state that mobile technologies are saving them time because they can complete their assignments and reports in school, hence they do not have to do them at home. A student in grade 7 (G7/3) says that students with mobile devices could do their reports in school:

Before, when we had to write a report, we had to go home and use desktop computers to do it there, but now with our iPads we can do it any time even here in school. (Student G7/3, *School S, focus group interview)*

A student in grade 9 (G9/2) also agrees that mobile devices are very helpful because they can complete their projects in school: *We can do a project and finish it in one day here in school. (Student* G9/2, *School S, focus group interview)*

Most students in the interviews believe that mobile technologies are lighter than books and are easier to carry. Students in School H are allowed to bring their mobile technologies only; however, students in School S have to bring their books and their mobile technologies. Students in School H liked bringing mobile technologies to school because they believe they are lighter than books. For example, a student in grade 8 (G8/3) says that mobile devices are lighter than books: *We like mobile devices because we don't have to bring books to school, they are lighter. (Student* G8/3, *School H, focus group interview)*

Another student (G8/6) also finds it is easy to bring mobile devices instead of books: *It is easier to have mobile devices because they are lighter. (Student* G8/6, *School H, focus group interview)*

On the other hand, students from School S complain about the heaviness of their school bags because they have to carry their school books along with their mobile devices. A student in grade 9 (G9/2) stated that carrying books and mobile devices is heavy for them:

When we started in grade seven, they said that we shouldn't bring our books to school. Unfortunately, we're using our books and the iPads and they're very heavy. (Student G9/2, *School S, focus group interview)*

6.3.3.3 Enhancing Communication and Collaboration

Students say that mobile technologies are facilitating communication and collaboration between them, their classmates, and their teachers. For example, a student in grade 8 (G8/4) asserts mobile devices are helpful in finding out about assignments and collaborating with their classmates and teachers:

The best thing is that they are easy to work with and we can communicate easily with each other, like when we forget homework. We can communicate with classmates, and with the teachers. (Student G8/4, *School H, focus group interview)*

6.4 Challenges of Mobile Learning

6.4.1 Headteachers

Two themes emerged from the analysis of the headteachers' interviews: internet access and substituted tool, which are put under the main themes of technical problems and teachers' confidence.

6.4.1.1 Technical Problems

The headteacher's assistant complains of the weakness of the network provided. The weak network forces them to stop or reconsider the implementation of several programs that require internet access.

We need high-speed internet, and this is the problem that we face. This is an obstacle for implementing many programs and sometimes we can't implement programs because of the slow speed of internet provided by the network company. (Headteacher assistant, School H, semi-structured interview)

She also adds that because of this weakness, the schools provide intranet, so they do not stop working:

We tried with two network providers and we are facing the same problems, so that's why we are using intranet. (Headteacher assistant, School H, semi-structured interview).

The assistant also stresses the importance of having the same type or brand of mobile technologies, as this could make it easier for technical staff to check and update the devices, when necessary. She adds that buying the devices from the same supplier could also help in the event of any technical issues:

It is easier to have the same type of device as we only have one technician who specialises in that type. Also, if we buy the devices from one supplier, we can contact the company if there are any technical problems. (Headteacher assistant, School H, semi-structured interview)

Financial support is a significant prerequisite to support mobile learning projects. School H assistant emphasises the importance of financial support to renew the mobile devices and the network: *It is essential to secure financial support to ensure our budget will cover renewal and network costs.* (Headteacher assistant, School H, semi-structured interview)

6.4.1.2 Teachers' Confidence

The headteacher of School S believes that teachers are not using the mobile devices to their full potential: *They're still not using the devices to their full potential.* (Headteacher, School S, semi-structured interview)

He blames teachers for using the devices as a substitution tool for research only, while there are other activities that they can do if they are well prepared:

I feel the main challenge is ensuring the use of such devices is effective, to be honest, adding more to what's been done. Otherwise, there is no point. If they're the same stuff the kids can get from a textbook or any other traditional resource, then there is no point. (Headteacher, School S, semi-structured interview)

The headteacher maintains that teachers should understand that mobile devices are not merely substitutes for other research tools:

Teachers need to understand that there are other purposes that can be achieved. It should not just substitute for, you know, any other research that can be done on a computer. (Headteacher, School S, semi-structured interview)

The headteacher's assistant insists that training should be conducted to guarantee the success of mobile learning in schools. She said that: *The teaching staff should be trained to use technology* (Headteacher assistant, School H, semi-structured interview), so that they are able to teach and use mobile technologies effectively. On the other hand, School S headteacher advocates that teachers need specific training on how to use mobile devices in classrooms in each subject area: *I think they just need more training. We need specific training to specify what mobile technologies can offer for each subject area.* (Headteacher, School S, semi-structured interview)

The assistant of School H highlights the importance of parents' involvement in mobile learning projects. She states that, inviting the parents to see what their children achieved with mobile devices could help the parents to follow their children at home.

We ask parents to come and understand how their children are working with the mobile devices, so they can follow their children at home. (Headteacher assistant, School H, semi-structured interview)

6.4.2 Teachers

The interviews with the teachers reveal that teachers face the challenges of discipline and distraction in their classrooms, mobile learning knowledge, and confidence. The emerged themes are put under the following headings: technical problems, discipline and distraction, and teachers' confidence.

6.4.2.1 Technical Problems

Most teachers give emphasis to the importance of accessing the internet with mobile devices for the success of the mobile learning project. SS states that the network should be available in school anytime they need it so they do not have to go to the resource centre to get a connection:

Internet should be available at all times, so we don't have to go to other places such as the resources centre to be connected. (Teacher SS, School H, semi-structured interview)

SM also suggests that the network should be strong because many teachers and students are connecting to the internet at the same time: *The network should be strong because many students and teachers are accessing the internet at the same time. (Teacher SM, School H, semi-structured interview)*

This factor is also emphasised by Naismith and Corlett (2006), who concluded that internet access is an important factor for mobile learning implementation.

Teachers also agree that technical support should be available at all times to help teachers or students, when needed. For example, SS says that technical support is not the teachers' responsibility: there should be technicians who are ready to help as and when needed:

It's not the teachers' responsibility to fix the students' devices when they have a problem. There should be someone students can go to when they have a technical problem with their devices. (Teacher SS, School H, semi-structured interview)

SM supports having technical support in school because contacting external technical help wastes time:

The IT department should be accessible to fix any technical problems if needed because calling external companies is difficult and time consuming. (Teacher SM, School H, semi-structured interview)

6.4.2.2 Discipline and Distraction

Most teachers complain about the difficulty in controlling their classes when students are using mobile devices for learning, and this distracts their attention and understanding. For example, AG was annoyed with the fact that students do not listen when told to put their mobile devices away:

I found that I would tell them exactly, what we were going to do for the period, and then I say we're not using the iPad. This is what we are doing, and it has nothing to do with iPads, 5 minutes later they all get their iPads out and they're doing something when I expressly asked them not to. (Teacher AG, School S, semi-structured interview)

AG also complains of the distraction caused by mobile devices to the students' attention in their classes:

When it comes down to paying attention, I think the problem is that they have been given a shiny new plaything and because they're students they're young and frankly their brains...students' brains are not fully matured. Yet they go, 'Oh shiny new plaything let's play with it'. They don't go, 'Oh playing with it is good but also let's use it for education'. (Teacher AG, School S, semi-structured interview)

VM also said that students use mobile technologies for visiting social websites or playing games:

The main thing is that students don't use the mobile devices for education. They are spending time doing other things, social things or even playing games. (Teacher VM, School S, semi-structured interview)

SH also talks about the distraction of mobile devices and some students' tendency to play games with their devices in the classroom:

Some students use this technology for games and get addicted to them. So, when you are teaching they want to play games instead of studying. (Teacher SH, School H, semi-structured interview)

Distraction is also a challenge that SO mentions in her interview:

Some distraction is surely there. If it was a book they would have kept at the front and I would be able to see what they are doing, but they keep their laptops open facing them and it's

difficult for us to see what they are watching or doing. This is a very big disadvantage that I have to think of. (Teacher SO, School H, semi-structured interview)

TS faced the problem of having to constantly monitor the students who were using their mobile devices for purposes other than studying:

I found it difficult because students are addicted to these devices and must be monitored at all times. It's like following your kids at home. If I leave iPads with them, you find them checking other websites. (Teacher TS, School S, semi-structured interview)

SM discusses the need to continually control the class when they have mobile devices:

We have to control the class and watch the students continually. If we don't need the devices in class, I tell my students to keep them aside. If we need them, I allow them to use them, even though that requires strong control. (Teacher SM, School H, semi-structured interview).

Most teachers recommend that certain parameters or restrictions should be established in any mobile learning project to restrict the usage of mobile technologies to educational purposes. For example, AG suggested that there should be particular parameters in the mobile devices that restrict students:

I think that in order for technology in the classroom to be truly useful and truly beneficial to the students, there need to be specific parameters installed on the devices, not just policy or school rules that go on the wall. (Teacher AG, School S, semi-structured interview)

She clarifies that she wants mobile devices with specific restrictions so that students can only access applications that are linked to the classroom:

Why isn't there a device that you can give to a student with specific parameters? You know like you can only use the internet or certain applications for searching these topics and they're all directly linked to the classroom in some way. (Teacher AG, School S, semi-structured interview)

TS also suggested that there should be restrictions for students' mobile device usage because some students use them for chatting and playing games:

It's useful, but we need to apply some restrictions because some students use them for fun and chatting as the network is open to everywhere in school. (Teacher TS, School S, semi-structured interview)

TS also suggested a certain program that can restrict the access of some applications:

It's appropriate for some lessons, but not every day use. It would be effective if we could install a program that restricts students' access to some websites. (Teacher TS, School S, semi-structured interview)

On the other hand, SO recommended that rules of usage should be based on coordination between the teachers and students:

There should be proper coordination between the students and the teachers of how to use it and when to use it. (Teacher SO, School H, semi-structured interview)

This point is made by Kolb (2008) as one solution to the problem of distraction caused by mobile phones. She referred to this as a "social contract" between the teacher and the students, which included when, where and how mobile devices should be used in class.

SM discouraged the frequent use of mobile devices in classes because this weakens the students' handwriting skills:

I don't encourage that mobile devices are used all the time. They should look at books, so they can practise writing Arabic, and don't lose their skill of handwriting. (Teacher SM, School H, semi-structured interview)

TS also believes that students do not need any training to use mobile technologies because they are born with these technologies:

Students don't need any training. Students help me understand how to use a new application and learn very fast. This is the generation of this technology. They grasp technology faster than we do (Teacher TS, School S, semi-structured interview)

On the other hand, AG emphasised that students need to be trained on the pros and cons of using mobile technologies:

Sixth graders should be given lessons on the pros and cons of using iPads so they immediately know how to recognize when they should and shouldn't use an iPad (Teacher AG, School S, semi-structured interview)

AG's suggestion is similar to Kolb's (2008) recommendation that students should be taught the digital etiquette of mobile use in every setting.

6.4.2.3 Teachers' Confidence

VM reports that *teachers* are facing the difficulty of knowing what mobile technologies can offer and how to utilise them:

I think the challenge teachers face is to know what's available and how to benefit from them, and probably find the time to be able to experiment and discuss these things. (Teacher VM, School S, semi-structured interview)

VM also believes that teachers face the challenge of a limited amount of time to experiment and become confident using mobile technologies:

Teachers' time is always the enemy and finding time to be able to really explore the possibilities is difficult. We are not confident using these devices because we don't have time to practise using them. Some teachers may not have any problems, but I think that most teachers don't have time to become confident. (Teacher VM, School S, semi-structured interview).

