Qatar Learning Management Project: Exploration of factors influencing secondary school teachers' practices

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Qatar Learning Management Project: Exploration of factors influencing secondary school teachers' practices

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Abstract

School education in the information age has adopted a number of e-learning technologies that are believed to enhance teaching and learning practices and equip students with the skills to manage the challenges of their future workplaces. One of these e-learning technologies is the Learning Management System (LMS). Teachers in Qatar secondary schools use this system through an online portal to connect with students, parents, school administration and policy makers. The LMS has introduced many new functionalities for teachers; however, integrating such technologies in educational contexts is complex, and there is a need to better understand the factors that influence teachers' LMS practices. This study aimed to add to the understandings of e-learning systems LMS by exploring factors influencing teacher's LMS practices in secondary stage school context in Qatar.

This study utilised an exploratory sequential mixed methods design, starting with qualitative data collection in the form of semi-structured interviews that were thematically analysed. Based on the findings of the qualitative phase, the instrument for the quantitative phase was developed. The quantitative phase used an online questionnaire that was analysed using descriptive statistics and factor analysis.

The results showed that four important factors were hindering teachers' LMS integration: MoEd policies, students and parents, IT lab classes, and LMS design and usefulness. Some minor differences were found between more and less experienced teachers, and between science teachers and teachers of other subjects; however, these differences did not affect the overall hindering influence that the identified factors had on teachers' LMS integration. Five supporting factors were also explored: the use of tablets, MoEd support, LMS functions, personal factors related to individual teachers and the school administration. This study contributes to our understanding of teachers' behaviour regarding technology integration and highlights important areas of development for better LMS integration into teachers' practice. The study contributes new empirical data to the field of technology use in the school education context and proposes a novel framework to describe LMS use in Qatar.

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List of Abbreviations

COM:	Communication
DTPB:	Decomposed Theory of Planned Behaviour
ICDL:	International Computer Driving License
ICT:	Information Communication Technologies
IT:	Information Technology
ITL:	IT Lab Classes
K-12:	Kindergarten to year 12
K-Net:	Knowledge Network
LMS:	Learning Management System
LMSS:	LMS design and usefulness
MEdP:	MoEd Policies
MEdS:	MoEd Support
MoEd:	The Ministry of Education
PEU:	Perceived Ease of Use
PF:	Personal Factors
PU:	Perceived Usefulness
SA:	School Administration
SEC:	Supreme Educational Council
SP:	Students and Parents
T:	Tablets
TAM:	Technology Acceptance Model
TPB:	Theory of Planned Behaviour
TRA:	Theory of Reasoned Action

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Saoud Abdulla Al-Jamali

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the University Ethics Committee on [13/09/2017] and The Ministry of Education and Higher Education in Qatar on [12/6/2017].

I declare that the Word Count of this Thesis is 62,543 words

Name:

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Signature:

Date:

21st of September 2021

Chapter 1 – Thesis Overview

1.1) Chapter One

This first chapter provides an overview of the main contents of each chapter in this thesis.

1.2) Chapter Two

The second chapter of this thesis provides brief background information about the author and background on the State of Qatar, the context of this research, and its educational development. It focuses on technological integration in the government educational system, specifically the Learning Management System used in schools. It also describes some similar technological LMS integration processes in other contexts worldwide, including the difficulties experienced across these contexts.

1.3) Chapter Three

The third chapter in this thesis reviews the literature relating to the factors that have been found to influence teachers' LMS use in practice. It reviews several learning theories (behaviourism, cognitivism and constructivism) that underpin our understanding of teachers' behaviour in relation to the LMS, with some specific examples taken from constructivist learning theories, Piaget's theory of cognitive learning and Vygotsky's sociocultural theory (McLeod, 2018; Schunk, 2012).

The chapter goes on to review related behavioural models that were developed to understand human behaviour, such as the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975) and the Theory of Planned Behaviour (TPB; Ajzen, 1991). Other relevant technology-focused behavioural models are also reviewed, such as the Technology Acceptance Model (TAM; Davis, 1989) and the Decomposed Theory of Planned Behaviour (DTPB; Taylor & Todd, 1995). Finally, gaps in the existing literature are identified and the research questions for this study are presented.

1.4) Chapter Four

Chapter Four presents the study's methodology. It begins by outlining the theoretical, pragmatic, epistemological and ontological assumptions behind the choice of methods used. It then discusses the strengths and weaknesses of the chosen mixed methods approach, which consisted of a qualitative phase of data collection and analysis followed by a quantitative phase. Each phase is then separately detailed in terms of data collection and analysis, including considerations related to researcher positionality, reliability, validity and ethics.

1.5) Chapter Five

The fifth chapter presents the findings and analysis of both phases of the study. The analysis of Phase One data resulted in 49 potential factors that were used to construct the instrument for the second phase of data collection. In the Phase Two data analysis, nine factors were identified with a high level of potential influence on teachers' LMS integration, along with four limiting factors and five supporting factors. The chapter ends with a combined overview of the results of both phases, synthesising the two sets of findings.

1.6) Chapter Six

Chapter Six discusses the findings presented in Chapter Five and relates them to the literature, identifying the original contributions that this study makes to our knowledge in the field. One of the main findings is related to MoEd policies, which were found to hinder teachers' LMS integration by imposing additional administrative tasks that overload teachers and distracts them from teaching. In addition, the MoEd's LMS integration is not clear to teachers and other stakeholders: they could not identify whether LMS was intended for management or learning purposes or both. Students and parents, IT lab classes and LMS design and usefulness were all found to limit teachers' LMS integration. Combining the nine most influential factors, a new LMS framework was created.

1.7) Chapter Seven

The seventh chapter presents the limitations of the research, practical recommendations, future research suggestions and conclusion.

1.8) References and Appendices

In this section, academic references are presented. These are followed by the detailed tables and documents that constitute the Appendices.

Chapter 2 - Background

2.1) Introduction

This chapter provides brief background information about the author and background information about Qatar, the country in which this research was conducted, going into detail on the development of its educational system and the integration of technology into teaching. It then focuses on the use of the LMS and similar technologies in Qatar and other countries, with some examples of experiences in the field.

The following section describe my own experience in the educational field and an explanation of why this research was conducted. I also reflect on my understanding of and beliefs about what it means to be a teacher in Qatar.

About the Author

I am a chemical and process engineer who worked in the oil and gas field for more than four years after my graduation in July 2010. My educational experience mostly came from my volunteering work, which began in 2006 and focused on the development of children aged 10 to 18 in terms of their academic knowledge, morals, social interaction and physical and mental health. Through this work, I experienced different educational environments and engaged with many people, ranging from government staff at the Qatar Ministry of Education (MoEd), teachers, school administrations, parents and students. Being a part of this community for more than 10 years, I have observed many of the achievements and success stories within Qatar’s education system, as well as some of the issues that need to be addressed and resolved. In particular, the general shortage of Qatari teachers means that it is important to encourage Qataris to engage with the educational experience in any way possible. While volunteering, I strove to add an educational qualification to my engineering degree, which gave me a solid, accredited academic structure and knowledge that helped me to better engage with the educational community.

In the current context of rapid advancements in technology, research into new innovations helps us to capture educators' up-to-date experiences and evaluate how education practice is responding to the changes. This allows us to better guide the current and future teaching and learning process. The most recent investigation of LMS integration in Qatar took place in 2011, when the LMS was in its infancy, so more recent research that targets teachers' experiences with this technology is well overdue.

The motivation for this research comes from my experience that while technically the LMS has great potential in enhancing administration, teaching practices, and learning practices, it has gained something of a negative reputation in Qatar, with teachers tending to focus more on the problems it is causing than on its benefits. I have discussed this informally with a close circle of friends who are working in the educational field either as teaching or non-teaching staff. Many of these friends discussed their negative experiences with LMS integration. This led me to look for published research into Qatar's LMS integration project, to understand why the LMS technology is considered to be problematic and how it could be more successfully implemented. However, there was very little existing school-based (K-12) LMS research.

Another motivation for this study was to provide teachers with the opportunity to communicate their LMS experiences, given that they have accumulated considerable experience with LMS integration since the project was originally rolled out. This constitutes a current gap in the literature. Further discussion of gaps in the existing literature is presented in section 3.7.

Reflection on Being a Teacher in Qatar

Being a teacher in Qatar is considered a great honour, an honour that also comes with great responsibility. I have experienced this feeling when working with students and their parents in my volunteer work. The expectations from both of them puts some pressure on me and let me think carefully about my decisions. This is because of the impact that teachers have on shaping the future of the country through the students they teach. Students are influenced by their school environment and by their interactions with teachers and friends. Many teachers are seen by students as inspiring examples because of the way in which they live their lives and the contribution they are making to society. This impact on students' aspiration differed from young and older students. I have engaged with a wide range of student age groups, they ranged between 10 and 21 years old. Younger students were attracted to the social and environment experiences more, while older students were attracted to the intellectual experience in addition to the social environment.

It has been increasingly evident to me in recent years that in many government schools, Qatari students and staff are becoming the minority. The majority of students and staff now have different nationalities and backgrounds. This heterogeneous environment can make it a challenge to preserve the Qatari cultural environment at school, but at the same time it brings opportunities to work and interact with other students and staff of other nationalities, which enriches students' experiences. The MoEd endeavours to preserve the Qatari cultural environment through certain annual events, such as the celebration of Qatar's national day on the 18th of December each year. This celebration is Qatari culture-themed and schools organise activities to support this, for example a showcase of hospitality in a Qatari *majlis* (guest room), the *rezeef* (a Qatari sword dance), and Qatari poetry. Some schools run competitions between students in these activities. Further details about Qatar and its education system are presented in the following section.

I have engaged with a few non-Qatari students during my volunteer work and have found that non-Qatari students were hesitant in starting a conversation with me or other Qatari students. So, I started talking to them and encouraged them to engage with other Qatari students in the activities I prepared, this have helped in breaking the ice.

2.2) The State of Qatar

The State of Qatar is a peninsula located in the Middle East (Al-Abdulla, 2011; Naser et al., 2006; Weber, 2010). It occupies an area of 11,521 km^2 and is considered one of the developing countries in the region (Al-Abdulla, 2011; Naser et al., 2006). It is a conservative Islamic country with Arabic as its official language (Qatar e-government 01, 2020). Its population was most recently measured at over 2,795,000 (PSA, 2020). Qatar is known for the richness of its oil and natural gas reserves, and its main income is from the production of oil and gas. It has the third-largest natural gas reserves in the world after Russia and Iran (Qatar Gas, 2020).

In the 1930s, Qatar was an undeveloped country whose main trading activities were fishing and pearl fishing. After oil extraction and production began in the 1950s, the country began to grow and develop economically (Qatar e-government 02, 2020). Sheikh Hamad Bin Khalifa Al-Thani's period as ruler of the country (1995 - 2013) saw the greatest development in many sectors in the country. Population growth was exponential: in 1995 there were around 513,000 people in the country, and by the end of 2013 there were over 2,336,000 people (Worldometer, 2020), of which only around 400,000 were Qataris. This increase was mainly due to the growth in expatriate labour, which was focused on building, operating and working at new and expanding organisations.