Through analysing the teachers' interviews, this research has found that the following factors might affect the successful implementation of mobile learning: internet access, technical support, training, parameters for mobile technologies usage, and collaboration groups.

Most teachers support the idea that teachers should be trained before starting such programmes; however, they also highlight the idea of having pedagogical training on how to use mobile devices for teaching and learning. For example, AG argues that it is important to train teachers before mobile devices are provided to them:

If you're going to give the device to the teacher, you should also provide the training. So that the teachers know how to use the device and share this knowledge with their students. (Teacher AG, School S, semi-structured interview)

TS also supports the idea of giving teachers specific training of how to use mobile technologies for teaching:

Success is more likely when the basics of how to use iPads are taught, not only websites or applications, for example, teaching us how to use the iPads for each lesson. I tried to teach myself, but I need more help in using the mobile devices in every lesson. (Teacher TS, School S, semi-structured interview)

This is similar to what teachers thought in the study undertaken by Pegrum et al. (2013) where teacher respondents were overwhelmed by the prospect of how to integrate mobile devices into their teaching.

AG also dislikes the fact that some teachers lack the technical knowledge in the use of mobile devices and their consequent lack of confidence:

There are teachers who are not familiar with these technologies and I don't like the fact that they're being told to use these devices when they are not familiar with them and are afraid of making mistakes. (Teacher AG, School S, semi-structured interview)

VM also pointed out that training the teachers is important because they are the ones who will use the devices in class:

I think you need to train teachers. It's important because, although students are very capable of working out things for themselves, it's the teacher that needs to work out how to use it. (Teacher VM, School S, semi-structured interview)

AG suggests that there should be collaboration between groups of teachers, which could help teachers learn methods of using mobile technologies in their classes:

I think it would be a good idea to create a group in each department to collaborate and brainstorm ideas on how to use iPads in Maths, Science and English. (Teacher AG, School S, semi-structured interview)

VM also mentioned that sharing knowledge and discussion between teachers is important for successful implementation: *Yes, absolutely, there needs to be more discussion and sharing. (Teacher VM, School S, semi-structured interview)*

Teachers report different methods of using mobile technologies in their classes. For example, AG described how she uses mobile devices in vocabulary lessons:

If I've given students vocabulary words, I'll say right, ok get your iPad out you have 15 minutes to go to dictionary.com and look up the definitions of these words. (Teacher AG, School S, semi-structured interview)

She also uses the mobile devices to communicate with her students and carry out polls and quizzes with Edmodo:

You can actually do assignments on Edmodo, like you can ask questions, you can do a poll, you can do a quiz comprehension and check quiz. I prefer to do that sort of thing in class (Teacher AG, School S, semi-structured interview)

VM also uses Edmodo to share content with students:

I use online learning sites like Edmodo and provide PowerPoint and all the information for students online which they can access on their phones. (Teacher VM, School S, semi-structured interview)

SH states that she uses mobile devices in class by getting her students to assemble parts of the skeleton:

Inside these mobile devices, you can disassemble the parts of the skeleton directly, through the drag and drop activities. You can also show them the parts of the skeleton visually as a routine teaching method. (Teacher SH, School H, semi-structured interview)

While SM uses mobile devices for searching for information to write class reports:

In class, students have their mobile devices and they can use them to search and find information. Then, they write their reports. This made search processes easier as they have unlimited resources. (Teacher SM, School H, semi-structured interview)

TS also used mobile technologies for searching and finding answers to questions for her subjects:

I teach Islamic studies. Sometimes iPads are useful in finding the verses of the Quran and then investigate the Islamic rules in the verses. Sometimes, we use it to search for prophets' stories. It's useful for searching and finding answers to questions that we discuss in class. (Teacher TS, School S, semi-structured interview)

She also uses the mobile devices to elicit morals and ethics after watching a video:

I sometimes divide the class into groups and make them explore the ethics and morals of a video they watch in class. (Teacher TS, School S, semi-structured interview)

6.4.3 Students

The students' focus group interviews revealed several challenges that students face while using mobile technologies in school, which can be categorised in the following themes: cognitively demanding environment, technical problems, distraction and teachers' confidence.

6.4.3.1 Cognitively Demanding Environment

G9/2 considers that using iPads in lessons might reduce the students' performance:

I know a girl who was always playing with the iPad and did not focus in class. The teachers were always telling her to focus, she didn't listen, and last year she achieved below her average (Student G9/2, School S, focus group interview)

Students in grade 9 also do not want to use mobile devices in class because they think that these devices are distracting their attention and wasting their time. G9/2 says that they do not want iPads this year because these devices do not allow them to focus on their studies:

We didn't want iPads this year or next year because they prevent us from focusing on our studies and exams. (Student G9/2, School S, focus group interview)

She insists that mobile devices should not be given to grade 9 and 10 because they are doing their IGCSE:

Given that grades 9 and 10 are the most critical, I think iPads should not be provided because they waste students' time (Student G9/2, School S, focus group interview)

6.4.3.2 Technical Problems

Most students complain about the short battery life of their devices and having to charge their mobile devices at home to avoid facing problems in school. G7/1 in grade 7 states that she has to charge her device at home because the batteries lose power quickly: *You have to make sure it's charged at home otherwise the device will switch off quickly. (Student G7/1, School S, focus group interview)*. Another student in grade 7 (G7/2) describes having to charge her mobile device as a responsibility: *It's our responsibility to charge it at home. (Student G7/2, School S, focus group interview)* A student in grade 8 (G8/5) also complains that some programs do not open or are slow when opening: *We have some problems with SharePoint and Windows Journal. Sometimes they do not open, and they are slow. (Student G8/5, School H, focus group interview)*

6.4.3.3 Distraction

A student in grade 8 (G8/5) believes that studying with books is better because students are not distracted by games:

When we study with books, students can't play games; they focus on the lesson and pay attention to what the teachers are saying. (Student G8/5, School H, focus group interview)

Students in grade 9 are also worried about their studies as they are beginning, what they call, their 'critical years', nine and ten. For example, G9/3 reports that students cannot resist playing on their mobile devices and this was distracting their attention in classes:

There are some girls who can't control themselves. When they have iPads they just play and don't pay attention to lessons. (Student G9/3, School S, focus group interview)

This result is similar to Chou et al.'s (2012) findings, where students were distracted by looking at other websites that were not related to the tasks that they were given.

Grade 9 students from School S complain of the schools' restrictions on the installation of their favourite applications on their mobile devices. G9/1 states that the applications on their mobile devices are limited. Some applications were used to design their presentations when they were in grade 7, but the school deleted most of these applications last year:

The applications are very limited, and this makes it difficult for us. When we were in grade seven, there were many applications to choose from and it was fun. Last year, they deleted many applications and it was difficult because we couldn't use many useful ones, like we used to design our presentations with the support of these applications. (Student G9/1, School S, focus group interview)

Another student, G9/2, complains that their school had deleted the Apple Store application from their iPads, so they would not be able to install any applications: *"They deleted the App Store after they installed the applications they wanted on our devices." (Student G9/2, School S, focus group interview)*

G9/1 expressed disappointment that the school had deleted her favourite application for designing presentations:

I remember there was an application called Slides for creating presentations which enabled you to choose the theme and motions like the computer. This year, they replaced it with another application … (Student G9/1, School S, focus group interview)

Students report that they feel responsible for their mobile devices and obliged to use them in a good way. For example, (G7/2) feels responsible for keeping it undamaged:

I feel more responsible that I have a mobile device and I try to use it in a good way. They gave me the responsibility because they trust that I will not damage the device. (Student G7/2, School S, focus group interview)

Students in grade 9 felt more responsible for their academic future. A student (G9/1) says that they should be responsible and reflect on their academic future when they have mobile devices:

It's a responsibility, and you should take the responsibility of shaping your academic future. (Student G9/1, School S, focus group interview)

Another student in grade 9 (G9/3) recommends that school should trust them more and allow them to download games on their devices, so they can play in their free time:

I *think that they should put the Apple Store on our iPads to control ourselves, and download some games when we have free time, so we feel more responsible. You know, some students do it behind their backs. (Student G9/3, School S, focus group interview)*

6.4.3.4 Teachers' Confidence

Students in grade 9 express frustration because they feel that their teachers lack the required knowledge in using mobile technologies. This problem makes them think that they are wasting time and effort which could be better spent on their studies during IGCSE (International General Certificate of Secondary Education).

G9/1 states that teachers do not use mobile devices effectively in class: *Teachers are not using them effectively because they don't know how to use them. (Student G9/1, School S, focus group interview)*

G9/1 complains that teachers do not know how to use mobile devices and they come unprepared to class, which is wasting their time:

The teachers don't know how to use iPads, and this is why we waste time. Some teachers arrive to class unprepared, they waste time trying to open a file that doesn't open and it's becoming boring. Teachers should arrive fully prepared for the work. (Student G9/1, School S, focus group interview)

G9/2 also admitted that they were not receiving any help from teachers on how to use new applications because teachers did not know how to use them:

Sometimes we would ask teachers how to use a new application but even the teachers didn't know how to use it, so you know we would just waste the lesson time trying to figure it out. (Student G9/2, School S, focus group interview)

6.5 Summary

The interviews were analysed, and the key themes which answer the two research questions were revealed. The emerged themes were put under the appropriate research enquiry. In this chapter, the interviewees, who were the headteachers, teachers and students, are described. Then, the themes related to the pedagogical benefits of mLearning were discussed and the enabling factors for successful mLearning implementation were examined in relation to the different participants. Finally, the emerging themes of the challenges of mLearning were analysed.

Chapter 7: Discussion of the Findings

7.1 Introduction

The current case study explores the perceptions of a range of school stakeholders (teachers, senior management, IT technicians and students) around the use of mLearning at their school. The aim of this chapter is to discuss the findings from both interviews and questionnaires in the context of the wider literature and the theoretical framework identified for this study (Chapter 3). It will be organised in the order of the two research questions set out in section 1.2; therefore, the first section will discuss the data relating to the first question, which highlights the perceptions of the participants around pedagogical affordances of mLearning while the second section will focus on reflecting on participants' views on the challenges around mLearning within their school.

The results of the questionnaires for both the headteachers and the teachers reveal that the majority agree that the successful implementation of mLearning relies on four factors: resource availability, technical support, teacher training and curriculum integration. They also identify that effective leadership combined with support from policy makers, opportunities for encouragement and rewards as well as parental support will support effective mLearning initiatives.

7.2 Pedagogical Benefits of Mobile Learning

The results of this research concur with the wider literature around the pedagogical benefits that mLearning offers in terms of student engagement and learning in authentic and situated ways as well as the opportunities for communication and collaboration. While there were positive results from both schools about the contributions that mLearning makes to student learning, the results also point to some differences between the two schools, which are at different stages of mLearning implementation. The study did not aim to compare the two schools but take a snapshot of stakeholders' perceptions at the only two Omani schools that had implemented mLearning initiatives at the time it was conducted.

7.2.1 Enhancing Student Learning and Engagement

Teachers at both schools agree that mLearning supports students' engagement and enhances positive attitudes towards learning. They also commented positively on the opportunities for differentiation and inclusion that it offers, especially for students who needed additional

support. For those students who may be normally disengaged or need additional support, gaining more interest in learning is a focus; however, emphasis on positive academic results is a whole-school priority to justify teachers' investment of time to plan and use mLearning in their lessons. Private schools are moving towards the IGCSEs and they rely heavily on summative exams to report on progress. As a result, mLearning implementation has not always been aligned with those assessment processes, even at School H, which has introduced mLearning for ten years. Longitudinal gains in terms of achievement and academic scores were not reported and data was not collected to support such results. Boyd (2001) reports on the importance of collecting a minimum of two years' data to evaluate such institution-wide initiatives and alerts us to the fact that at times educational institutions do not collect such data five years after digital implementation. In that sense, both schools have limited data to support further investments in mLearning. While the headteacher at School H said that students who were using mobile technologies achieved better results than students who were using the traditional methods (see section 6.3.1), she was referring to individual case studies rather than whole classes. Higher achievement is also found to be an advantage for students in schools (Hwang & Chen, 2013; Kiger, Herro, & Prunty, 2012; Looi et al., 2011; Shih, Kuo, & Liu, 2012) as well as higher education students (Cheng, Hwang, Wu, Shadiev, & Xie, 2010; Kert, 2013; Oberg & Daniels, 2013).

However, there was a slow shift towards formative assessment and emphasis on higher order thinking skills through mLearning activities. Teachers and students reporting on the wider access to a richer range of information as a way of enhancing students' learning and critical thinking is further consistent with Koole's (2009) views on thinking skills and mLearning. They reported on mLearning supporting more autonomy in student learning as teachers encourage students to look for answers, definitions, and discuss them later together (sections 6.3.2.1 and 6.3.1.1).

While the learning tasks may be at the Substitution or Augmentation Stage of the SAMR model (section 6.3), they still introduce more current teaching and learning practices, progressing the more traditional curriculum and teaching styles of Omani schools and fulfilling the government vision for an external facing and diverse curriculum (Al-Abri, 2014). Students also stated that they are more excited to learn or 'learn better' through the use of mobile devices and take advantage of the connectivity options that mLearning offers. Students seemed to be more willing to spend time on academic tasks, a result that is similar

to Looi et al. (2011), who found that students were more engaged with learning when using mobile devices than the other classes without devices.

7.2.2 Providing Authentic and Situated Learning Opportunities

The focus on resource access in this study includes practical and physical opportunities around mobility, such as not having to carry books around, in addition to having access to a wider pool of educational resources. Some cultural priorities, such as the portability of the resources, are reflected in the participants' responses. The size, weight, and structure of a device are important for them. These characteristics also match the users' physical and psychological abilities, as reported by Koole (2009). Students from School H are more positive about the lightness of mobile devices than the School S students. On the other hand, students from School S are not comfortable with the weight of their school bags because they have to carry both their books and their mobile devices (section 6.3.3.2).

Teachers and students agree that having mobile devices makes it easier to learn because students can learn everywhere, as the devices are lighter than books. This opportunity was also noted by Crompton (2013a) and Traxler (2009). Dictionaries, and access to resources from around the world, facilitate students' learning in authentic ways. While this access may be also available on a desktop computer, it is the mobility and immediacy that reflects this generation of students, "born in a world of immediacy used to finding things at the click of a finger", as AG commented. This access to resources that Rogers and Price (2009) identify also frees up teachers' time to concentrate on engaging in deeper learning tasks with their students.

Time saving was identified as a key positive outcome of mLearning by the teachers and senior managers at both schools, a point recognised in the wider literature as well (Corbeil & Valdes-Corbeil, 2007). Speed is gained in assisting teachers with their administrative tasks, thereby freeing up their time to support less able students. Taking photos of notes written on the whiteboard and saving them up as a resource, also supports students who do not have to spend time copying notes from the board (6.3.3.2). In a country like Oman, there is emphasis on speed, and there is a shift in teachers' approaches, as this time saving introduces opportunities for a change in teaching style and more dialogic teaching, which will be also discussed in the next section.

There are limited opportunities for more extended problem-solving activities as Kearney, Burden and Rai (2015) describe, where students are part of a wider community of practice.

However, students are provided with authentic tasks as discussed by Traxler (2009), where they are accessing current information and provided access to content anytime and anywhere (Corbeil & Valdes-Corbeil, 2007). For those Omani students the opportunities to research and consider resources beyond the geographical borders of their country gives them access to educational resources that would be difficult or costly to implement otherwise, as Traxler and Kukulska-Hulme, (2015) report. Their learning is situated within the context and culture in which it occurs, with opportunities to be informed by access to international resources. In that sense, they consider, reflect and at times want to question technological practices and learning tasks in relation to the resources they are able to access as part of their mobile learning tasks.

7.2.3 Enhancing Communication and Collaboration

The study revealed that collaboration between teachers and students takes place and is enhanced by the use of mobile technologies (sections 5.3.2, 5.3.3 & 6.3.3.3), as supported in the wider literature (Corbeil & Valdes-Corbeil, 2007; Crompton, 2013a; Wheeler, 2009). However, co-operation with teachers and students is centred around a very specific focus, mainly the completion of individual homework rather than producing collaborative pieces of work. Teachers at both schools still explore opportunities to use mLearning in collaborative tasks. A number of the tasks are co-operative while the function of mobility is still not fully explored, even after ten years of mobile learning implementation at one of the schools, and key priorities still remain preparation for exams.

The results indicate that mobile technologies are used to present materials and display video clips. This result demonstrates that students might play passive roles in most mLearning activities as they are just watching the presented materials or media. The activities are more teacher-centred than student-centred as the teachers are still playing the dominant role in the way the tasks are structured. Collaboration is usually between teacher and students and again there is a preference for substitution. For example, using the mobile devices to access online dictionaries and find definitions of key words; to reassemble the parts of a model skeleton using a drag and drop app on their mobile devices or to find verses in the Quran, investigate the Islamic rules in the verses, and search for prophets' stories.

Students co-operate on assignments, though a lot of the joint work seems to take place between home and school rather than when students work on collaborative tasks at school. The results show that 25.3% of students are communicating and collaborating with their

classmates when they have assignments to complete at home but they did not question the suitability of the format of the task for tablet access, as Ott et al.'s (2014) study revealed. Internet access from home was not reported as a challenge while connectivity at school was, and as a result co-operation is pushed beyond the school boundaries for tasks to be completed. Students did not report on inter-peer relationships as a factor in completing collaborative tasks successfully. However, if increased use of collaborative mLearning tasks is to be encouraged, more work on supporting and defining peer collaboration and group work approaches should be threaded in the curriculum.

Working at home requires parents' support. All the teachers and one headteacher in the questionnaires agree that parents' support is required for successful implementation of mLearning. The headteacher's assistant strongly agrees that parents support is essential. In her interview, she maintained that inviting the parents to see what their children did with mobile devices could help the parents to support their children at home (see section 6.5.1).

The teachers also agree that parental support on integrating mLearning at home is required. The mean level of agreement with this statement among all the teachers was high, at 4.25. Moreover, the questionnaire responses show that 38% of students receive support from their parents. The role of parents in the four elements of successful mLearning (learning activity, technical, political and cultural) is stressed by Passey (2010).

The researcher included participants who are directly involved with mLearning at the school, such as headteachers, teachers and students. However, parents' support appeared to have an impact on mLearning, as mentioned above, and it is highly recommended that parents are involved in future research studies.

School S uses Edmodo to share information with students and teachers while School H uses SharePoint to share and send information and worksheets. As SharePoint is part of Microsoft it may point to a more consistent approach from the school to organise access to resources in a safe way in terms of data storage and access that fits within international digital changes. However, at both schools there were not priorities and clear objectives for the curriculum integration of mLearning as a whole school approach; as a result, teachers are substituting other technologies, such as smartboards or desktop computers with mobile technologies, but they are not fully utilising the capacities they offer.

7.3 Challenges of Mobile Learning

While the headteacher of School H strongly agrees with all the factors for the successful implementation of mLearning, the headteacher of School S is not sure for a number of reasons, such as giving teachers additional time for planning and the availability of technical support in the district or region. He declares that he is not sure whether teachers are receiving support from policy makers and from parents. Teachers, he maintains, should be rewarded for using mobile learning, by encouragement from leaders, and, more importantly, the integration of mLearning activities with the curriculum, as well as making the reform of mLearning a priority.

The success in implementing these factors in the two schools indicates that most factors for successful mLearning implementation are always available in School H (Table 5.31). Moreover, only two items, effective support from parents (item 10) and frequent motivation and encouragement by school leaders (item 11), are frequently available. In addition, School H teachers agree that all the successful factors are evident in their school; however, their answers range from 'sometimes' to 'always', with most responses being between 'frequently' and 'always'. The means range from 3.44 to 4.44, which illustrates that most responses are between 'frequently' and 'always', while only two statements have been implemented 'sometimes' (items 5 and 7).

On the other hand, the availability of these factors in School S is less frequent. According to the responses from the School S headteacher, internet access is always available (item 1), and access to mobile devices, technical support, training for teachers, enough time for training and planning and effective support from school (items 2, 3, 4, 5, 6, 8) are frequently available. However, adequate time for evaluation, support from policy makers and parents, motivation from school leaders and integration into the curriculum (items 7, 9, 10, 11, 12) are 'sometimes' available.

The teachers' responses show that they also agree that all the successful factors are implemented in their school, as shown in Table 5.32. All their responses range from 3.31 to 4.19, the mean ranging between 'sometimes' to 'always'. The teachers believe that time for teacher training and evaluating their practice (items 4 and 7) receives less consideration than the other factors. The slight difference between the two schools might be due to the time dedicated to mLearning implementation. School H has more experience with mLearning as it has been implemented since 2005, whereas it has only been implemented for two years in

School S. Therefore, School H has had more time to provide the necessary requirements to support the mLearning initiative than the other school.

The questionnaire and interview results reveal a number of challenges to implementing mLearning. The researcher classifies these challenges into four categories: cognitively demanding environment, technical problems, distraction and discipline and teachers' confidence. These will be considered in turn.

7.3.1 Cognitively Demanding Environment

The results show that interaction complexity has an impact on students' learning performance and mental effort in mobile learning; the higher the interaction complexity is, the higher the mental effort and the better the learning performance in mobile learning will be. Interaction complexity has an impact on students' learning performance and mental effort in mobile learning (Wang, Fang, & Miao, 2018). The results show that students in grade 9 do not prefer to use mobile devices in class because they think that these devices have a negative effect on their focus on studies and exams and they do not wish to have them in grade 10. G9/2 argues that mobile devices should not be given to grade 9 and 10 as they are preparing for their IGCSE exams and using mobile devices can be an extra load for them.

On the other hand, Table 5.18 shows that only 12.5% of the teachers thought that mobile technologies had a negative impact on students' thinking skills, as they readily referred to their devices when faced with any question. The depth of learning and thinking was also found by Kukulska-Hulme and Pettit (2009) to be one of the drawbacks of using mobile devices for learning. Moreover, teachers employ mobile technologies for presenting material, displaying videos and research purposes, as shown in Table 5.15. No complex demanding activities are employed in the classroom, which explains the reason they did not mention any cognitive load on their students.

Mobile technologies can be a cognitive load in the case of grade 9 students, which was found also by Deegan (2015), Wang, Fang, and Miao (2018) and Chu (2014).

7.3.2 Technical Problems

Technical problems, such as network access and working with different versions of mobile devices, affect the successful and consistent implementation of mLearning at times. While this is a common issue reported in the literature (Brown & Mbati, 2015; Kukulska-Hulme &

Pettit, 2009; Naismith & Corlett, 2006), in the case of Oman, a country that is relative new to implementing digital educational interventions, it proves to be more of a pedagogical hindrance. As a result, teachers utilise a limited but what they consider 'safe and proven' range of resources, and are not always able to expand on their repertoire due to low connectivity and resistance from the technical team to install programs.