The state of Qatar is one of the six countries that make up the GCC (Gulf Cooperation Council), which was formed in 1981. The genesis of the GCC occurred six years before that, in 1975, when His Highness the Emir of Kuwait Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah visited Sheikh Zayed Al Nahyan, the ruler of the United Arab Emirates, his idea to create the GCC. In May 1981, the six countries – the Kingdom of Saudi Arabia, the Oman Sultanate, the United Arab Emirates, the State of Kuwait, the State of Qatar and the Kingdom of Bahrain – agreed to form the GCC. They agreed to work together for their mutual benefit in a range of areas, of which education was one.

Qatar's development proceeded across various fields, such as health services, economics, education and sports. In health development, for example, as of 2019 Qatar has over 27 health centres, provides over 50 services and is home to 4000 clinicians (PHCC, 2019). One of the most recently developed services is virtual consultation, which was very useful during the COVID-19 pandemic (PHCC, 2021).

Economically, Qatar's Gross Domestic Product has increased greatly since 2000, increasing from 17.76 billion USD to 175.8 billion USD in 2019 (The World Bank, 2021). The main cause of this increase is related to the expansion in oil and gas production. In sports, Qatar has hosted many events, such as the Asian games 2006 (with a second hosting to occur in 2030). It has hosted a variety of handball, wrestling, basketball, tennis, table tennis and football events, and will host the FIFA World Cup in 2022.

Educationally, Qatar has hosted 51 TEDx events (TED, 2021). It has also hosted educational initiatives such as WISE (World Innovation Summit for Education), which discusses various topics related to education, such as access and inclusion, early childhood, emerging technologies and EdTech, life skills and others (WISE, 2021). Qatar reached this global level after a challenging period of development. The following section details the history of Qatar's education system.

2.3) The History of Education in Qatar

In the 1890s, education in Qatar was through what were known as *kuttab* and *mulla*. Those two words refer to the teachers of the time, who used to gather students at their houses or in *masjids* (mosques). At that time, the existence of 15 such schools is recorded in Ottoman documents (Al-Abdulla, 1998). Studies in these schools focused on the Holy Quran, Islamic Studies, Arabic language and poetry. The education system did not change a great deal until the 1950s, when the production of oil became a spur for change. In 1952 and 1953, the Amir of Qatar at that time, Sheikh Ali Bin Abdulla Al-Thani, ordered four people to develop an educational plan for the whole country (Al-Abdulla, 1998). In 1954 there were two formal schools, and after two years this had increased to six schools with 1089 students. In 1957, the Ministry of Knowledge (which was later renamed the Ministry of Education, MoEd) was founded with HH Sheikh Khalifa bin Hamad Al-Thani as its president. By 1964 there were nine schools with 4346 students (Al-Abdulla, 1998).

Another significant change in education took place between 1965 and 1972, when the Ministry of Education developed its own curricula and education expanded to the secondary level for both genders (Al-Kobaisi, 1979). In the 1970s, Qatar began to develop its first higher education institution, Qatar University, which was formally opened in 1977 (QU, 2020).

Education kept expanding until 2002, when the government officially announced the establishment of the Supreme Educational Council (SEC), which gradually replaced the MoEd and took over its projects (Brewer et al., 2007; SEC, 2002). The main change that occurred after the establishment of the SEC was the reform of government schools. This reform program started with five schools. Its main feature was that each government school was to be considered an ‘independent school’ that was commercially run by its principal. Instead of the MoEd controlling schools’ expenses through their finance team, the school principal received an annual budget in the school's private bank account that was expected to cover all costs (such as salaries, refurbishments, utilities and equipment). Each principal became responsible for his or her school's curriculum; before, this had been provided to all government schools by the MoEd's curriculum development team. Another important reform that affected assessment practices was dual examination, which meant that students sat two examinations for all subjects. The first of these examinations was provided by the school and the second by the SEC. However, the SEC reverted to being the MoEd, and 'independent schools' to 'government schools', in 2016 (see 2.6 below). The following figure shows the four main periods in Qatar's educational development:

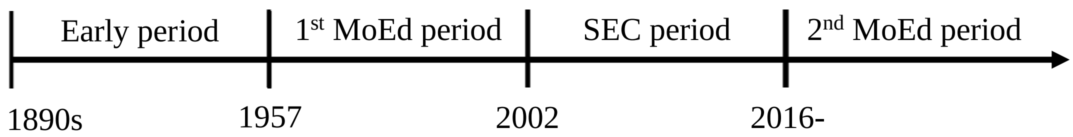

Figure 1. Timeline showing Qatar's educational development

2.4) Educational Structure

The education system in Qatar has three main stages: Primary, Preparatory and Secondary. The Primary stage consists of six grades (1 - 6). Students start at the age of six or seven years old in Grade One. In Grade 6 students are around 12 years old. The Preparatory stage (equivalent to Lower Secondary or Middle School elsewhere) consists of three grades (7 - 9). Students start Grade 7 at the age of 13 years old and by grade 9 are around 15 years old. The Secondary stage (equivalent to High School or Upper Secondary elsewhere) consists of three grades (10 - 12). Students start Grade 10 at the age of 16 and by Grade 12 are about 18 years old.

All students follow the same curriculum until Grade 11, when they are given the option to choose one of three different paths: the scientific path, the literature and humanities path, or the technological path. Across those paths there are three categories for the subjects taught: shared subjects, mandatory path subjects and elective subjects.

The shared subjects are Islamic Studies, English Language, Physical Education and Social Skills/Scientific Research. For students on the scientific path, the mandatory subjects are Arabic language, Mathematics, Chemistry, Physics and Biology; elective subjects are Business Management, Information Technology, Visual Arts (Architecture/Interior Design), and History/Geography. For students on the literature and humanities path, mandatory subjects are Arabic Language, General Science, Geography, History and General Mathematics. Elective subjects are Visual Arts, Business Management, Languages, Mathematics (derivatives and integrations) and Information Technology. For students on the technological path, the mandatory subjects are Telecommunications and Network Technologies, Algorithms and Programming, Mathematics, Arabic Language and Physics. Elective subjects on this path are Visual Arts, Business Management, Chemistry and History/Geography (MoEd, 2019).

The government's 2030 Vision aimed to set goals for different sectors in the country. The following section discusses this vision, focusing primarily on education.

2.5) Qatar's 2030 Vision

In 2008, Sheikh Hamad Bin Khalifa Al-Thani announced the country's National Vision for 2030 (QNV 2030). QNV 2030 was structured according to the four pillars of Human, Social, Economic and Environmental Development. In the words of the official QNV documentation:

- 'Human development: is the development of all its people to enable them to sustain a prosperous society

- Social development: is the development of a just and caring society based on high moral standard, and capable of playing a significant role in the global partnership for development
- Economic development: is the development of a competitive and diversified economy capable of meeting the needs of, and securing a high standard of living for, all its people for the present and for the future
- Environmental development: is the management of the environment such that there is harmony between economic growth, social development and environmental protection.' (GSDP, 2008).

'An Educated Population' is one of the three components of the Human Development pillar. Qatar aims to provide a world-class education system that equips its citizens with the skills they need and allows them to reach their full potential. The system supports and encourages research, creativity and innovation through an effective system of funding for scientific research (GSDP, 2008).

2.6) Investment in Educational Technology

Qatar has invested considerably in developing its educational system. The following tables present the increase in the number of schools, teachers and students, separating government schools (gov.) and independent schools (ind.). From the school years 2005/06 to 2014/15, the reports were annually generated by the SEC. For the years 2015/16 and 2016/17, reports were annually generated by the MoEd.

As shown in Table 1 below, the number of government schools began to decrease in the 2006/07 academic year. This was due to their transformation into independent schools following the SEC's educational plan. By the 2010/2011 academic year, all government schools had become independent schools. It can be seen in Table 1 that the total number of schools decreased in this school year. This occurred for two main reasons: first, some government schools were amalgamated to create a new independent school in a new building, and second, some school buildings were demolished and those schools were closed permanently. In 2016/17, the SEC reverted to being the MoEd and all independent schools also reverted to being government schools.

Table 1. Number of schools in Qatar, 2005-2017

Year	**# Gov. Schools**	**# Ind. Schools**	**Total schools**
2005/06	152	0	152
2006/07	138	52	190
2007/08	118	70	188
2008/09	93	85	178
2009/10	92	108	200
2010/11	0	170	170
2011/12	0	178	178
2012/13	0	178	178
2013/14	0	178	178
2014/15	0	179	179
2015/16	0	189	189
2016/17	193	0	193

Table 2 below highlights the number of teachers teaching in government schools, which were transformed into independent schools and then back to government schools as stated above. The number of teachers increased until 2010/11, when it decreased due to the merging and closures of government schools.

Table 2. Number of teachers in Qatar, 2005-2017

Year	# Gov. Teachers	# Ind. Teachers	Total Teachers
2005/06	6,802	0	6,802
2006/07	6,747	2,657	9,404
2007/08	6,169	3,646	9,815
2008/09	4,975	4,506	9,481
2009/10	3,693	5,536	9,229
2010/11	0	8,942	8,942
2011/12	0	12,358	12,358
2012/13	0	12,130	12,130
2013/14	0	13,326	13,326
2014/15	0	13,728	13,728
2015/16	0	14,552	14,552
2016/17	14,888	0	14,888

Table 3 below shows the number of students in the same school years. A similar pattern to previous tables can be seen, with one difference: the number of students did not decrease, as compared to the numbers of schools and teachers shown in Tables 1 and 2. This is because the SEC moved students affected by school closures to the nearest schools to their homes. This allowed students to continue their learning without disruption.

Table 3. Number of students in Qatar, 2005-2017

Year	# Gov. Students	# Ind. Students	Total Students
2005/06	55,778	0	55,778
2006/07	48,834	29,019	77,853
2007/08	38,504	40,782	79,286
2008/09	30,493	49,900	80,393
2009/10	18,864	62,915	81,779
2010/11	0	85,863	85,863
2011/12	0	89,200	89,200
2012/13	0	96,720	96,720
2013/14	0	98,908	98,908
2014/15	0	102,241	102,241
2015/16	0	107,986	107,986
2016/17	113,532	0	113,532

The SEC (and later the MoEd) introduced various technologies to support teaching and learning practices. They equipped classrooms with projectors, provided teachers with laptops, prepared computer laboratories and installed smartboards. Table 4 shows the increase in computer provision to students and schools.