While each school has a dedicated IT technician, problems still occur but there is a different focus. At School H participants complain about the slow speed of the internet and as a result this challenges accessing the online shared teaching and learning space (Sharepoint). In contrast, at School S participants do not have a problem with the network but complain about security, devices breaking down and the battery life of the devices, which they have to charge at home the night before. In both cases there did not seem to be a whole school approach towards technical support.

Providing a strong network is a requirement for effective mLearning implementation. It is acknowledged in the FRAME model by the intersection between the technology and the device and the social aspect, and the wider literature on the topic (Dikkers, 2014; Naismith & Corlett, 2006) and reinforced by the findings in this study. Internet access is accepted as an important factor of successful implementation by both teachers and headteachers. It receives a mean of 4.47 in the teachers' responses, and values of 4 to 5 in the headteachers' responses.

The results from both the questionnaires and the interviews place emphasis on the significance of providing technical support in mLearning schools. The questionnaires reveal that there is an agreement with the importance of having technical support in the school; however, the participants are not sure of the need for technical support in the region or district. The questionnaire results indicate that the two headteachers agree on the importance of having technical support in the school. However, there is disagreement on the need for technical support in the region or district. While the headteacher at School H strongly agreed with this, the headteacher at School S was not sure. This is likely to be because the two schools are independent private schools which do not receive any financial or technical support from the Ministry or the district. The headteacher's assistant at School H also emphasises the importance of having the same devices, so it is easier to get technical support from the technician in the school. Moreover, having the same type of device makes it easier to call the supplying company when complicated technical support is needed. The teachers' responses to the questionnaires also reveal an agreement on the importance of this factor.

Similarly, the need for technical support in the school receives more agreement than the need for technical support in the region.

The questionnaires showed that funding for mobile devices was provided by parents in the case of School H, and by the school and parents for School S (Table 5.2). This shows that parents are asked to pay extra fees for their children's mobile devices to cover their cost. Financial support is a significant prerequisite to support mobile learning projects; however, schools need more than to just buy the devices. This is what the assistant of School H refers to when talking about the financial support of mLearning. Financial support is not only necessary for buying mobile devices, but also for renewing the devices and maintaining the network (see section 6.4.1.2).

Investigating a cost model for technology, infrastructure and services is one of the important factors that Futurelab et al. (2004) highlighted. Therefore, financial support should be considered and prepared for before and during the implementation of mLearning.

7.3.3 Distraction and Discipline

Teachers and students report on the challenge of distraction and discipline in their classrooms as a result of the introduction of mobile devices, as has been reported in the literature (Chou et al., 2012; Kukulska-Hulme & Pettit, 2009; Rogers & Price, 2009). Teachers feel that mobile technologies occupy their students' attention when they are doing non-mobile activities, and in turn, students feel that they are sometimes distracted by games. Most teachers complain of the difficulty in controlling their classes when their students are more interested in their mobile devices than their lessons. For example, AG expresses irritation when her students do not listen to her instructions to not use their iPads when unnecessary, and SO reports that it is difficult to see what the students are doing or watching on their devices. Such examples emphasise the need for establishing a netiquette about the use of the devices (Kolb, 2008) but also point to the fact that the traditional behaviour management techniques that teachers are familiar with need to be revisited. However, none of the teachers suggest banning the devices from the lessons, a solution that Kolb (2008) and Johnson (2010) emphasise is not the right one, and instead they should find ways of integrating these devices into the classroom activities.

Distraction may be a result of the type of learning tasks teachers choose. Teachers use the devices mainly for substitution rather than a wider range of activities as suggested by Johnson (2010): using mobile devices for polling, recording lessons, sharing files, playing virtual

education games and digital manipulatives, assigning to read e-books and preparing multimedia presentations.

Disruption may also be a result of student excitement from doing something new, as Chen et al. (2003) report, especially in the case of students who have used the technology at school for a year only or when it is not used consistently due to technical challenges. It may also point to avoidance challenges students may be facing (Chu, 2014). VM also believes that students should only use mobile devices for playing games and social media, not for educational purposes, which reinforces the importance of teacher CPD and awareness of gamification as a possible teaching and learning approach.

Students in grade 8 and 9 are more concerned about their academic future and their exams; thus, they believe that mobile devices distract their attention. Grade 9 students are worried about their IGCSE exams, and also agree that mobile devices distract their attention.

The emotional state of the learners or their desire to accomplish a task affects their readiness or ability to accept new information, and this is part of the learner aspect in the FRAME model. In addition, there is the effect of the social aspect when miscommunications might occur because one of the four maxims, namely quality, quantity, relation, and manner, is not seen (Koole, 2009).

Kolb (2008) also suggests that distraction can be avoided by collecting the devices in one place until it is time to use them and setting a social contract between the teacher and the students, stating when, where, how and why devices will be used in the classroom. Moreover, teachers should also explore new ways of using mobile technologies in their classroom which are different to other teachers in their school or other practitioners in the same field.

However, the need for setting up a social contract with students before starting any mLearning activity, as suggested by Kolb (2008), is important instead of just restricting device access.

7.3.4 Teachers' Confidence

The results indicate that a small number of teachers (12.5%) face confidence problems in employing mLearning in their lessons. Teachers reported that they do not have the time to experiment and become confident using mobile technologies. The literature also identifies teachers' IT skills and pedagogical understanding of technology can be key challenges

(Brown & Mbati, 2015; Chou et al., 2012; Crompton, 2013a; GSMA, 2011; Naismith & Corlett, 2006; Pegrum et al., 2013). Likewise, grade 9 students have doubts about their teachers' mobile knowledge and this leads to a lack of trust between the students and their teachers. For example, G9/1 doubts the effectiveness of her teachers' use of mobile devices and apps in class and complains that teachers are wasting lesson time trying to open something on the device.

The School S headteacher in particular holds the view that teachers are not using the mobile devices to their full potential. He added that teachers were using the devices as a substitution tool for research only and there is no point using them if the students are getting the same material they get from a textbook.

This result implies the need for teachers' specific professional development before mLearning is initiated in schools, which was also raised by Pegrum, Oakley, and Faulkner (2013).

The professional development of teachers should include technological and pedagogical knowledge which will allow them to use technologies from the substitution to the transformation level (SAMR in Figure 4).

The questionnaire findings indicate that both teachers and headteachers agree that teachers should receive specific training for mLearning. Both headteachers agree on the importance of implementing mLearning (see Table 5.28). Moreover, the mean for all the teachers' responses was high (4.5), as presented in Table 5.30. This indicates that all the teachers agree that they should be provided with specific training for mLearning. Similarly, the participants also agree that students have sufficient knowledge to use mobile devices: the headteachers' responses were 4 and 5 and the mean for all the teachers was 4. This reveals that students have sufficient knowledge to use mobile technologies but teachers do not, and they need specific training.

The interviews with the two headteachers indicate that teachers should be trained to use mobile technologies. The School H headteacher's assistant expressed the view that teachers should be trained to use mobile devices effectively in their classes. Additionally, the School S headteacher laid stress on the importance of providing specific subject training on how to use mobile devices in classrooms in each subject area (see section 6.4.1.2).

The interviews with the teachers further confirmed the significance of training teachers to use mobile technologies in their teaching. They stress the need for pedagogical training on how mobile devices can be used in the classroom. For example, AG argues that training is as

important as the mobile devices, therefore they should be linked together. This training helps teachers to know how to use mobile technologies appropriately.

AG also dislikes the fact that some teachers lack the technical knowledge of how to use mobile devices and consequently lack confidence in using these devices because they are afraid of making mistakes. VM also points that training teachers is important because they are the ones who would operate the devices in class. He added that students can work out things for themselves, but teachers need support and training to do that. Furthermore, TS expresses the need for pedagogical training on how to use mobile technologies in teaching. She supports the idea of more training on how to use iPads for every lesson, rather than basic training for specific websites and applications (see section 6.4.2.3).

The interviews also indicate that students do not need any training on how to use mobile technologies; rather, they need to be trained on the appropriate and inappropriate uses of these devices. For example, TS thinks that students do not need any training for using mobile technologies because they are more knowledgeable than teachers in this area. She also admits that she gets help from her students when struggling with a new application. On the other hand, AG emphasises that students needed specific training on the good and bad uses of mobile technologies, to know when they should use their mobile devices in class and when they should not (section 6.4.2.2).

The results indicate that training teachers to use mobile technologies is imperative to ensure successful employment of mLearning and this is compatible with Futurelab et al.'s (2004) study. Furthermore, teachers not only need the technological training, but also the pedagogical training on how to integrate such devices in their teaching. This point is made by Cochrane (2014), who emphasises the importance of providing technological and pedagogical support for mLearning participants. In addition, the TPACK model of Mishra and Koehler (2006) highlights the importance of teachers acquiring three types of knowledge: technological, pedagogical and content to integrate technology into their classroom.

The results also indicate that students do not need training to use mobile technologies, as they have sufficient knowledge of this. However, they need specific training on the appropriate and inappropriate uses of mobile devices to recognise how these devices should be used in school. This is also a recommendation made by Kolb, who stated that students should be taught the 'digital etiquette' of using mobile devices in every setting (Kolb, 2008).

The above results and discussion indicate that teachers should be provided with adequate technological and pedagogical training to build the confidence to employ mLearning in their classrooms. The results also indicate that students do not need training on how to use mobile devices; however, they do need specific training on the digital etiquette to learn the appropriate and inappropriate uses of such devices.

Dikkers suggests that teachers need to share their practice with other experts in the field (Dikkers, 2014). Similarly, AG suggests that there should be collaboration groups of teachers, to help them share and learn new techniques of using mobile technologies in their classes. These groups will help teachers to brainstorm ways of using mobile technologies in each subject. Moreover, VM also believes that discussion between teachers is important for successful implementation (see section 6.4.2.3).

Teachers in the same school or from other schools can form a collaborative group to share ideas and learn from other teachers. If they are not free during the school day, they can form an online collaboration group to communicate with each other at their convenience. The questionnaire results indicate that 87.5% of teachers frequently used their mobile devices at home. This means that online collaboration groups would be appropriate for teachers as they frequently use their mobile devices at home. This solution can also solve the difficulty of finding the time to practise, as VM pointed out.

Pegrum and his colleagues (Pegrum et al., 2013) recommended a professional development network as a platform, through which teachers can collaborate. This is because the teachers in their study feel underprepared and overwhelmed by the problem of how to integrate mobile devices in their teaching. This discussion reveals that teachers need to share and learn new techniques of using mobile technologies in their classrooms. To that end, they need to form collaboration groups or networks to share their practice with other experts in the field. In addition, it is recommended that teachers form an online community or group to chat and exchange ideas and examples of their practice. Online collaboration can be convenient for most teachers as they are busy in school but frequently use their mobile devices at home.

Learning communities is a criterion in the learning intersection of the FRAME model. These communities involve collections of learners who work together to accomplish mutual goals. Mobile technologies can help them to interact and solve problems with other learners in different locations (see section 3.3) (Koole, 2009). Hence teachers can use the technology to interact with other teachers to share knowledge and be involved in the mLearning community.

7.4 Summary

The analysis of the results suggests that mLearning offers several benefits to the participants in both schools. Mobile technologies are found to enhance learning, provide access to different resources, save time, enhance communication, and facilitate learning everywhere.

However, the findings indicate that the participants face technical, distraction, discipline and confidence challenges. The distraction caused by mobile devices creates a challenge for class discipline and the ability to maintain students' focus in the lesson. It is suggested that such distractions could be overcome by integrating mobile devices more in classroom activities and setting up a social contract between teachers and students. Teachers are also challenged in terms of their confidence to employ mLearning in their classes because of their lack of pedagogical knowledge. Thus, the SAMR model is a useful starting point to consider when integrating mobile learning activities.

The results from the questionnaires and the interviews revealed that six key factors should be in place for the successful implementation of mLearning. These factors are: internet access, technical support, teacher training, support and recognition, parental engagement, and effective project leadership. The examples of implementation of mLearning activities indicate that teachers in both schools are still at the enhancement stage of the SAMR model. Most of the learning tasks show that they are substituting other technologies like books or desktop computers with mobile devices.

Chapter 8: Conclusion

8.1 Introduction

The aim of this research is to explore the uses and practices of mobile learning in two schools in Oman. In this final chapter, there will be an attempt to summarise the findings and highlight the significant research contributions. The chapter will address the following points: a summary of the research findings and the contribution to knowledge; suggestions for educational policy and practice; the limitations of this study; and suggested areas for further research.

8.2 Contribution to Knowledge

This research explored mLearning practices in two private schools in Oman to identify factors that contribute to the effective implementation of mLearning. The following research questions guided the study:

1. What are the opportunities for using mobile learning in these two schools?
2. What are the challenges involved in employing mobile learning at each school?

This is the first study that has explored mLearning practices in Omani schools; previous studies have been focusing on higher education interventions. It included participants from the only two schools that had integrated mLearning as a whole-school intervention at the time of the study. Questionnaires and interviews with the two headteachers, the IT technicians, teachers and students from each school were conducted and analysed. The findings agree with the wider literature about the affordances that mLearning makes in students' learning. The study found that the students learn better with mobile devices; communication and collaboration with the students and teachers in school and at home is enhanced; and access to online resources offers opportunities for the students to learn anywhere and anytime. However, it was evident that mLearning was used to facilitate traditional processes and preparation for exams, and as a result what could be considered a more conservative and behaviourist approach to mLearning, usually around substitution and enhancement stage activities (SAMR), is employed. This narrow use of mLearning was also an expectation by students, who were focused to prepare for exams and did not always view mLearning as conducive to their studies. In that sense, implementation of mLearning should be considered from the lower years of school to ensure student familiarisation with processes and approaches and embed more consistently mLearning as part of their curriculum. More

collaborative and transformational uses of mLearning, such as the use of social media, which are discussed in the wider literature, are not evident at either school yet.

Stricter cultural norms around the use of the internet or educational trips may also play a role in those teaching practices; however, limited access to online resources, mainly due to the lack of translated resources, and lack of teacher training to develop digital literacy skills and understanding of how to implement mLearning within the curriculum also play a role in the particular approaches to mLearning that the participants reported.

The learning activities reflected the priorities of Omani education for an external looking curriculum, but schools focus on a narrow set of educational outcomes for reading, writing and numeracy; developing digital literacy and citizenship skills is not embedded in the curriculum or the learning activities. As a result, there is a lack of a consistent school plan to support the safe use of mLearning. At the moment students are encouraged to use many different apps but without any awareness of the possible misuse or dangers that such use may pose. For the strict Omani society, this is an interesting contradiction. In that context, parental involvement is important in order to reinforce a social contract that needs to be set up around safe and responsible use of mobile devices and internet access.

Authentic experiences based around using online dictionaries and access to resources from around the world are embedded in the mLearning activities; however, the learning is still firmly situated in the classroom or home. Learning outside the classroom is not an educational priority in Oman and as such opportunities that the mobility that the devices offer are not explored. However, the portability of the device is a priority for the schools. Considerations around the weight of carrying the devices in the school bag were discussed by teachers and students.

The results revealed that both the teachers and students faced technical problems with the mobile devices, such as battery charging and slow network response. Teachers complained of the distraction to student behaviour caused by mobile technologies used in classrooms but at the same time students doubted their teachers' technical knowledge which, in turn, led to a lack of confidence between the two groups. However, these disruptive behaviours can also be considered as agents of change for both students and teachers. In the more didactic Omani educational system, students, as confident users of mobile devices, are developing more of a voice in the classroom and shaping slowly the mLearning teaching and learning practices. This disruption leads to the reconsideration of teaching approaches and styles of delivery.

The data revealed that effective leadership and institutional support affects mLearning implementation. There was no clear vision and future-proofing for the curriculum implementation of mLearning at either school. While gains from the mLearning implementation is a longitudinal approach, there were no plans for formative evaluation of such an extensive whole-school project.

Although the two schools were at different phases of mLearning use, with School H starting in 2005 and School S in 2013, they both face the same challenges. Even if internet access is not a challenge for one of the schools, problems like training to support more understanding of mLearning and distraction are common in both schools. Additionally, the participants highlighted three factors in the interviews that might determine the success of mLearning implementation, which were the extent of financial support, setting up a social contract between teachers and students, and creating teachers' collaboration groups.

8.3 Recommendations of the Study

8.3.1 Policy Makers

In addition to the evidence from the present research and previous international studies around IT integration and school change (Venezky & Davis, 2002) government support for promoting pedagogical innovations is important. There is the need for a systematic approach to the evaluation of whole-school technology implementations with identifiable success criteria for schools. The creation of a department at the Ministry of Education that oversees such technological implementations and supports the development of resources for teacher training and regional support will provide consistency in curriculum developments and school infrastructure. As device features is a priority for schools, central procurement processes for device purchase or allocation are important to set up and be supported in transparent ways.

While it may be early days for Oman and no incidents of cyberbullying have been reported from schools, a forward-looking e-safety policy can reassure schools and parents about support to implement mLearning tasks further.

The Ministry of Education should consider supporting mLearning schools financially and technically, before and during digital implementations. Financial support is required to provide schools with devices and networks, as well as provide the necessary maintenance during application. Prior to the implementation of mLearning in schools, the Ministry of Education should also consider providing specific training for teachers and students on how to

use mobile technologies in their practice. Training teachers should involve technical and pedagogical use, as well as specifying how these devices can be used in their subject areas. Technical and pedagogical support should also be provided for teachers and students during mLearning implementation. This support might prevent any frustration or delay caused by any device or human failure to accomplish lessons' objectives. Support for such school-wide implementation should include training for change management and training measuring the impact of the implementation.

8.3.2 Schools

The present study would suggest that the content of in-service training in the process of implementing mLearning should be tailored to teachers' current and individualised professional demands. As such, auditing their professional needs and priorities must be accompanied by consistent CPD (Continuing Professional Development) opportunities, both in-house to strengthen teacher collaborations and externally. Schools can also set a time for teachers to meet together to share good practice and planning, both face-to-face and online, to support family priorities and travelling arrangements.

Schools could also consider rules and regulations for mobile technologies' use to alert students of the consequences of misuse and distraction. It would also be helpful to educate students on the appropriate and inappropriate uses of mobile technologies by organising workshops or lectures for them. The development and implementation of such initiatives can be supported by further leadership distribution and the creation of the role of the IT Co-ordinator at the schools. Such a role can facilitate communication between the IT technical team and the curriculum team. It can strengthen discussions around appropriate access control for the mobile devices and investigate internet connection needs based on curriculum requirements as well as the creation of a social contract with students and agreed rules of use and conduct with mobile devices.

Schools should also involve parents in their mLearning implementation scheme, as they play an important role in supporting their children at home. They could be involved by inviting them to meetings with teachers to highlight significant information about mLearning projects. They could also be invited to observe lessons using mobile technologies so that they feel they are highly involved in their children's learning and they can then support them purposefully.

8.4 Limitations of the Study

In a sense, it is anticipated that the findings from this research do not necessarily translate directly into an urban context and therefore further work is needed. Despite this, however, a number of implications for managing pedagogical innovations – whether in rural or urban schools – may still be drawn from this research by means of scrutinising the research findings and the related studies reviewed in this thesis.

This research is based on a case study of two middle schools in Muscat, the only schools that at the time of the study had implemented whole-school mLearning initiatives. The results cannot be generalised to other regions in Oman, and the study recognises that there will be differences between schools in more rural areas in Oman.

Additionally, the researcher acknowledges that the two casestudy schools are private educational institutions and there were no government schools that had employed mLearning at the time of the study. As discussed in Chapter 2, the Ministry of Education has an overview of all the schools in Oman and the researcher appreciates that there will be curriculum differences between government and private schools.

Rich data might be collected through lesson observations, but questionnaires and interviews were used to collect data as a more ethical way to gain the participants' trust in sharing their experiences. Formal permission for observations would have been possible but may have not supported participant engagement. As a result, the researcher chose to use the mixed methods approach to triangulate the participants' views.

The teachers' sample for the questionnaires was small in comparison to the number of teachers in the two schools. Although the researcher had distributed 41 questionnaires for teachers in both schools, only 16 returned them (39%). Even so, this rate accords favourably with Cook et al. (2000) who found that an average 39.6% response rate is appropriate.

8.5 Suggestions for Further Research

The aim of this study is to fill the gap in the research of mLearning in schools in Oman, as there are only a few studies available, all related to higher education. This area is in need of more research to give a clearer picture to the Ministry of Education in Oman of how to employ mLearning successfully in schools, which might lead the Ministry to implement mLearning in the five digital schools, as mentioned earlier in the introduction to this thesis. The findings might guide the Ministry as to what steps should be taken prior to implementation.

There is a need for further research on teacher practice and how they employ mLearning in their classrooms. The present research shows that teachers are currently substituting mobile technologies for other technologies. Therefore, more research is required on teachers' techniques and views about mobile technologies and how they might assist and improve teaching and learning. Further research on the training teachers receive is recommended so that they are better prepared to employ mLearning in their practice. Research into the effect of training teachers on the SAMR model is also recommended from the substitution stages to the transformation stages in their classrooms.

Furthermore, additional research on how to solve the distraction issue caused by mobile technologies and how to engage students on the use of mobile technologies in their learning is desirable. This implies a need for research on the effect of training students on the good and bad uses of mobile technologies on their behaviour in classrooms.

There is also a need for further studies to explore whether mLearning is more appropriate for some subject areas than others, or some tasks than others.

This study found that most teachers and students preferred classroom management applications like Edmodo, which suggests that teachers and students view mobile devices as communication and interaction tools. Therefore, research into types of mobile applications that are of more interest to teachers and students is also required in order to see how such applications are usable and beneficial for teaching and learning.

8.6 Summary

In this final chapter, the results of the research are summarised by reference to the two research questions. The findings revealed that students learn better with mobile devices, that communication and collaboration with students and teachers in school and at home is enhanced, and that access to online resources offers opportunities for students to learn anywhere and anytime. The results also revealed that both teachers and students faced technical problems with the mobile devices, such as battery charging and slow network response. Teachers complained of the distraction to student behaviour caused by mobile technologies used in classrooms but at the same time students doubted their teachers' technical knowledge which, in turn, led to a lack of confidence between the two groups

Additionally, the interviews revealed that the participants highlighted three factors that might determine the success of mLearning implementation. These three suggested factors were the

extent of financial support, setting up a social contract between teachers and students, and creating teachers' collaboration groups. Teachers were not doing something special with these technologies, so they had not reached the transformation stage of using the technology, as in the SAMR model. It was also found that half of the sample of both teachers and students preferred classroom management applications like Edmodo.

The research has a number of implications for the policy makers and schools. It is suggested that the Ministry of Education should support schools financially, technically and pedagogically before and during mLearning implementation. Such support should include the provision of the devices and reliable networks, in addition to the delivery of technical and pedagogical training to teachers and students. Schools should also help teachers gain confidence in using technology in their practice by organising workshops, meetings and creating collaboration groups. Schools should also set rules for misuse and distraction and involve parents by inviting them to meetings and classroom observations. Teachers can also play a significant role in their own professional development by sharing their good practice with other teachers. They can also address the distraction caused from mobile devices by setting up social contracts with their students which stipulate when and how to use them in their classrooms.