Table 4. Average computers per school and average students per computer, 2005-2017

Year	Gov. Students/ Computer	Ind. Students/ Computer	Average	Computers/ Gov. School	Computers/ Ind. School	Average
2005/06	12.8	0	-	27.2	0	-
2006/07	18.5	8.4	13.45	28.3	143	85.65
2007/08	12.6	9	10.8	39.3	150.1	94.7
2008/09	12	5.4	8.7	37	196.1	116.55
2009/10	9.5	6.2	7.85	38.8	207.1	122.95
2010/11	0	6.8	-	0	141.2	-
2011/12	0	7.3	-	0	151.4	-
2012/13	0	7	-	0	177.1	-
2013/14	0	4	-	0	253.4	-
2014/15	0	15	-	0	169.2	-
2015/16	0	11.2	-	0	172	-
2016/17	8.5	0	-	180	0	-

2.6.1) The Knowledge Net

The Qatari government established the Supreme Council of Information and Communication Technology (ictQatar) in 2004, with the aim to develop a knowledge-based society, and equip graduate students with the skills required to meet the challenges of workplaces and industry (Al-Jaber & Dutta, 2008; Karkouti, 2016). In 2005, the School Knowledge Net (K-Net) was introduced by ictQatar into schools, with eight schools participating in the first implementation phase. By 2008, the number of schools participating in K-net project had increased to 37 independent schools. K-Net was ‘a three-way educational portal connecting users with resources’ (MOTC, 2009).

ictQatar worked closely with stakeholders to address technical issues with K-Net, providing individual training and workshops. As a way to encourage K-Net integration, ictQatar presented awards in eight categories for the best K-Net integration by schools and teachers. Along with the SEC, they gradually increased the number of participating schools to cover all of the independent schools in the country by 2010 (Brewer et al., 2007; Karkouti, 2016; MOTC, 2009).

2.6.2) The Learning Management System in Qatar

With the continuous development of K-Net by the SEC and ictQatar, the system was reformed and reintroduced as the Learning Management System (LMS) in 2011. LMS implementation in schools was executed in three stages, starting in the 2011/12 academic year (Bader, 2012). The second phase began in the first semester or the 2012/13 academic year (Bodor, 2012), and the third and final phase, in which the LMS covered all independent schools in Qatar, began in the second semester of the 2012/13 academic year (Al-Arab, 2013; Al-Sharq, 2013).

Teachers were trained in the use of the LMS prior to its implementation. The SEC indicated that they had trained 600 teachers prior to the second phase of implementation (Bodor, 2012). In addition, lead LMS teachers in schools who were charged with implementing LMS provided in-house training sessions for colleagues at the same school (Bader, 2012).

In support of the LMS project, the SEC announced the electronic school bag (e-bag) project (Bodor, 2012; Karkouti, 2016), whereby all students received a tablet device loaded with e-books for all study modules. The SEC also created an online library called the ‘e-library’ and an online platform for materials called ‘e-content’ (Lonn et al., 2011; Bader, 2012; Al-Arab, 2013).

In February 2013, the first phase of the e-bag project was launched, with the aim that it would be completed within three years (Bodor, 2012; SEC, 2013). However, this goal was not achieved and the distribution of the e-bags was discontinued. Some of the reasons for stopping this project were mentioned by one school principal in a press interview: he stated that the tablet devices had been subject to technical issues such as battery life, maintenance cost and inappropriate use by students leading to damage (Al-Watan, 2017). In 2017, the MoEd mentioned in a press interview that they had replaced e-bags for each student with tablet devices for schools. Instead of individual tablets, they provided each school with a number of portable tablet devices and fixed computers in computer laboratories for students to use and to be integrated with the LMS (Al-Watan, 2017).

In 2016, by a new Emiri decree, the MoEd was re-established and the SEC abolished, and the MoEd took over all of the SEC's responsibilities (Al-Fakki, 2016; Almeezan, 2016; Karkouti, 2016). LMS integration continued to be implemented, but with less public attention due to this major change in the education system. Technical information regarding the LMS and its global use are discussed in the following section.

2.7) The Learning Management System

The LMS is one of the most well-known technologies adopted by educational organisations. Its use has been reported in many studies, though most of these studies have focused on higher education organisations (Adzharuddin & Ling, 2013; Asiri et al., 2012; Emelyanova & Voronina, 2014; Oliveira et al., 2016; Ouadoud et al., 2018). Several, however, have focused on K-12 stages (Awang et al., 2011; De Smet et al., 2012; Nasser et al., 2011; Yildirim et al., 2012).

2.7.1) What is an LMS?

An LMS is a type of technology used to promote educational practices through e-learning. The LMS became very popular in the 21st century (Saputry, 2021). E-learning in an educational context means ‘all forms of electronically supported or mediated learning and teaching’ (Al-Qahtani & Higgins, 2013; p. 221; Keengwe et al., 2014). E-learning is sometimes referred to as online learning because of its use of the internet (Al-Qahtani & Higgins, 2013; Sorgenfrei & Smolnik, 2016; Turvey, 2010).

The LMS is a product of previous innovations that were developed over time and introduced into the field beginning in the early 1920s. Many current LMS functions were similar in early teaching and learning practices, such as the teaching machine used by Sidney L. Pressy in the 1920s that utilised multiple choice questions. When using this machine, students could not advance to the next question unless they selected the correct answer (Athmika, 2020).

In 1953, the first video airing of a lecture was televised from the University of Houston, USA (Athmika, 2020). One key invention in 1960 was PLATO (Programmed Logic for Automatic Teaching Operations). This was a computer-based training program introduced by Dr Donald Bitzer that allowed learners to take control of their learning (Athmika, 2020). Another feature of PLATO was the introduction of social and collaborative learning communities through its networks. Learners were able to chat with each other in dedicated chat rooms (Athmika, 2020). PLATO was further developed and used as an LMS more recently (Watson & Watson, 2007).

In 2000 the first open-source LMS was introduced. This was named MOODLE (Modular Object-Oriented Dynamic Learning Environment). MOODLE was a software package that learners could download onto their computers. One of its main features was personalised learning, whereby learners were able to choose their content (Athmika, 2020). MOODLE was followed by other LMSs such as WebCT and Blackboard (Cavus, 2013).

LMS continued to develop and have included an increasingly large variety of functions. Currently, an LMS is specifically defined as an online interactive software technology used to support learning and teaching practices in terms of planning, material distribution, communication and performance evaluation (Adzharuddin & Ling, 2013; Al-Busaidi & Al-Shihi, 2010; Asiri et al., 2012; De Smet et al., 2012; Ouadoud et al., 2018).

Planning in the LMS consists of developing strategies to achieve goals (Mahoney & Cameron, 2008; Oliveira et al., 2016). Planning has many forms: teachers can plan their lessons and develop strategies to be used, they can create personal learning plans and strategies for individual students based on their performance, or they can create plans for specific groups of students (Oliveira et al., 2016; Yildirim et al., 2012). For example, a student could be doing very well in a subject, and to keep this student motivated a teacher could create a motivation plan that contains bonus challenging tasks. The planning function can also be used by other stakeholders, for example the school administration. School administrations can use the LMS to plan, manage and organise specific training courses and online forum discussions or meetings (Adzharuddin & Ling, 2013; Oliveira et al., 2016).

Via the LMS, electronic materials can be shared more easily and quickly than hard copies. The LMS also allows for the sharing of various types of materials, such as documents, web links, videos, audio files and pictures (Hoic-Bozic et al., 2009; Kesim & Altinpulluk, 2013; Lonn et al., 2011). Sharing materials supports the sharing and construction of knowledge (Chen, 2008; Cobb & Bowers, 1999; Ouadoud et al., 2018), and constructing knowledge is one of the goals of learning (Teo & Noyes, 2008; Nasser et al., 2011). The sharing feature of the LMS also supports different student learning styles (Surjuno, 2011), for example those described by Sarasin (1999) in her VAK (Visual, Auditory, Kinaesthetic) theory.

Communicating online through the LMS opens space for interactions outside of school at any place and any time on a controlled online platform; both synchronous and asynchronous communication are enabled (Ouadoud et al, 2018). An online communication feature is helpful for students and teachers, for example. Teachers can discuss items that were not covered during the class or can open a new discussion with students about the next topic. Students who are shy, who might not have had the opportunity to ask questions during a class, or who came up with new questions after a class can use the LMS to communicate with their teachers. One of the benefits of communicating online is that students have more time to reflect on a question before answering (Martín-Rodríguez et al., 2015). In the United Kingdom, the government saw the importance of online communication, outlining in the Department of Education and Schools e-strategy that they expected schools to provide access to online educational platforms for students by 2010 (Turvey, 2010).

Another benefit of online communication through the LMS is that it provides more opportunities to listen to students and their families (Turvey, 2010). Teachers' communication with parents through the LMS increases parents' interaction with the LMS, making parents more likely to see the LMS as beneficial (Blau & Hameiri, 2010). Students also have the flexibility to learn in a one-on-one environment or collaboratively in a group with other students (Sorgenfrei & Smolnik, 2016). Thus, communication becomes more effective with the use of the LMS (Al-Busaidi & Al-Shihi, 2010).

Skill in online communication and collaboration is a key work requirement in the 21st century (Wilson et al., 2015). Online communication through the LMS has many forms, including text, voice recordings and videos. Communicating through the LMS is not only for students and teachers; school administrations and parents can also use it (Davidovitch & Yavich 2015; Nasser et al., 2011).

Students' grades and teachers' performance evaluations can also be recorded in the LMS (Oliveira et al., 2016). Teachers' interactions with the system can be accessed by the school administration through electronic records of logins that can be generated using an administrator account (De Smet et al., 2012; Nasser et al., 2011). Parents can also follow their children's performance by accessing their children's profiles in the LMS (Hidayat, 2018; Nasser, 2019; Nasser et al., 2011). Checking performance and receiving feedback influences students' achievement (Davidovitch & Yavich, 2015). LMS have helped learners to counteract social isolation through online learning, especially during the COVID-19 pandemic, when online learning became the most widely used teaching and learning method (Hanafie Das et al., 2020; Raza et al., 2021).

Globally, the LMS has been tested and used in many countries. The decision as to when to adopt and integrate the system has been different from one country to another, and the level of integration has also varied. The following section presents some examples of LMS integration in different countries.

2.7.2) Countries Investing in LMSs

Many instances of LMS integration have been based on private organisational decisions. However, there have also been some cases in which governments took the responsibility for such an integration. Below are some examples of LMS integration across the globe categorised by geographical location.

2.7.2.1) The Eastern World

In Hong Kong, Cheng and Yuen (2018) evaluated LMS use in junior secondary schools. They took a longitudinal approach, distributing surveys at intervals of three months. The first survey was distributed at the beginning of the academic year, the second survey after three months, and the final survey was distributed six months after the first. Their model was based on TAM and Expectation Confirmation Model (ECM) proposed by Oliver (1980). The aim of their research was to understand students' acceptance of LMS continuous usage, and their participants were 1,182 junior secondary students from 25 schools. All surveys were administered by teachers in computer classrooms at their schools. Interestingly, these researchers found that perceived ease of use was not significantly related to students' intentions to use the LMS in the first survey. However, ease of use became increasingly associated with intention and satisfaction in the second and third surveys. The findings regarding the effect of perceived usefulness on intention and satisfaction were the opposite: there was a strong effect in the first survey, but this dropped off in the later surveys (Cheng & Yuen, 2018). One of the limitations acknowledged was the targeted sample: because the participants were junior secondary students, compared to adults, some bias may have occurred due to relative differences in cognitive skills (Cheng & Yuen, 2018).

Research into the use of LMSs in some countries has evaluated updates, as with the research done in Indonesia by Hidayat (2018). He tested a new LMS system known as Quipperschool that aimed to improve students' mastery of Biology at senior high school level. The LMS previously used by these students had a fixed design that did not allow teachers to make modifications based on students' needs. The Quipperschool system had three main features: Quipper School Link, Quipper School Learn and Quipper School Create (Hidayat, 2018). The system allowed students to interact online through reading, writing and access to online materials. They could also access their own and their peers' performances. Another feature of Quipperschool is an adaptable curriculum for all stages from junior to senior high. Hidayat

(2018) found that Quipperschool could be used to improve mastery of biology at senior high school level. There were some technical issues related to internet connections and device availability, so he recommended that blended learning be applied to overcome those issues (Hidayat, 2018).

Malaysia initiated Smart School Integrated Solutions (SSIS) in 1997 as part of the country's 2020 vision. The aim of SSIS was to transform teaching and learning processes by integrating technologies at school. The Malaysian government chose 90 schools to begin with based on their performance and location. Those 'smart schools' differed in their technological facilities from normal schools: they were better equipped with ICT infrastructure that promoted the use of Smart School Management Systems (SSMS). The Malaysian government believed that schools should be transformed to be able to cope with the new technological challenges (Ali et al., 2009; Thang et al., 2011). Awang et al. (2011) compared 25 smart schools with 25 normal schools in terms of progress in using knowledge management systems. They created a conceptual model that highlighted the influence of culture, management and technology on the creation, capture, storage, application and sharing of knowledge. Their questionnaire tool had five sub-sections: the importance of managing knowledge, facilities and methods of managing knowledge, knowledge sharing barriers, knowledge activities, and contributing factors to managing knowledge. They found that culture, management and technology all supported knowledge management. However, they also were able to identify some barriers, including 'time constraints, workloads, sharing behaviour and the ICT infrastructure' (Awang et al., 2011; p. 279). One interesting finding was that despite smart schools' extra funding compared to normal schools, the school type was not found to be a determinant of knowledge activities (Awang et al., 2011).

Oman recently introduced an LMS into their education system, aiming to address issues with the system 'through a data driven approach' (Nasser, 2019). In 2016, the Ministry of

Education in Oman rolled out an LMS covering all of the Sultanate's schools. In the beginning, the LMS was used for administrative purposes only. More recently the system has started to include students and parents and the variety of information available has increased, such as new access to students' achievements (Nasser, 2019).

Another study in Indonesia had a unique focus on students' morals in addition to their learning during the COVID-19 pandemic. Hanafie Das et al. (2020) researched the possibility of developing a sociocultural approach during the challenging pandemic period through Moodle. This research took place at the University of Muhammadiyah Enrekang. They gathered data through Moodle, observations, tests and documentation. They found that students showed developments in their creativity with the use of Moodle as an LMS.

2.7.2.2) The Western World

In Australia, Mahoney and Cameron (2008) investigated whether an LMS should be integrated in schools. Due to the fast technological development in this area, 2008 technologies are now outdated when compared to current technologies. However, these researchers examined MOODLE as the LMS integrated into schools, a system that did provide many of the functions provided by today's LMSs, such as monitoring progress, allowing online quizzes and uploading tutorials and PowerPoint presentations, in addition to submitting assignments online (Mahoney & Cameron, 2008). Teachers participating in the research, regardless of their literacy level and LMS skills, found the LMS useful for lesson planning. As there were six teachers delivering the same course, only one of them needed to do each lesson plan and then share it with the others, so sparing them time to work on other teaching-related tasks (Mahoney & Cameron, 2008). There were some issues with the initial usage of MOODLE: for example, planning and monitoring online discussions was time-consuming. Some technical issues also occurred while connecting MOODLE to the school network, as the school administration aimed to have a single username and password for both systems. The claim that an LMS would benefit all schools was not conclusively supported in their research, as there were many factors to be considered, making LMS uptake in a school a complex decision (Mahoney & Cameron, 2008).

In Belgium, an LMS is widely used across the country, covering all regions. The Belgian government finances the LMS system integration through GO! Network, which is one of three main educational networks in the region of Flanders. Each educational network is free to create its own curriculum (De Smet, 2015). De Smet et al. (2012) tested the instructional use and acceptance of LMS by teachers in secondary stage schools in Belgium, differentiating between informational use and communicational use. Seventy-two schools were willing to participate in the research, resulting in a total of 505 participating teachers. The researchers found that informational use took precedence over communicational use, and that for teachers to use the LMS in an informational way, ease of use and LMS usefulness should be considered (De Smet et al., 2012). They also found that being innovative was not necessarily enough to prompt teachers to use the LMS for communication. Perceived ease of use was found to be the strongest indicator of LMS acceptance. The researchers recommended that school managers 'take into account the importance of a teachers' efforts and performance perceptions and the direct and indirect impact of internal ICT support on LMS adoption' (De Smet et al., 2012, p. 688).

In Canada, Stockless (2018) tested the acceptance of the LMS in a school with 35,000 students and 2,400 teachers. At the time of the research, the LMS had been newly introduced to the school less than a year before. Stockless (2018) predicted that the LMS would be beneficial for K-12 students' learning, as it had been found to be beneficial for higher education students. The research used the famous TAM created by Davis (1989) to identify factors that influence LMS acceptability by teachers, check whether teachers' ICT use influences their intentions regarding LMS usage, and whether ICT used by teachers influences their perception of the affordances of LMS features. He found that the LMS supports teachers' teaching and learning practices, and that teachers' perceptions of LMS usefulness influence their intentions. However, he could not confirm that teachers' ICT use and their perceptions of the affordances of LMS features were predictors of teachers' intentions to use the LMS. Several factors were suggested to have affected the findings: the optionality of LMS use for teachers, the number of teachers trained in LMS use, and the number of teachers who participated in the research. In addition, the LMS had been relatively recently introduced into the school system (Stockless, 2018).

Slovakia tested the use of an LMS called Claroline in the 2011/2012 academic year. The aim of this study was to evaluate students' experiences and opinions regarding the system (Balážovič & Karolčík, 2016). Claroline LMS supports the Slovak language, and it is free for teachers to use: they can simply create an account with a password, log in and start using it. Claroline is fast, easy to use and provides teachers with the opportunity to produce interactive exercises intended to attract and promote students' learning (Balážovič & Karolčík, 2016). For example, when students complete an online test in Claroline, they receive their results and feedback instantly. Balážovič & Karolčík (2016) used a survey tool with both open- and close-ended questions to collect the data. They found that Claroline LMS integration by primary stage students did not pose any difficulties, and that parents were gradually accepting the e-learning environment (Balážovič & Karolčík, 2016). One interesting finding was that pupils requested a 'test administered via the Claroline' (Balážovič & Karolčík, 2016; p. 20).

2.7.3) Issues Affecting LMS Integration

The decision to integrate a technology is based on its benefits and the value it is predicted to bring to the educational system and to society, as described above. However, integrating such technologies can be complex and is not always successful, as there are many factors that need to be considered.

The literature featured some criticisms of the benefits of LMS in educational institutions. Some of these were design problems: The LMS was found to be designed to focus more on teacher-centric approaches. This issue was reflected in the system's static structure, and in the fact that most features in the system were run under an instructor's supervision (Alfelaij, 2016; Alhazmi & Abdulrahman, 2012; Ottenbreit-Leftwich et al., 2010).

Some researchers reported that students' outcomes and achievements did not improve after the integration of the LMS and similar technologies (Alhazmi & Abdulrahman, 2012; Al-Qahtani & Higgins, 2012). It was reported in some cases that the administrative requirements of the LMS were overloaded, hindering teachers' educational integration of the system (Alhazmi & Abdulrahman, 2012; Awang et al., 2011; De Smet; 2015). Hence, the LMS was typically not used to promote student-centric approaches in which students are expected to construct knowledge. In some cases, the LMS was found to have a limiting effect on self-directed learning, as materials and learning tasks are all prescribed (McLoughlin & Lee, 2010). It was also found that the LMS did not support informal student-centric learning (Chen & Bryer, 2012). These authors recommended the inclusion of social media as a tool to encourage discussions and collaborations with clear agendas.

In her personal reflection, Al-Ali (2010) comments that the technology department at the organisation she worked at refused to encourage students and other stakeholders to use the e-learning system. The refusal was due to a reversal from the Public Authority of Applied Education and Training (PAAET) of their initial agreement on implementation. Instead of gradually expanding the e-learning system, they wanted it to cover the whole organisation, without training teachers or students (Al-Ali, 2010). Such issues contribute to the failure of technological integrations.

The language used in LMSs has also affected their successful use. For example, many participants have requested to have materials in Arabic rather than English (Safar, 2012). Some countries' governments may show an interest in integrating technologies into their education system, but in practice they may not treat this as a high priority. As a result, school principals in these countries may abandon the idea of integrating e-learning into their schools (Alfelaij, 2016).

2.8) Summary

This chapter has presented some background on Qatar, the country that is the focus of this research, including general information, educational history and development, educational structure, 2030 Vision and recent technological investment in the educational system with the introduction of the LMS. Following this, an LMS was defined and the global use of LMS was discussed with a focus on the K-12 level. Finally, several issues that have been shown to affect the successful integration of the LMS were presented.

The next chapter will provide a deeper literature review regarding the factors that influence teachers' behaviour in relation to LMS integration. It will also feature an examination of relevant theoretical background relating to learning, human behaviour and technology acceptance and integration.

Chapter 3 – Literature Review

3.1) Introduction

This chapter reviews the literature on factors influencing teachers' behaviour regarding learning management system (LMS) integration in practice. The literature review is split into four sections. The first section examines potential factors influencing LMS integration. This section focuses on three main aspects: subjective norms, attitudes and perceived behavioural control. The second section reviews literature related to learning theories and the integration of the LMS. The three main theories examined are behaviourism, cognitivism and constructivism. The third section reviews influential theoretical frameworks aimed at understanding human behaviour and development, which are the basis for other theoretical frameworks. The fourth section covers technology interventions in education. This section focuses on theoretical frameworks that have been developed to understand user behaviour regarding technology acceptance and integration.