This study has a number of limitations, chief of which is that it was conducted only in one region and government schools were not involved. Further research could be conducted using other instruments, such as observations, to gain rich data about classroom practice. The teachers' sample was also small when compared with the teachers' population in the two schools, so further research would require a larger sample, arguably from state schools.

This study also suggests other areas for further research, particularly into teachers' views and their approaches to mLearning and the type of training they are receiving. There is also a suggestion for more research on distraction and the effect that training students on the good and bad uses of mobile technologies has on their behaviour in classrooms. It is also suggested to explore whether mLearning is more appropriate for some subject areas than others, or some tasks than others. Finally, research into the value mobile applications add is recommended, especially since they are of considerable interest to teachers and their students.

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Appendices

Appendix A: Teachers' Questionnaire

A Questionnaire of How Mobile Technologies are Used in Schools (Teachers)

The aim of this questionnaire is to investigate mobile devices uses in schools. As a teacher in the school we are interested in finding out your experiences of using mobile learning in your practice. Information gathered will held confidentially and will be used for research purposes only. It will take about 10 minutes to complete.
Definition of Mobile Learning: The process of learning anywhere and anytime using handheld mobile technologies such as mobile phones or tablets.

Part (1)

Tick the appropriate boxes for the following questions.

1) **Gender:**									
Male					Female				
2) Years of experience teaching in schools:									
1-2		3-6			7-10		10-20		More than 20
3) Years of experience in using mobile devices:									
1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	More than 10
4) Do you use mobile devices at home?									
Frequently			Sometimes				Never		
5) Do you consider yourself an expert user of mobile devices?									
Yes			No				Not sure		
6) Do you use mobile devices in school for work?									
Frequently			Sometimes				Never		
If yes, list the activities:									
7) Have you found that mobile learning can be helpful for teaching and learning?									
Yes			No				Maybe		
List three reasons for your answer. 1, 2. 3,									
8) Do you face any challenges in employing mobile learning for teaching and learning?									
Frequently			Sometimes				Never		
List the three main challenges. 1, 2, 3,									

Part (2)

Tick the appropriate box that applies to your view of the factors in general for successful mobile technologies use.

1= Strongly Disagree, 2= Disagree, 3= Not Sure, 4= Agree, 5= Strongly Agree

N	Factors	1	2	3	4	5
Technological Resources						
1	Regular internet access should be available.					
2	Teachers have enough access to mobile devices for their classes when needed.					
Technical Support						
3	Technical support should be available in school when needed.					
4	Technical support should exist in the region or the educational district.					
Training						
5	Specific training should be provided to teachers to use mobile learning.					
6	Students have sufficient knowledge and skills to use mobile devices.					
Time						
8	Teachers need to be given additional planning time to integrate the use of mobile learning in their practice.					
Institution and Policy Makers Support						
9	Mobile learning should be receiving enough support from the policy makers.					
Parental Support						
10	Parents should support mobile learning integrating at home.					
Motivation and Encouragement						
11	Use of mobile learning teachers should be recognised and rewarded by senior managers					
12	Leaders should regularly encourage mobile learning practices.					
Integration into the Curriculum						
13	Mobile learning activities should be integrated with the curriculum.					
14	Mobile learning activities should be supplementary to the curriculum.					
Effective Leadership						
15	Head leaders should have an input in mobile learning.					
16	Policy leaders should make mobile learning a priority in education as reforms.					

Part (3)

Rate the following factors according to how they are implemented in your school.

	Factor	1 Never	2 Rarely	3 Sometimes	4 Frequently	5 Always
1	Availability of internet access					
2	Access to mobile devices by teachers					
3	Availability of technical support					
4	Training opportunities for teachers					
5	Adequate time for teacher training					
6	Adequate time for teacher planning					
7	Enough time for teachers to evaluate mobile learning in their practice					
8	Effective support from school					
9	Effective support from policy makers					
10	Effective support from parents					
11	Frequent motivation and encouragement by school leaders					
12	Integration into the curriculum					
13	School management provides effective leadership					

Part (4)

Answer the following questions.

1) What are other factors for successful mobile learning projects that are not mentioned above?

2) In your opinion, what is the impact of mobile technologies on learning?

3) Identify an example of how you have used mobile learning successfully in your teaching?

4) Share an example (or more) of successful mobile learning applications or projects that have been implemented in your school?

Note:

If you are happy to discuss with the researcher mobile learning practices in your school further, please write your name, email and mobile number.

Name:.....

Contact number or email:.....

Appendix B: Headteachers' Questionnaire

A Questionnaire of How Mobile Technologies are Used in Schools (Headteachers)

The target of this questionnaire is to investigate mobile devices uses in schools. As a senior administrator in the school we are interested in finding out how you support mobile learning and the challenges associated with it. Information gathered will held confidentially and will be used for research purposes only. It will take about 10 minutes to complete.
Definition of Mobile Learning: The process of learning anywhere and anytime using handheld mobile technologies such as mobile phones or tablets.

Part (1)

Tick the appropriate boxes.

Part (1)

Tick the appropriate boxes and complete the following questions.

1) Gender:	
Male	Female

2) Years of experience as a headteacher:				
1-2	3-6	7-10	10-20	More than 20

3) For how long has your school implemented mobile learning?					
1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	More than 6

4) In your school do all the classes use mobile devices for learning?	
Yes	No
If No, list the classes (e.g. grades) that use mobile devices.	

5a) What is the ratio of mobile devices to students at your school (e.g. 1 to 1, etc)

5b) In your view is that ratio sufficient?	
Yes	No maybe

If No, list the classes (e.g. grades) that use mobile devices.			
6) Where did the funding for the mobile devices come from?			
Government	School	Parents	Other
If other, please specify.			
7) Why did you choose to adopt mobile learning at your school?			
List three reasons for your answer. 1, 2, 3.			
8) Have you found that mobile learning can be helpful for teaching and learning?			
Yes	No	Maybe	
List three reasons for your answer. 1. 2, 3.			
9) Do you face any challenges in employing mobile learning in your school?			
Frequently	Sometimes	Never	
List the three main challenges. 1. 2. 3.			

Part (2)

Tick the appropriate box that applies to your view of the factors in general for successful mobile technologies use.

1= Strongly Disagree, 2= Disagree, 3= Not Sure, 4= Agree, 5= Strongly Agree

N	Factors	1	2	3	4	5
Technological Resources						
1	Regular internet access should be available.					
2	Teachers have access to enough mobile devices for their classes when needed.					
Technical Support						
3	Technical support should be available in school when needed.					
4	Technical support should exist in the region or the educational district.					
Training						
5	Specific training should be provided to teachers to use mobile learning.					
6	Students have sufficient knowledge and skills to use mobile devices.					
Time						
7	Teachers need to be given additional planning time to integrate the use of mobile learning in their practice.					
Institution and Policy Makers Support						
8	Mobile learning should be receiving enough support from the policy makers.					
Parental Support						
9	Parents should support mobile learning at home.					
Motivation and Encouragement						
10	Use of mobile learning by teachers should be recognised and rewarded by senior managers					
11	School leaders should regularly encourage mobile learning practices.					
Integration into the Curriculum						
12	Mobile learning activities should be integrated within the curriculum.					
13	Mobile learning activities should be supplementary to the curriculum.					
Effective Leadership						
14	Headteachers should have an input in mobile learning.					
15	Policy leaders should make mobile learning a priority in educational reforms.					

Part (3)

Rate the following factors according to how they are implemented in your school.

	Factor	1 Never	2 Rarely	3 Sometimes	4 Frequently	5 Always
1	Availability of internet access					
2	Access to mobile devices by teachers					
3	Availability of technical support					
4	Training opportunities for teachers					
5	Adequate time for teacher training					
6	Adequate time for teacher planning					
7	Enough time for teachers to evaluate mobile learning in their practice					
8	Effective support from school					
9	Effective support from policy makers					
10	Effective support from parents					
11	Frequent motivation and encouragement by school leaders					
12	Integration into the curriculum					

Part (4)

Answer the following questions.

1) What are other factors for successful mobile learning projects that are not mentioned above?

2) Identify an example of how mobile learning has been used successfully in your school

Note:

If you are happy to discuss with the researcher mobile learning practices in your school further, please write your name, email and mobile number.

Name:.....

Contact number or email:.....

Appendix C: Students' Questionnaire

A Questionnaire of How Mobile Technologies are Used in Schools (Students)

The target of this questionnaire is to investigate mobile devices uses in schools. Information gathered will held confidentially and will be used for research purposes only. It will take about 10 minutes to complete.
Definition of Mobile Learning: The process of learning anywhere and anytime using handheld mobile technologies such as mobile phones or tablets.

Part (1)

Tick the boxes.

1) **Gender:**			
Male		Female	
2) Class:			
Grade 6	Grade 7	Grade 8	Grade 9
3) Years of using mobile devices in school:			
1-2	2-3	3-4	More than 4

Part (2)

Tick the boxes and complete the questions.

1) Do you enjoy using mobile devices for learning?			
Yes	No	Sometimes	Not sure
List three reasons for your answer. 1. 2. 3.			
2) Do you find using mobile devices for learning easy?			
Yes	No	Sometimes	Not sure
List three reasons for your answer. 1. 2. 3.			

3) Do you receive enough support to use mobile devices for learning?			
Yes		No	
If yes, who supports you? You can tick more than one answer			
Your teachers	The school headteacher	Your parents	Peers
4) What do you find challenging when using mobile devices for learning?			
List three challenges. 1. 2. 3.			
5) What benefits do you gain from mobile learning?			
List three benefits. 1. 2. 3.			

Part (3)

Tick the boxes and complete the questions.

1) Do you use mobile devices at home?		
Frequently	Sometimes	Never
2) Do you use mobile devices for school assignments?		
Yes	No	
List three activities that you use mobile devices for. 1. 2. 3.		
3) List as many of your favourite applications/programs that you used at school on your mobile device?		

Appendix D: Technical Staff' Questionnaire

A Questionnaire of How Mobile Technologies are Used in Schools (Technical Staff)

The target of this questionnaire is to investigate mobile devices uses in schools. As a technical member of staff we would like to gain your opinions on issues of integrating mobile devices at your school. Information gathered will held confidentially and will be used for research purposes only. It will take about 10 minutes to complete.

Definition of Mobile Learning:

The process of learning anywhere and anytime using handheld mobile technologies such as mobile phones or tablets.

Part (1)

1) **Gender:**	
Male	Female

3) Years of experience working in schools:				
1-2	3-6	7-10	10-20	More than 20

1) Gender	
Male	Female

2) How many years have you been a technician?					
1-2	3-4	5-6	7-8	9-10	More than 10

3) How many years have you been working in this school?					
1-2	3-4	5-6	7-8	9-10	More than 10

4) What are the types of mobile devices does the school provide to students?				
Smartphones	Tablets	Handheld computers	Personal Digital Assistant (PDAs)	Other

If other, please list.

-

5) What platform does the school offer students in terms of mobile devices?	
IOS	Android
If other, please list. -	

6) Are there any technical issues in using mobile devices at your school (e.g. access to internet)?	
Yes	No
If yes, please list three. 1. 2. 3.	

7) Are there other challenges of employing mobile devices at your school (e.g. budget)?	
Yes	No
If yes, please list three. 1. 2. 3.	