3.2) Factors Influencing LMS Integration

Researchers have identified many factors influencing technology integration in general and LMS integration in particular (Abdul Hamid et al., 2020; Adzharuddin & Ling, 2013; Al-Qahtani & Higgins, 2013; Ashrafi et al., 2020; De Smet et al., 2012; Emelyanova & Voronina, 2014; Nasser et al., 2011; Ozkan et al., 2020; Yuen et al., 2019). Various methods are used to categorise factors in the literature. For example, Nasser et al. (2011) examined the factors affecting student usage of LMS in Qatar schools and categorised these factors as manipulative and non-manipulative. These researchers recruited over 1,300 participants to answer questionnaires, and followed the questionnaires with student focus groups; however they did not include other important factors such as teachers, time and workload.

In their research on the Jusur LMS in the Kingdom of Saudi Arabia's higher education, Asiri et al. (2012) used internal and external variables as the categories (see Figure 2). The internal variables included three sub-categories: attitudes towards the use of LMS, beliefs about e-learning, and competence level in using the LMS. External variables included external barriers and demographic factors. Their framework and categorisation were based on a combination of two theoretical frameworks, the Theory of Reasoned Action (TRA, Ajzen, 1991) and the Technology Acceptance Method (TAM, Davis, 1989), in addition to some recommendations from the literature (Asiri et al., 2012). Both theories will be discussed in the theoretical background section (section 3.3).

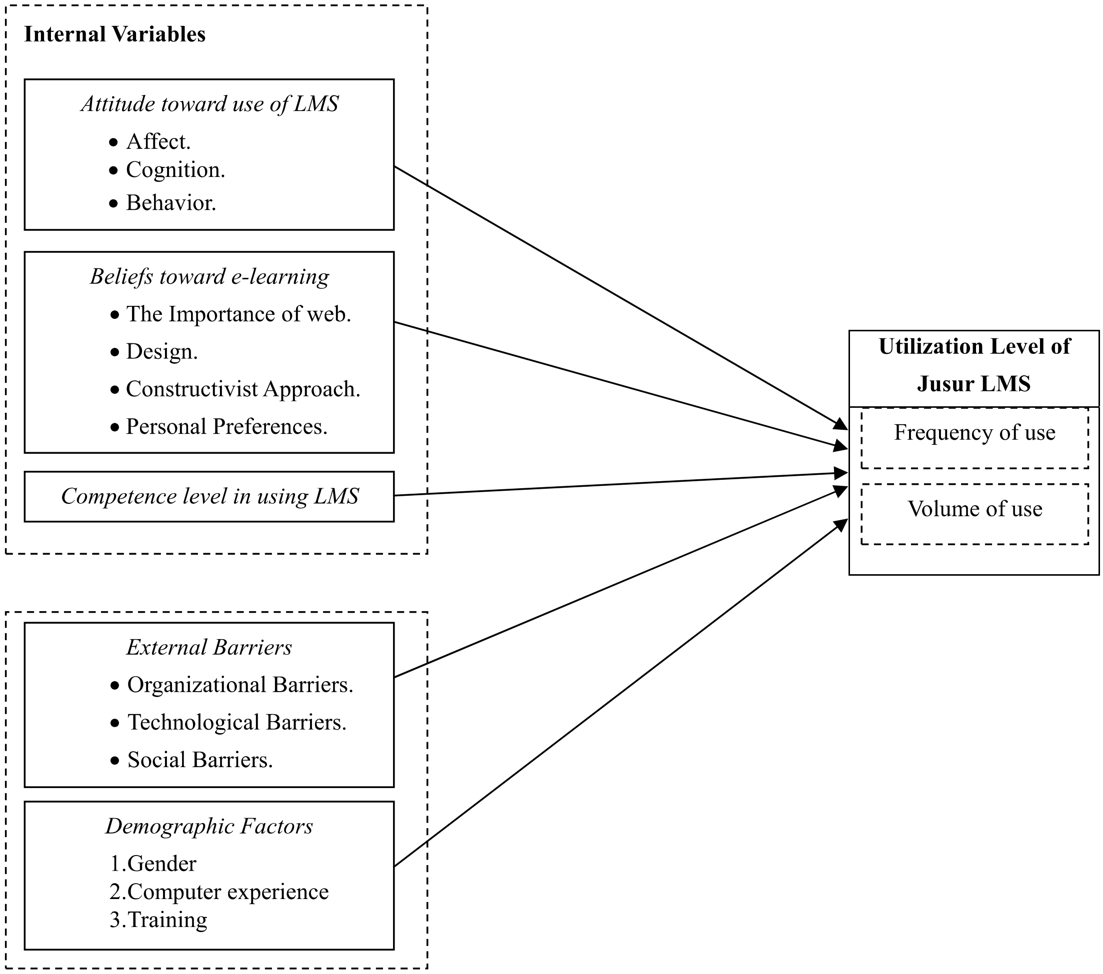

Figure 2. Jusur LMS utilisation framework (Asiri et al., 2012, p. 137).

Research by Al-Busaidi and Al-Shihi (2010) on the acceptance of the LMS was conducted to create a theoretical framework for evaluating the acceptance of the LMS by instructors (see Figure 3). These researchers based their work on the TAM (Davis, 1989). Three categories of factors were identified: instructor factors, organisational factors and technology factors. All of these categories had a direct relationship with the TAM components perceived usefulness (PU) and perceived ease of use (PEU), which will be discussed in detail in section 3.5. Their theoretical framework focused on the acceptance of the LMS by instructors and did not include other factors, such as social factors (Chien et al., 2014; Kriek & Stols, 2010) and policies (Asiri et al., 2012; Nasser et al., 2011).

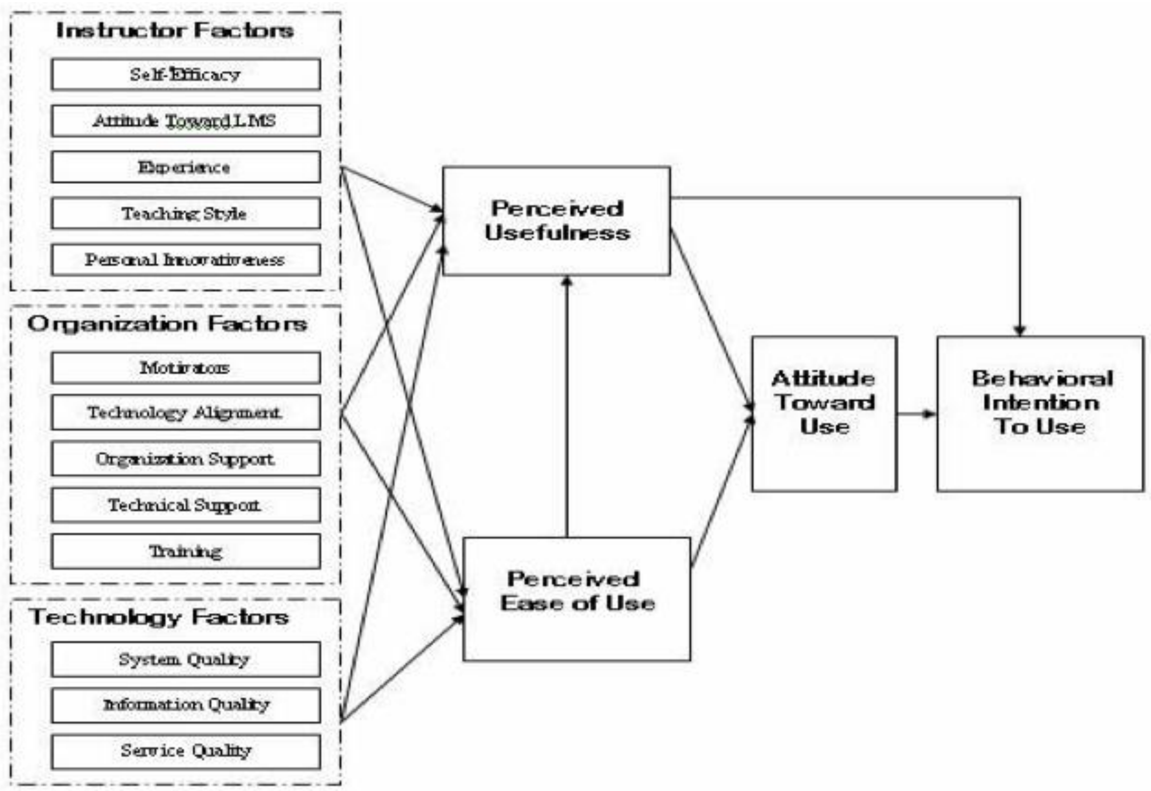

Figure 3. Instructor's LMS acceptance model (Al-Busaidi & Al-Shihi, 2010, p. 6) see appendix A for a better readable information.

In this chapter, literature will be reviewed following the categorisation system developed by Chien et al. (2014): subjective norms, attitudes and perceived behavioural control. Subjective norms include social factors, attitudes include factors related to the technology integrated, and perceived behavioural control includes factors related to the resources and of personal control. These three categories are the determinants of intention introduced originally by Taylor and Todd (1995) in their Decomposed Theory of Planned Behaviour (DTPB). The following section will review the factors influencing LMS integration by teachers.

3.2.1) Subjective Norm Factors

Subjective norms refer to social relationships that affect teachers in terms of performing a behaviour or approving of it (Abdul Hamid et al., 2020; Aljaloud et al., 2019; Ashrafi et al., 2020; Chien et al., 2014; Kriek & Stols, 2010; Trafimow, 2008). Subjective norms have been shown to be a significant determinant of behavioural intention (Abdul Hamid et al., 2020; Bond, 2019; Tarhini et al., 2015). Taylor and Todd's (1995) DTPB decomposed two factors under subjective norms: peers and superiors who are members of a person's social environment that influence their decision making (Chien et al., 2014). Asiri et al. (2012) emphasised the importance of teachers' social awareness and social support. Chien et al. (2014) examined perceived social pressure as a factor influencing teachers' intentions, which determine their behaviour according to TRA (Ajzen & Fishbein, 1977). These examples demonstrate the importance of social considerations, especially as education in schools occurs in social environments (Shieh, 2012).

In LMS, online communication is one social feature that enables teachers to communicate with students, parents, administrators and colleagues (Abdul Hamid et al., 2020). This communication is open and is not restricted to a place or time: they can communicate synchronously and asynchronously (Abdel-Maksoud, 2018). Stakeholders such as policy makers, school administration and parents expect expert use of all of the LMS communication functionalities. These expectations put pressure on teachers when integrating the system (Adzharuddin & Ling, 2013; Nasser et al., 2011). The expectations of teachers themselves surrounding the LMS was found to influence their usage (Aljaloud et al., 2019; Ashrafi et al., 2020). Kriek and Stols (2010) indicated that colleagues' expectations had a significant effect on the integration of technology by teachers. Chen et al. (2008) stated that parents' expectations put pressure on teachers regarding ideal technology use and instruction. This was also found by Ahmad and Hamad (2020) and in a study of smart schools in Malaysia (Awang et al., 2011).

In addition to communication, the contributions of parents to their children's development and to technology integration have been determined to be a significant factor in the successful integration of an LMS and technology by teachers (del Carmen Ramírez-Rueda et al., 2021; Ertmer et al., 2001; Keengwe et al., 2014; Zhu et al., 2018). Parents contribute to teaching and learning processes in different ways. The inclusion of parents in planning and designing student development plans has been found to be beneficial to student learning and to the successful integration of technology by teachers (Bond, 2019; Yildirim et al., 2014). Similarly, Blau and Hameiri (2010) indicated that the involvement of parents improves pedagogy and exchange and 'promote[s] interaction' (p. 245). Parents who recognise the benefits of technology for their children's learning tend to have more positive attitudes towards its day-to-day integration (Ahmad & Hamad, 2020; Tsuei & Hsu, 2019). Therefore, informing parents beforehand about the technology to be integrated at school is recommended to promote their assistance with the integration process (Chien et al., 2014; Tsuei & Hsu 2019).

Parents, and in particular their knowledge of and attitude to technology, have a strong influence on children's use of technology for learning (Bianchi et al., 2020; Looker & Thiessen, 2003). Hadad et al. (2020) highlighted several 'parenting styles' to explain their understanding of child development in relation to technology, a finding supported by Ahmad and Hamad (2020) and Swanzen (2018). Parenting style refers to the 'patterns of parental authority in relation to the child, which create the emotional context for the parent-child relationship' (Hadad et al., 2020, p. 3). Three parenting styles were identified based on Baumrind's (1971) parenting typology: authoritative, authoritarian and permissive (Baumrind, 1971; Hadad et al., 2020; Kaniušonytė & Laursen, 2021; Macmull & Ashkenazi, 2019). A fourth style was added in 1983 by Maccoby and Martin that they termed the 'uninvolved' parenting style. Authoritarian parents expect blind obedience from their children, but do not respond to their children's needs; their children can develop poor self-esteem and social skills. Authoritative style parents respond to their children's needs and have more warmth and support, but they also have high expectations; their children tend to develop good self-esteem and social skills. Permissive parents have fewer rules and are warm and indulgent towards their children; their children tend to have some behavioural problems but usually show high self-esteem and good social skills (Baumrind, 1971; Hadad et al., 2020; Macmull & Ashkenazi, 2019). Uninvolved parents do not become involved in their children's lives, do not set high expectations, and are indifferent to their children's needs; their children tend to be low achievers with weak social skills (Hadad et al., 2020).

The relationship between technology integration and parenting was researched by Hadad et al. (2020) and Ahmad and Hamad (2019), who found that the resistance of some parents could be described based on their perceived lack of acceptance. As detailed in section 3.5, TAM (Davis, 1989) is a good indicator of technology acceptance and is useful in understanding parents' resistance. Theoretically, TAM was found to be insufficient to explain resistance. Rama, Murthy and Mani (2013) introduced the 'three pillars of technology resistance', a model originally based on the 'three pillars of sustainability' (Purvis et al., 2019; WCED, 1987), that includes social, environmental and economic resistance. In technological educational research, a fourth pillar was introduced: 'pedagogical resistance' (Hadad et al., 2020). Social resistance is related to parents' concerns regarding their children's internet exposure in terms of duration and content (Bian & Leung, 2015; Ebbeck et al., 2016). Environmental resistance is related to physical and health risks that the child may suffer, such as back pain, obesity and visual impairment (Ebbeck et al., 2016) or mental ill health (Blau, et al. 2019). Economic resistance is related to parents' capacity to pay for all related components of the technology to be used, including the internet connection, technological devices, maintenance and accessories (Ebbeck et al., 2016). Pedagogical resistance is related mostly to parents' and educators' concerns about students being distracted from learning (Hadad et al., 2020). For example, although technology integration has various features that may enhance pedagogy, the lack of instructional strategies may sometimes cause a disconnection between a technology’s characteristics and the actual use of the technology by students (Sung et al., 2016). For example, the use of some mobile devices in the classroom might allow students to access social media and gaming apps, which affect their concentration (Courage, 2019 in Hadad et al., 2020; Green M., 2019).

The involvement of parents in educational practice can take various forms. Building a community of practice is one useful approach that has been recommended in the literature. A community of practice is a group of people sharing the same agenda and working together in a sustained way to implement that agenda (Đurišić & Bunijevac, 2017; Green T., 2018; Hornby & Blackwell, 2018; Laluvein, 2010). Unlike social networks, which focus on the quantity of interactions, communities of practice tend to focus on the quality of interactions (Hornby & Blackwell 2018; Laluvein, 2010).

In educational parent-teacher communities of practice, the student or child is usually at the centre. Parent-teacher relationships are bound to the existence of students as both teachers and parents have children’s learning as their key focus (Đurišić & Bunijevac, 2017; Hornby & Blackwell 2018). This common agenda may work as the domain to construct a community of practice. A community of practice provides the opportunity to share ways of doing things, understand and agree on what is best for children’s learning, construct knowledge and enhance pedagogy (Hirano & Rowe, 2016; Hornby & Blackwell 2018; Laluvein, 2010). However, there might be some challenges for a community of practice. These might include control, power, trust, expectations and willingness to participate (Hornby & Blackwell 2018; Malone, 2015). Power refers to the ability to force, control or influence others. This kind of power should be recognised, as it may shape social interactions between the members of the community of practice. Exercising power positively promotes trust within relationships. The presence of trust within the community of practice leads to better-quality interactions (Roberts, 2000; Wathne et al., 1996). Two other critical characteristics for a successful community of practice are active participation and members' willingness to share knowledge (Ardichvili et al., 2003).

Students are primary LMS users. As with parents, there are various student-related factors that may affect LMS integration (Abdul Hamid et al., 2020). Student experience in using LMSs can affect LMS integration by teachers (Dündar & Akçayır, 2014; Klobas & McGill, 2010). For example, students need to have the necessary information technology (IT) skills to work with computers and log into the LMS (Adzharuddin & Ling, 2013; Liu et al., 2010; Nasser et al., 2011). Students' lack of IT skills might waste subject-specific teaching time in teaching IT skills (Browne, 2015). However, students may also be experienced and have the necessary skills to use the system but not be motivated to do so (Keengwe et al., 2014; Selim, 2007). Emelyanova and Voronina (2014) stated that students sometimes have no desire to work with the LMS because they are used to face-to-face teaching. In such situations, teachers have been found to value student learning over technology integration (Abdul Hamid et al., 2020; Chien et al., 2014; Herbel-Eisenmann et al., 2006; Wilkins, 2008).

However, students are inevitably going to need to engage with LMS-like software. One of the aims of introducing LMSs into schools is to engage students with this kind of technology. Students' engagement has been discussed in the literature (Abdul Hamid et al., 2020; Aljaloud et al., 2019; Bond, 2019) and has been defined as:

> the energy and effort that students employ within their learning community, observable via any number of behavioural, cognitive or affective indicators across a

> continuum. It is shaped by range of structural and internal influences, including activities and the learning environment. (Bond & Bedenlier, 2019, p.2)

Typically, the more students are in control of their learning environment the more engaged they are (Li et al., 2019; Ozkan et al., 2020; Swanzen, 2018). Student engagement with technology was explicitly theorised by Bond and Bedenlier (2019), who created a student engagement framework that was based on the bioecological model of influence on student engagement. The framework was originally developed by Bronfenbrenner and colleagues (1979) and updated by Bond (2019) and proposes that engagement happens at four systemic levels: micro, meso, exo and macro.

The microsystem is concerned with the students themselves and their immediate environment: parents and other family members, teachers, peers, curriculum, technology and institution. The mesosystem is the student's social and economic background. This works as a connection between the microsystem and the exosystem. The exosystem includes the student's extended family, their parents' workplaces, school policy and the national curriculum. The highest-level system is the macrosystem, which includes culture, history, economics and broad technological developments. Those factors are very similar to the factors influencing teachers, highlighting the complexity of engagement with the LMS and the depth of the interconnections between those factors and stakeholders. Those interconnections are not linear but act in a continuous circular relationship (Bond & Bedenlier, 2019).

Teacher-student interaction is described in the literature as one of the most important factors in student engagement. This interaction is not bound to a single place or type of communication, such as face-to-face in the classroom; it can take various forms and occur through different mediums. When using technology, the interaction could take place through online texting, discussion, or videos and audio files. The introduction of technology is intended to facilitate and promote students' interactions with their teachers and facilitate a productive relationship (Aljaloud et al., 2019). On the LMS, those kinds of interaction functions need to be taught to students, which suggests that it is important to provide LMS training sessions to students as well as to teachers. One of the more seldom discussed factors in literature is enjoyment. If students enjoy using the LMS, it is expected that the enjoyment will be reflected in their achievements and interactions (Aljaloud et al., 2019; Hadad et al., 2020; del Carmen Ramírez-Rueda et al., 2021). While most researchers have focused on students' initial reaction to the LMS, Ashrafi et al. (2020) investigated the factors influencing students' intention to continue using the LMS. They found that students' intentions were affected by perceived enjoyment, perceived usefulness and subjective norms such as the behaviour of teachers, parents and close friends (Ashrafi et al., 2020).

The introduction of technology in education is driven and influenced by policy (Bianchi et al., 2020; Blackwell et al., 2014; Duggan, 2019). Hence, policy is an additional factor influencing the integration of LMSs by teachers (Abdul Hamid et al., 2020; Ozkan et al., 2020), and is one of the factors affecting LMS integration in Qatar according to Nasser et al. (2011). Bianchi et al. (2020) found that strong technological policies improve students' achievements in the long run. In the UK, when the national Department of Education wanted to introduce programming into their curriculum, they responded with the creation of policies that focused on learning to code and the knowledge and skills necessary to use computers (Williamson et al., 2019). Blackwell et al. (2014), in their research on factors influencing digital technology use in early childhood education, found that sound technological policy had a direct positive effect on teachers' technology use.

Conversely, in some countries, policymakers have not focused on improving pedagogy but instead on providing technological devices to schools (Muralidharan et al., 2019). Livingstone (2012) argued that policies aim to achieve educational outcome improvements using information communication technology (ICT), rather than aiming to teach students 'how to use technologies' (p. 11). It has been found that the availability of technology in schools alone is not enough for effective technology integration (del Carmen Ramírez-Rueda et al., 2021; Ertmer & Ottenbreit-Leftwich, 2010; Vongkulluksn et al., 2018). Asiri et al. (2012) considered policy a potential barrier to the successful integration of the Jusur system in Saudi Arabia. Policy enforces standards for the integration of LMS by teachers and sometimes adds additional administrative work for teachers, which overloads them and consumes effort and teaching time (Awang et al., 2011). Some of the participants in the study by Chien et al. (2014) regarded policies as constraints to their successful use of technology-based assessment. One of the possible reasons for the differences between teachers when evaluating policy as a factor could be a misconception about the reason or goal behind the introduction of such technological policies. To avoid such misconceptions, the school administration needs to clearly explain the school's technological integration vision, as teachers tend to use the LMS and similar technologies based on their perceived benefits for their teaching and learning experiences.