8) What proportion of your working time do you spend supporting mobile learning?				
10-20%	20-40%	40-60%	60-80%	80-100%

9) How many technical staff are employed at the school?			
one	Two	three	more than 4

10) Is the technical staff number in your school sufficient for supporting mobile learning?	
Yes	No
If No, please list the reasons. - -	

Appendix E: Teachers' and Headteachers' Interview Questions

Teachers & Headteachers Interview Questions

Perceptions

1) What do you think the students are getting out of mobile learning?

2) Are there subjects that lend themselves to mobile learning? Is that why you are here?

Practice

3) How did you engage in the mobile learning project?

4) Can you see mobile learning is more for primary/middle/secondary?

Policy

5) What do you think can facilitate mobile learning policy and practice?

6) What do you think needs to be in place for successful implementation?

Appendix F: Students' Interview Questions

Students Focus Group Interviews

Perceptions

1) Do you enjoy using mobile devices in school? Why?

2) What is the most interesting thing of using these devices for learning?

Learning

3) Do you think that they are helpful in learning? How?

4) How do mobile devices affect your learning?

5) Is it better to learn without these devices like the traditional classroom instruction? Why?

Challenges

6) What are the difficulties of using these devices in school?

Appendix G: Permission to Conduct Research in Schools

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

Dear the Director of the Research and Development Office,

My name is Muna Abdullah Al-Siyabi, and I am a PhD student at the University of Reading in UK. The research I wish to conduct for my Doctoral thesis involves investigating how mobile technologies are used in schools. I mean by mobile technologies: all the digital mobile devices such as smartphones and tablets. This project will be conducted under the supervision of Dr. Yota Dimitriadi and Professor Rachel McCrindle.

I am seeking your consent to conduct a survey study in schools in Oman by distributing questionnaires and inviting for follow up interviews with the teachers, the headteachers and the technical team.

This study will attempt to contribute to the research of mobile learning and the development of the mobile learning projects in schools. The intention is that the findings will be used to inform the leaders and policy makers of the successful factors of mobile learning.

This project has been reviewed following the procedures of the University Research Ethics Committee and has been giving a favourable ethical opinion for conduct.

I am providing you an information letter describing the research in detail. If you require any further information, please do not hesitate to contact me on mobile: +447460693702, email: ff806271@reading.ac.uk. Thank you for your time and consideration.

Yours sincerely,

Muna Abdullah Al-Siyabi

PhD Candidate, Institute of Education

University of Reading

Appendix H: Information Sheet and Consent Forms for Teachers, Headteachers and IT Staff

University of Reading

Information sheet for the participants to the study

Research Project: Investigating the role of mobile technologies in schools

Dear Teacher/Headteacher/IT Staff,

I am a PhD research student in the Institute of Education at the University of Reading. I would like to invite you to participate in this important research that explores how mobile technologies (including all digital mobile devices such as smartphones and tablets) are used in schools in Oman. This project will be conducted under the supervision of Dr. Yota Dimitriadi and Professor Rachel McCrindle.

Before you decide whether or not you can take part, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully.

What is the purpose of the study?

This study will contribute to the research into mobile learning in schools. The intention is that the findings will be used to inform leaders and policy makers about factors that can contribute to the successful implementation and development of mobile learning activities and projects.

In order to achieve these goals the researcher chose a mixed methods approach using questionnaires and interviews since these are the most suitable instruments to examine the research questions. The researcher will attempt to conduct the study in two schools in Oman by distributing questionnaires and inviting you for follow up interviews.

Why have I been chosen to take part?

You have been invited to take part in this project because your school are employing mobile technologies for learning and teaching.

What will happen if your school takes part?

You are invited to complete a short questionnaire and also to decide whether you want to take part in a follow-up one-to-one interview focused on your experience of mobile device use at their school. The questionnaire will take a maximum of 20 minutes to finish at your own convenience. Regarding the interviews: if you agree to take part (by ticking the box in the questionnaire form and sharing your contact details with the researcher), the interview will take place face to face at a mutually convenient date and time. With your agreement, the interview will be audio recorded and transcribed. This transcription will then be shared with you in order to check for accuracy and for you to confirm that you are still happy for it to be used in the research.

Do your schools have to take part?

It is entirely up to you whether you participate. If you decide to take part, you will be asked to sign a consent form.

University of Reading

You may also withdraw your consent to participation at any time during the project, without any repercussions to you or your school, by contacting the researcher, Mrs Muna Al-Siyabi, Tel: 07460693702, email: ff806271@reading.ac.uk

What are the possible advantages and disadvantages of taking part?

Participants will benefit from the opportunity to reflect on their experiences of mobile learning The information you give will remain confidential and will only be seen by the researcher and her supervisors. Neither you or the school will be identifiable in any published report resulting from the study.

Participants in similar studies have found it interesting to take part. We anticipate that the findings of the study will be useful for teachers, headteachers and policy makers in planning how to embed mobile devices in learning and teaching.

There are no anticipated risks from participating in this study.

Will what I say be kept confidential and what will happen to the data?

Any data collected will be held in strict confidence and no real names will be used in this study or in any subsequent publications. The completed questionnaires and the interview records of this study will be kept private. The data collected in the study will provide the basis of my PhD thesis and it will be shared with my two supervisors as well. The thesis will be published in hard copy and electronic format which will be housed at the Institute of Education, University of Reading. The data and the analysis of the data will also be used to produce articles, books, conference papers, as well as presented in conferences and lectures. In any of these formats I reassure you that your identity and anonymity of the school will be protected. All information collected will be kept strictly confidential (subject to legal limitations). In addition, you will be offered a summary of the findings if you want it. In order to protect the anonymity of each participant, pseudonyms will be used to ensure that participants cannot be identified. All electronic data will be held securely in password protected files on a non-shared PC and all paper documentation will be held in locked cabinets in a locked office.

In line with University policy, data generated by the study will be kept securely in paper or electronic form for a period of five years after the completion of the research project.

Who has reviewed the study?

This application has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

What happens if I change my mind?

You can change your mind at any time without any repercussions. During the research, you can stop completing the activities at any time. If you change your mind after data collection has ended, we will discard your data.

What happens if something goes wrong?

In the unlikely case of concern or complaint, you can contact the researcher's supervisors at the University of Reading: Dr Yota Dimitriadi, Tel: 0044 118 378 2688, email: Y.Dimitriadi@reading.ac.uk and Prof. Rachel McCrindle, Tel: 0044 118 378 6536, email: r.j.mccrindle@reading.ac.uk

Where can I get more information?

If you would like more information, please contact Mrs Muna Al-Siyabi, Tel: 07460693702, email: ff806271@reading.ac.uk

University of Reading

I do hope that you will agree to your participation in the study. If you do, please complete the attached consent form and return it. If you have any questions, please feel free to call me at 07460693702, email: ff806271@reading.ac.uk

* This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you for your time.

University of Reading

Participant Consent Form (Questionnaire)

Research Project:

I have read the Information Sheet about the project and received a copy of it. I understand what the purpose of the project is and what is required of me. All my questions have been answered.

Participants' Name: _____

Please tick as appropriate:

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. (Yes / NO)
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. (Yes / NO)
3. I consent to completing a questionnaire. (Yes / NO)

Signed: _____

Date: _____

Muna Al-Siyabi, PhD Researcher

UK Mobile: 07460693702 Oman Mobile: +98699889100 Email: ff806271@reading.ac.uk

Supervisors:

Dr Yota Dimitriadi **Institute of Education** **University of Reading** **London Road Campus** **4 Redlands Road** **Reading RG1 5EX** **Berkshire** **United Kingdom** **Email:y.dimitriadi@reading.ac.uk** **Tel: +44 (0) 118 378 2688**	**Professor Rachel McCrindle** **School of Systems Engineering** **University of Reading** **Whiteknights Campus** **Reading** **RG1 5EX** **United Kingdom** **Email: r.j.mccrindle@reading.ac.uk** **Tel: +44 (0) 118 378 6536**

University of Reading

Participant Consent Form (Interviews)

Research Project:

I have read the Information Sheet about the project and received a copy of it. I understand what the purpose of the project is and what is required of me. All my questions have been answered.

Participants' Name: _____

Please tick as appropriate:

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. (Yes / NO)
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. (Yes / NO)
3. I consent to be to take part in a follow-up interview. (Yes / NO)
4. I agree to this interview being recorded. (Yes / NO)

Signed: _____

Date: _____

Muna Al-Siyabi, PhD Researcher

UK Mobile: 07460693702 Oman Mobile: +98699889100 Email: ff806271@reading.ac.uk

Supervisors:

Dr Yota Dimitriadi **Institute of Education** **University of Reading** **London Road Campus** **4 Redlands Road** **Reading RG1 5EX** **Berkshire, United Kingdom** **Email:y.dimitriadi@reading.ac.uk** **Tel: +44 (0) 118 378 2688**	**Professor Rachel McCrindle** **School of Systems Engineering** **University of Reading** **Whiteknights Campus** **Reading** **RG1 5EX** **United Kingdom** **Email: r.j.mccrindle@reading.ac.uk** **Tel: +44 (0) 118 378 6536**

Appendix I: Information Sheet and Consent Form for the Parents of the Students

University of Reading

Information sheet for the parents of the students

Research Project: Investigating the role of mobile technologies in schools

Dear Parent,

I am a PhD research student in the Institute of Education at the University of Reading. I would like to invite you to participate in this important research that explores how mobile technologies (including all digital mobile devices such as smartphones and tablets) are used in schools in Oman. This project will be conducted under the supervision of Dr. Yota Dimitriadi and Professor Rachel McCrindle.

Before you decide whether or not you can take part, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully.

What is the purpose of the study?

This study will contribute to the research into mobile learning in schools. The intention is that the findings will be used to inform leaders and policy makers about factors that can contribute to the successful implementation and development of mobile learning activities and projects.

In order to achieve these goals the researcher chose a mixed methods approach using questionnaires and interviews since these are the most suitable instruments to examine the research questions. The researcher will attempt to conduct the study in two schools in Oman by distributing questionnaires and inviting you for follow up interviews.

Why has my child been chosen to take part?

Your child has been invited to take part in this project because he or she is studying in a school that is employing mobile technologies for learning and teaching.

What will happen if my child takes part?

Your child will be invited to complete a short questionnaire and also to decide whether he/she wants to take part in a follow-up group interview with other students focused on the mobile device use at school. The questionnaire will take a maximum of 10 minutes to finish at his/her own convenience. Regarding the interviews: if you agree your child to take part, the interview will take place face to face with a group of four other students at a mutually convenient date and time. With your agreement, the interview will be audio recorded and transcribed. This transcription will then be shared with you in order to check for accuracy and for you to confirm that you are still happy for it to be used in the research.

Does your child has to take part?

It is entirely up to you whether your child participates. If you decide that your child can take part, you will be asked to sign a consent form.

University of Reading

You may also withdraw your consent to participation at any time during the project, without any repercussions to you or your child, by contacting the researcher, Mrs Muna Al-Siyabi, Tel: 07460693702, email: ff806271@reading.ac.uk

What are the possible advantages and disadvantages of taking part?

Participants will benefit from the opportunity to reflect on their experiences of mobile learning use. The information you give will remain confidential and will only be seen by the researcher and her supervisors. Neither your child or the school will be identifiable in any published report resulting from the study.

Participants in similar studies have found it interesting to take part. We anticipate that the findings of the study will be useful for teachers, headteachers and policy makers in planning how to embed mobile devices in learning and teaching.

There are no anticipated risks from participating in this study.

Will what I say be kept confidential and what will happen to the data?