Schools with a strong school-level vision regarding technology positively influence teachers' attitudes towards technology integration. This also helps to resolve issues with the under-use of technology (Blackwell et al., 2014; Ertmer et al., 2012; Somekh, 2008; Vongkulluksn et al., 2018). It is recommended that the school's technology vision be shared with parents to promote better understanding and acceptance, especially when technology is expected to be used at home (del Carmen Ramírez-Rueda et al., 2021).

Another aspect of policy that has been discussed in the literature is that internationalising technology integration policies would not be appropriate due to the differences in context between countries (Tarhini et al., 2015). Different factors may be relevant in different countries, and the interactions between factors may also be distinct, meaning that each country will have unique policy requirements.

3.2.2) Attitudes

Attitudes are considered to affect teachers' likeliness to perform a behaviour, in this case LMS integration (Ajzen, 1991). Attitudes are specifically related to the technology at hand. The PEU and PU of a technology are two critical factors in determining users' technology acceptance (Chesney, 2006; Liu et al., 2010; Saeed & Abdinnour-Helm, 2008; Tarhini et al., 2015). They are also the two determinants of the TAM created by Davis (1989). A further review of the model and its components is presented in the later sections.

Course and curriculum design is a potential factor in the integration of LMSs by teachers (Adzharuddin & Ling, 2013; Montrieux et al., 2015). Al-Busaidi and Al-Shihi (2010) argued that for successful LMS integration and acceptance, the e-learning design should be aligned with the department curriculum. Therefore, when designing materials for courses and curricula, a balance between online and face-to-face learning should be sought (Al-Qahtani & Higgins, 2013). For example, in Malaysia, the curriculum has been updated to incorporate more content and to account for new technology (Awang et al., 2011). However, successful integration of technology into the curriculum is challenging, and teachers need to be assisted when doing so (Bitner & Bitner, 2002). They need to develop plans and select appropriate applications that meet the curriculum's instructional needs and students' learning needs (Ertmer & Ottenbreit-Leftwich, 2010). Technical and collegial support is critical for a successful LMS integration and is directly related to user behaviour.

Course and curriculum design is not the same at all levels, and children in earlier years interact differently with technology to children in later years. This difference should also be considered when introducing LMSs in schools (Chen, 2008; Livingstone, 2012; Martin-Rodriguez et al., 2015; Yildirim et al., 2014).

Given all of the difficulties teachers might face when integrating the LMS into their teaching practices, the LMS should be reliable to use (Lonn et al., 2011). Loss of internet connection and other technical issues with the LMS disrupts the focus of teachers, shifting their attention from learning activities to the difficulties they are encountering (Peng et al., 2009; Yildirim et al., 2014). Additionally, unreliable systems pose a potential cybersecurity risk (Peng et al., 2009). The availability of technological tools is important for successful integration (Chen, 2008; Martin-Rodriguez et al., 2015; Smarkola, 2008). Nasser et al. (2011) and Yildirim et al. (2014) stated that the unavailability of technology is a barrier to LMS integration.

3.2.3) Perceived Behavioural Control Factors

Behavioural control factors affect an individual's beliefs about resources and personal control over events. These may either enhance or hinder people's perceived control over their behaviour (Ajzen, 1991, 2001). Self-efficacy is one of the primary control factors affecting the integration of LMS by teachers (Chien et al., 2014; Smarkola, 2008; Tarhini et al., 2015) Self-efficacy, a concept first introduced by Bandura and associates in their systematic research program, contributed to Ajzen's understanding of perceived behavioural control (Ajzen, 1991). The two frameworks are compatible, as self-efficacy is 'concerned with judgments of how well one can execute courses of action required to deal with prospective situations' (Bandura, 1982, p. 122). The age of the teacher is another factor mentioned in the literature (Becker, 2000): older teachers tend to resist LMS integration in their traditional teaching practice (Nasser et al., 2011). Older teachers also tend to have a greater influence on policy (Nasser et al., 2011).

Experience with LMS integration is also a factor. The more experienced teachers are with the LMS, the less time and effort it takes them to do a task, so a lack of experience clearly hinders the successful use of LMSs (Browne, 2015). In their research on LMS success, Klobas and McGill (2010) found that the time teachers spent using the LMS was affected by their experience with the system rather than by other factors. Similarly, in research about online learning communities, Liu et al. (2010) found that learners with prior experience in using online learning are more willing to participate in online learning communities.

However, experience is not acquired immediately. It takes time to develop, and time for teachers is precious. As mentioned in the introduction, the LMS can save teachers time, yet teachers seem reluctant to use LMS due to a fear of losing time (Browne, 2015; Dündar & Akçayır, 2014). Awang et al. (2011) found that time was one of the factors affecting participants' integration of knowledge management systems in smart schools. This was due to the new policy and the effort required to become used to the system and gain experience. They indicated that the problem for teachers of having insufficient time in their daily routines remains unresolved (Awang et al., 2011). For example, participants in the work by Chien et al. (2014) reported that time was an issue for them. To overcome this issue, they formed a group of teachers in the department to collaborate in designing and implementing a technology-based assessment. As result, there are possible solutions to overcome the lack-of-time issue. Blau and Hameiri (2010) added that the more time spent using the LMS, the more beneficial it is, which is consistent with the experience factor mentioned earlier. Therefore, teachers should be allowed more time by the administration to develop their LMS skills (Browne, 2015).

Workload is another potential factor that has been repeatedly mentioned alongside time in the literature (Dündar & Akçayır, 2014; Montrieux et al., 2015). The higher teachers' workloads are, the more time they need (Awang et al., 2011; Nasser et al., 2011). Teachers in Chen's (2008) study commented that the workload for covering the curriculum was already very heavy; therefore, they were hesitant to lose time allowing students to explore the curriculum content with integrated technology.

Another factor affecting LMS integration is training. Training refers to IT and LMS skills training, as both are important for the integration of LMSs in teaching. IT skills are important to enable users to use computers, laptops, or tablets to log into the LMS, while LMS skills allow them to benefit from the functionalities within the system. Some researchers have indicated that training is an external constraining factor (Al-Busaidi & Al-Shihi, 2010; Browne, 2015; Dündar & Akçayır, 2014; Livingstone, 2012). In Smarkola's (2008) research, teachers stated that training influenced their behavioural intentions in terms of classroom computer usage. However, teachers with limited or no training are found to integrate technology less into their teaching practice (Becker, 2000). Training should not be allocated as a one-time workshop, as that format is not very effective. Instead, teachers need to have follow-up or refresher workshops from time to time (Lakkala & Ilomaki, 2015).

In their research on LMS in Malaysian universities, Adzharuddin and Ling (2013) recommended that training be provided to all teachers, students, and lecturers in addition to providing an on-call support team to solve unexpected issues that might arise. The existence of a support team has also been indicated in the literature as a factor influencing LMS integration (Lonn et al., 2011; Smarkola, 2008). De Smet et al. (2012) stated that easy access to support would inspire teachers and promote technology integration. Similarly, in their research on developing ICT-supported pedagogy in schools in Finland, Lakkala and Ilomaki (2015) indicated that teachers should be provided with ICT support at school for everyday classes. Participants in this study reflected that the best support in their ICT pedagogy came from their more experienced colleagues (Lakkala & Ilomaki, 2015).

Cost, financial support, and infrastructure are all important investment factors in preparing a school setting for LMS integration (Chien et al., 2014; Livingstone, 2012; Nasser et al., 2011; Tarling & Ng'ambi, 2016). The cost of technology is high, and not all technology is fit for educational purposes. Many online higher educational institutes have failed because of the high cost, their lack of strategies, and their poor decision making (Adzharuddin & Ling, 2013).

On the other hand, the LMS is believed to be a more cost-effective e-learning technology in the long run, due for example to less paper usage (Al-Busaidi & Al-Shihi, 2010). Awang et al. (2011) argued that, when choosing technology, cost should be weighed in relation to expected educational benefits and infrastructure readiness. The Malaysian Ministry of Education invested in 90 participating schools in their smart schools project, in which they supplied computer software and components. The ICT infrastructure of those participating schools enabled knowledge management integration (Awang et al., 2011).

3.3) Theoretical Background

Teaching and learning processes are not the same for all teachers: each individual teacher has his or her own personal view and experience of these processes. Personal views and experiences are part of the study of human behaviour, a highly complex and widely discussed subject. In the *Oxford Dictionary*, human behaviour is defined as ‘the way in which one act or conducts oneself, especially towards others’ (Oxford, 2018). It also means ‘the way in which an animal or person behaves in response to a situation or stimulus' (Oxford, 2018). In the literature, human behaviour is defined as a physical process in the brain in response to outside stimuli (Bagozzi, 2007; Mahoney & Cameron, 2008). For example, people usually tend to report a behaviour based on an incident (for example, 'He kicked the ball after hearing the whistle'). A small part of the history of an observable behaviour is reported, but there is much more to it.

Skinner (1953) stated that behaviour is 'a primary characteristic of living things' (p. 45) and indicated that behaviour is influenced by both the self and environmental variables. By identifying the relationships between these factors and the behaviour, it is possible to control the behaviour by controlling these independent factors (Ashworth et al., 2004; Skinner, 1953). For example, in simple terms, the student behaviour of doing homework can be controlled by controlling the number of marks a piece of homework is worth and the deadline for submission. In this way, teachers are able to control students' behaviour by manipulating influential factors.

One of the main goals for teachers is for student learning. The LMS, as the name implies, is intended for learning. Therefore, it is important to review learning theories related to the LMS. Learning has been widely discussed in the literature (Hoic-Bozic et al., 2009; Mahoney & Cameron, 2008; Ouadoud et al., 2018). Many theorists have claimed to identify the theoretical underpinnings of the learning process. Schunk (2012), for example, characterised human learning as being due to 'a change in the rate, frequency of occurrence, or form of behaviour or response, which occurs primarily as a function of environmental factors'. Similarly, Ashworth et al. (2004) defined learning as the product of 'a change in behaviour, with an emphasis on a connection between a stimulus and a response'. It is argued that by understanding the learning behaviours of both teachers and students, policymakers and administrators will be able to better design and implement educational plans and achieve their goals (Chen, 2008; Montrieux et al., 2015; Nasser et al., 2011; Tarling & Ng'ambi, 2016). The following section will review the main relevant schools of thought regarding learning.