Any data collected will be held in strict confidence and no real names will be used in this study or in any subsequent publications. The completed questionnaires and the interview records of this study will be kept private. The data collected in the study will provide the basis of my PhD thesis and it will be shared with my two supervisors as well. The thesis will be published in hard copy and electronic format which will be housed at the Institute of Education, University of Reading. The data and the analysis of the data will also be used to produce articles, books, conference papers, as well as presented in conferences and lectures. In any of these formats I reassure you that your child identity and anonymity of the school will be protected. All information collected will be kept strictly confidential (subject to legal limitations). In addition, you will be offered a summary of the findings if you want it. In order to protect the anonymity of each participant, pseudonyms will be used to ensure that participants cannot be identified. All electronic data will be held securely in password protected files on a non-shared PC and all paper documentation will be held in locked cabinets in a locked office.

In line with University policy, data generated by the study will be kept securely in paper or electronic form for a period of five years after the completion of the research project.

Who has reviewed the study?

This application has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

What happens if I change my mind?

You can change your mind at any time without any repercussions. During the research, your child can stop completing the activities at any time. If you change your mind after data collection has ended, we will discard your data.

What happens if something goes wrong?

In the unlikely case of concern or complaint, you can contact the researcher's supervisors at the University of Reading: Dr Yota Dimitriadi, Tel: 0044 118 378 2688, email: Y.Dimitriadi@reading.ac.uk and Prof. Rachel McCrindle, Tel: 0044 118 378 6536, email: r.j.mccrindle@reading.ac.uk

Where can I get more information?

If you would like more information, please contact Mrs Muna Al-Siyabi, Tel: 07460693702, email: ff806271@reading.ac.uk

University of Reading

I do hope that you will agree to your child participation in the study. If you do, please complete the attached consent form and return it. If you have any questions, please feel free to call me at 07460693702, email: ff806271@reading.ac.uk

* This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you for your time.

University of Reading

Parent Consent Form (Questionnaire)

Research Project:

I have read the Information Sheet about the project and received a copy of it. I understand what the purpose of the project is and what is required of my child. All my questions have been answered.

Parents' Name: _____

Please tick as appropriate:

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. (Yes / NO)
2. I understand that my child participation is voluntary and that I am free to withdraw at any time without giving a reason. (Yes / NO)
3. I consent that my child can complete the questionnaire. (Yes / NO)

Signed: _____

Date: _____

Muna Al-Siyabi, PhD Researcher

UK Mobile: 07460693702 Oman Mobile: +98699889100 Email: ff806271@reading.ac.uk

Supervisors:

Dr Yota Dimitriadi **Institute of Education** **University of Reading** **London Road Campus** **4 Redlands Road** **Reading RG1 5EX** **Berkshire** **United Kingdom** **Email:y.dimitriadi@reading.ac.uk** **Tel: +44 (0) 118 378 2688**	**Professor Rachel McCrindle** **School of Systems Engineering** **University of Reading** **Whiteknights Campus** **Reading** **RG1 5EX** **United Kingdom** **Email: r.j.mccrindle@reading.ac.uk** **Tel: +44 (0) 118 378 6536**

University of Reading

Parent Consent Form (Interviews)

Research Project:

I have read the Information Sheet about the project and received a copy of it. I understand what the purpose of the project is and what is required of my child. All my questions have been answered.

Parents' Name: _____

Please tick as appropriate:

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. (Yes / NO)
2. I understand that my child participation is voluntary and that I am free to withdraw at any time without giving a reason. (Yes / NO)
3. I consent that my child can take part in a follow-up interview. (Yes / NO)
4. I agree to this interview being recorded. (Yes / NO)

Signed: _____

Date: _____

Muna Al-Siyabi, PhD Researcher

UK Mobile: 07460693702 Oman Mobile: +98699889100 Email: ff806271@reading.ac.uk

Supervisors:

Dr Yota Dimitriadi **Institute of Education** **University of Reading** **London Road Campus** **4 Redlands Road** **Reading RG1 5EX** **Berkshire, United Kingdom** **Email:y.dimitriadi@reading.ac.uk** **Tel: +44 (0) 118 378 2688**	**Professor Rachel McCrindle** **School of Systems Engineering** **University of Reading** **Whiteknights Campus** **Reading** **RG1 5EX** **United Kingdom** **Email: r.j.mccrindle@reading.ac.uk** **Tel: +44 (0) 118 378 6536**

Appendix J: Ethical Approval

University of Reading
Institute of Education
Ethical Approval Form A (version February 2014)

University of Reading

Tick one:

Staff project: ___ PhD _√___

Name of applicant (s): Muna Abdullah Khalfan Al-Siyabi

Title of project: How Mobile Technologies are used in Schools

Name of supervisor (for student projects): Dr. Yota Dimitriadi & Professor Rachel McCrindle

Please complete the form below including relevant sections overleaf.

	YES	NO	
Have you prepared an Information Sheet for participants and/or their parents/carers that:			
a) explains the purpose(s) of the project	√		
b) explains how they have been selected as potential participants	√		
c) gives a full, fair and clear account of what will be asked of them and how the information that they provide will be used	√		
d) makes clear that participation in the project is voluntary	√		
e) explains the arrangements to allow participants to withdraw at any stage if they wish	√		
f) explains the arrangements to ensure the confidentiality of any material collected during the project, including secure arrangements for its storage, retention and disposal	√		
g) explains the arrangements for publishing the research results and, if confidentiality might be affected, for obtaining written consent for this	√		
h) explains the arrangements for providing participants with the research results if they wish to have them	√		
j) gives the name and designation of the member of staff with responsibility for the project together with contact details, including email . If any of the project investigators are students at the IoE, then this information must be included and their name provided	√		
k) explains, where applicable, the arrangements for expenses and other payments to be made to the participants		√	
j) includes a standard statement indicating the process of ethical review at the University undergone by the project, as follows: 'This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct'.	√		
k)includes a standard statement regarding insurance: "The University has the appropriate insurances in place. Full details are available on request".	√		
Please answer the following questions			
1) Will you provide participants involved in your research with all the information necessary to ensure that they are fully informed and not in any way deceived or misled as to the purpose(s) and nature of the research? (Please use the subheadings used in the example information sheets on blackboard to ensure this).	√		
2) Will you seek written or other formal consent from all participants, if they are able to provide it, in addition to (1)?	√		
3) Is there any risk that participants may experience physical or psychological distress in taking part in your research?		√	
4) Have you taken the online training modules in data protection and information security (which can be found here: http://www.reading.ac.uk/internal/imps/Staffpages/imps-training.aspx)?	√		
5) Have you read the Health and Safety booklet (available on Blackboard) and completed a Risk Assessment Form to be included with this ethics application?	√		
6) Does your research comply with the University's Code of Good Practice in Research?	√		
	YES	NO	N.A.
7) If your research is taking place in a school, have you prepared an information sheet and consent form to gain the permission in writing of the head teacher or other relevant supervisory professional?	√		
8) Has the data collector obtained satisfactory DBS clearance?	√		
9) If your research involves working with children under the age of 16 (or those whose special educational needs mean they are unable to give informed consent), have you prepared an			√

information sheet and consent form for parents/carers to seek permission in writing, or to give parents/carers the opportunity to decline consent?			
10) If your research involves processing sensitive personal data[1], or if it involves audio/video recordings, have you obtained the explicit consent of participants/parents?	√		
11) If you are using a data processor to subcontract any part of your research, have you got a written contract with that contractor which (a) specifies that the contractor is required to act only on your instructions, and (b) provides for appropriate technical and organisational security measures to protect the data?			√
12a) Does your research involve data collection outside the UK?	√		
12b) If the answer to question 12a is "yes", does your research comply with the legal and ethical requirements for doing research in that country?	√		
13a. Does the proposed research involve children under the age of 5?		√	
13b. If the answer to question 13a is "yes": 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.			
If you have answered YES to Question 3, please complete Section B below			

PLEASE COMPLETE **EITHER SECTION A OR B** AND PROVIDE THE DETAILS REQUIRED IN SUPPORT OF YOUR APPLICATION, THEN SIGN THE FORM (SECTION C)

A: My research goes beyond the 'accepted custom and practice of teaching' but I consider that this project has no significant ethical implications.	

Give a brief description of the aims and the methods (participants, instruments and procedures) of the project in up to 200 words. Attach any consent form, information sheet and research instruments to be used in the project (e.g. tests, questionnaires, interview schedules).

Please state how many participants will be involved in the project: 100

This form and any attachments should now be submitted to the Institute's Ethics Committee for consideration. Any missing information will result in the form being returned to you.

The aim of this research is to investigate how mobile technologies are used in schools. Using mobile devices is not the target itself but rather tools that can facilitate activities that were not possible without these tools (Sharples , Arnedillo-Sanchez, Milrad, & Vavoula, 2009). More specifically, the researcher is aiming to explore the opportunities for using mobile devices, the important factors for successful mobile learning, examples of good practice as well as the challenges for implementing mobile learning in (middle) schools in the Gulf countries. The researcher is following a mixed methods approach through combining two methods for data collection, questionnaire and interview. The use of questionnaires will allow the researcher to approach a larger sample size (see below) while interviews will support in-depth discussions and exploration of the research topics. The researcher is planning to administer the questionnaire to a sample of teachers, head teachers and technical team in schools in Oman, Qatar and UAE (United Arab Emirates). These three countries are chosen because mobile learning projects are implemented in a number of their schools. The selected schools have been using mobile devices such as tablets for at least two years. It is estimated that the questionnaire will be sent to about 200 teachers, headteachers and technical (IT) staff in these countries. At the end of the questionnaire, the participants are invited to volunteer for semi-structured interviews to further discuss their mobile learning practices. It is hoped that 30 participants (10 per country) will opt in to contribute to the interviews. If more than 10 participants volunteer to be interviewed, then the researcher will apply the following criteria in selecting the sample for the interviews: participants will be chosen from different schools (maximum 2 per school: headteacher and teacher-no IT staff will be selected for the interview process) and they will have declared a range of attitudes (positive and negative) and experiences (novice to expert) towards mobile learning.

B: I consider that this project may have ethical implications that should be brought before the Institute's Ethics Committee.	

Please provide all the further information listed below in a separate attachment.

1. title of project
2. purpose of project and its academic rationale
3. brief description of methods and measurements
4. participants: recruitment methods, number, age, gender, exclusion/inclusion criteria
5. consent and participant information arrangements, debriefing (attach forms where necessary)
6. a clear and concise statement of the ethical considerations raised by the project and how you intend to deal with

then.

7. estimated start date and duration of project

This form and any attachments should now be submitted to the Institute's Ethics Committee for consideration. Any missing information will result in the form being returned to you.

C: SIGNATURE OF APPLICANT:

I have declared all relevant information regarding my proposed project and confirm that ethical good practice will be followed within the project.

Signed:

Print Name: Muna Abdullah Al-Siyabi

Date: May 2015

STATEMENT OF ETHICAL APPROVAL FOR PROPOSALS SUBMITTED TO THE INSTITUTE ETHICS COMMITTEE

This project has been considered using agreed Institute procedures and is now approved.

Signed: Print Name Andy Kempe Date 28.5.15
(IoE Research Ethics Committee representative)*

* A decision to allow a project to proceed is not an expert assessment of its content or of the possible risks involved in the investigation, nor does it detract in any way from the ultimate responsibility which students/investigators must themselves have for these matters. Approval is granted on the basis of the information declared by the applicant.

Sharples , M., Arnedillo-Sanchez, I., Milrad, M., & Vavoula, G. (2009). Mobile learning: small devices, big issues. In N. Balacheff, S. Ludvigsen, T. Jong & S. Barnes (Eds.), *Technology Enhanced Learning: Principles and Products.* (pp. pp. 233–249). Heidelberg, Germany: Springer.

Appendix K: A Sample of NVivo Qualitative Analysis