3.3.1 Types of Learning Theories

There are five main schools of learning theories: behaviourism (Ashworth et al., 2004; Ertmer & Newby, 2013; Harlow et al., 2007; Kozulin, 1986; Levin & Wadmany, 2006; McLeod, 2018), cognitivism (Ashworth et al., 2004; Cobb & Bowers, 1999; Ertmer & Newby, 2013; Greeno, 1989; Tschannen-Moran & Hoy, 2001), constructivism and social constructivism (Ashworth et al., 2004; Chen, 2008; Ertmer & Newby, 2013; Harlow et al., 2007; Hyslop-Margison & Strobel, 2007; Keengwe et al., 2014; Levin & Wadmany, 2006; McPhail, 2016; Peng et al., 2009; Simpson, 2002), social learning (Ashworth et al., 2004; Bandura, 1977, 1991, 2002; Browne, 2015) and humanism (Ashworth et al., 2004; Broudy, 1973; David, 2015; Rogers, 1985). There is no universally agreed-upon categorisation of learning theories; however, in this research, the categorisation systems created by Ashworth et al. (2004), Leonard (2002), and Merriam and Caffarella (1999) will be followed when describing critical learning theories. This is to assist in the comparison and discussion of the theories. It is not necessary to have each theory bound to one category. Some of them might be present in more than one category, for example Burner’s and Piaget’s theories (Ashworth et al., 2004; Leonard, 2002; Merriam & Caffarella, 1999). Three of the main schools of learning are important to this research, behaviourism, cognitivism, and constructivism, as they are the most common theories in LMS research (Hoic-Bozic et al., 2009; Mahoney & Cameron, 2008; Ouadoud et al., 2018).

3.3.1.1) Behaviourism

Behaviourism was initially proposed as the philosophy of the science of human behaviour (Skinner, 1974). It was first introduced by John B. Watson in 1913 in a work titled *Psychology as the Behaviorist Views It* (Ashworth et al., 2004, p. 4). He argued that 'psychology should be redefined as the study of' behaviour, which is where he was criticised by other psychologists, as most of them (e.g., Edward Titchener and William James) were focusing on 'studying mental processes in a mental world of consciousness'. However, at this time, the view on behaviourism was different (Skinner, 1974). Due to the difficulties in studying consciousness (a mental process), behaviourism gained more attention, as it 'could be studied under scientific conditions' (Ashworth et al., 2004, p. 6).

Skinner (1974) disagreed with some of Watson's extreme claims, such as 'the potential of a new-born infant', where he claimed that he could take any healthy infant and 'convert him' to any discipline he wanted (Skinner, 1974). For example, other external factors that are beyond one's control, such as politics and social issues, may play a great role in shaping one's behaviour (Skinner, 1974).

Behaviourist Fablet defined learning as 'an acquisition of new behaviour or modification of existing behaviour due to a stimulus' (Ouadoud et al., 2018, p. 29). Behaviourism or behavioural theories explain learning through the observation of environmental factors. In a classroom, students learn through observing their teacher or other external factors. In relation to the LMS, the behaviourist approach to learning can be seen in online multiple-choice questions, where students are stimulated by the questions to answer and obtain immediate feedback on their answers (Hoic-Bozic et al., 2009). This helps students learn through trial and error, as learning is an incremental process (Hoic-Bozic et al., 2009; Ouadoud et al., 2018).

This behavioural change is criticised as being only superficial, as it fails to provide a deep understanding of other factors (Ouadoud et al., 2018). Students might obtain the correct answer, but do not actually understand why it is the correct answer. It excludes internal factors, such as beliefs, emotions, and thought (Graham, 2017; Schunk, 2012). Graham (2017) indicated that Skinner focused more on describing the observed environmental influence on behaviour than on explaining the inner thinking process related to his experiments on rats. Others also argue that behaviourists neglect the influence of internal factors (Harlow et al., 2007); however, Skinner (1974) mentioned that it is not true, as he discussed the importance of internal factors as internal stimulation 'arising inside the body' and having 'an important part in' behaviour (p. 241). Behaviourists did not focus on internal factors when explaining learning, not because they were not important but because they were not observable (Schunk, 2012).

The increasing critique of behaviourism's (Harlow et al., 2007) exclusion of internal factors (Ashworth et al., 2004) led to the introduction of another learning theory known as cognitivism. The following section reviews the theory of cognitivism and its definition of learning.

3.3.1.2 Cognitivism

In contrast to behaviourism, cognitivism accounts for internal factors (Ashworth et al., 2004; Hoic-Bozic et al., 2009; Ouadoud et al., 2018). Cognitivist theories explain learning in terms of three important processes. First, a learner acquires knowledge through an external source. Second, the learner recognises and stores this knowledge in memory structures. Finally, the learner processes the knowledge and uses it to understand and solve problems (Ashworth et al., 2004; Chisanu et al., 2012; Ouadoud et al., 2018; Schunk, 2012). Learning here is defined as an internal mental phenomenon that results from what others do and say (Ertmer &

Newby, 2013; Hoic-Bozic et al., 2009), and the focus is on how learners 'perceive, interpret, store and memorize information' (Hoic-Bozic et al., 2009, p. 20).

This theory has parallels with LMS use, as teachers present and manage information through the system, and students interact with information, interpret it, store it, and use it for problem solving when needed (Hoic-Bozic et al., 2009). This approach allows teachers to target individual learning differences among students (i.e., learning styles) by uploading information in different formats, such as text, audio, and video materials (Ouadoud et al., 2018).

However, constructivists deny the assumptions of this thinking, stating instead that there is evidence that thinking takes place 'in situations, and that cognitions are largely constructed by individuals as a function of their experience in these situations' (Schunk, 2012, p. 230). In addition, learning is not guaranteed through well-structured materials alone, as there are other factors, such as motivation, that have a critical role in influencing learning (Ouadoud et al., 2018). This leads to the next school of learning theories: constructivism.

3.3.1.3 Constructivism and Social Constructivism

Constructivism is another philosophy of learning behaviour (Bruning et al., 2004; Harlow et al., 2007; Schunk, 2012; Simpson, 2002). In constructivism, learners construct their understanding actively based on their experiences and existing knowledge structures (Chen, 2008; Cobb & Bowers, 1999; Hoic-Bozic et al., 2009; Peng et al., 2009), in which a knowledge structure is 'the network of relationships the teacher establishes among reading and reading instruction concepts' (Roehler et al., 1988, p. 159). Learners are expected to be active and construct knowledge for themselves internally. Hence, individual people construct knowledge that is true for themselves but not necessarily for others. This is due to their personal beliefs and previous experiences (Chen, 2008; Cobb & Bowers, 1999; Teo, Chai et al., 2008); thus, it could be argued that knowledge is personal and 'a product of our cognitive act' (Simpson, 2002, p. 348).

In terms of educational technology integration, constructivism has tended to be the most relevant learning theory due to its emphasis on student-centred approaches (Amineh & Asl, 2015; Ozkan et al., 2020). Becker and Ravitz (2001, cited in Levin & Wadmany, 2006, p. 158) found that computer usage by teachers in practice is related to constructivist views. Similarly, Ouadoud et al. (2018) highlighted that LMSs support more student-centric approaches.

For example, in constructivist approaches, teachers tend to design their 'learning activities to engage students in active problem-solving genuine inquiry' (Chen, 2008, p. 68), in which students tend to ask questions and express and debate viewpoints (Chen, 2008). In LMS, this is reflected in discussion boards that emphasise online communication and collaboration.

However, in some of the literature, researchers refer specifically to *social* constructivism, rather than constructivism, in their discussion of learning theories related to technology integration (Levin & Wadmany, 2006; McPhail, 2016; Ouadoud et al., 2018; Peng et al., 2009). In social constructivism, knowledge is constructed in an active sociocultural setting rather than individually (Amineh & Asl, 2015; Levin & Wadmany, 2006). Social constructivism is mostly influenced by Vygotsky's sociocultural theory (Amineh & Asl, 2015; Hyslop-Margison & Strobel, 2007); however, both constructivism and social constructivism agree on the learner's active involvement in constructing knowledge (Hyslop-Margison & Strobel, 2007; McPhail, 2016).

Piaget's (1936) and Vygotsky's (van der Veer & Yasnitsky, 2011; Vygotsky, 1986) psychological theories are good examples of constructivist theories that have influenced educational technology research. They are reviewed in the following sections.

3.3.2 Examples of Learning Theories

3.3.2.1 Piaget's Theory of Cognitive Development

One of the most influential theories in educational practice is Piaget's theory of cognitive development (Geary, 1995), which was proposed in 1936. Piaget's theory is partly found in cognitivist, social learning, and constructivist schools of learning theories (Ashworth et al., 2004). However, it is discussed in the literature as part of constructivism (Geary, 1995; Karpov & Haywood, 1998; McLeod, 2018). Piaget argued that cognition develops in a process that occurs due to interaction with the environment and biological maturation (McLeod, 2018), where learners are viewed as 'active learners' who construct their knowledge for themselves (Geary, 1995). Biological maturation in general refers to the growth from childhood to adolescence (Beunen et al., 2006); however, Piaget focused on intellectual growth in children as they age (Ginsburg & Opper, 1979; McLeod, 2018).

According to Piaget, children's intellectual growth occurs in four stages. It starts with the sensorimotor stage (birth to two years old). In this stage, children's actions are spontaneous and they are trying to understand the world (Ginsburg & Opper, 1979). By the end of this stage, children have attained enough cognitive development to proceed to the next stage. The pre-operational stage (two to seven years old) is where they develop the ability to imagine the future and build on the past (Ginsburg & Opper, 1979). Next, in the concrete operational stage (seven to 11 years old), they show significant growth, especially given that they spend considerable time in school at this age. Their language and basic skills develop quickly alongside their physical and social interaction experiences. They develop reversibility in thinking, and they shift from the dominance of perceptions in their thinking towards having their own experiences (Ginsburg & Opper, 1979). Finally, in the formal operation stage (11+ years old), children improve their thinking and reasoning capabilities (Ginsburg & Opper, 1979; McLeod, 2018).

Piaget's theory can be divided into four main elements: biological maturation, physical environment experience, social environment experience, and equilibration (Schunk, 2012). The physical environment experience is the child's interaction with the environment through physical means, such as touching. The social environment experience is the child's interaction with people within the environment, forming different kinds of relationships. Equilibration is 'a biological drive to produce an optimal degree of adaptation between cognitive structures and the environment' (Duncan, 1995, p. 461).

For a learner to adapt to the world and reach equilibration, the learner must go through two important processes identified by Piaget and Cook (1952): assimilation and accommodation (Ginsburg & Opper, 1979; McLeod, 2018). Assimilation is 'fitting external reality to the existing cognitive structure', while accommodation is 'changing internal structure to provide consistency with the external reality' (Schunk, 2012, p. 236). For example, imagine that two brothers are watching an Olympic running competition in which the gap between the first runner and the second runner is constant. The older brother, who is 23 years old, asks the younger brother, who is 6 years old, 'Which one of them is going faster?' The younger brother answers, 'the first runner, because he is in front'. However, both of them are actually running at the same speed due to the unchanging distance between them. If the older brother tells his younger brother that he is wrong, it will create a conflict for the younger brother. The younger brother believes that the first runner is faster, but the new information means he has 'received conflicting environmental inputs' (Schunk, 2012). The younger brother can resolve this issue using assimilation or accommodation. He can assimilate the reality and believe that his older brother is testing him or that the first runner was running faster but now they are at the same speed. Alternatively, he can accommodate by believing his older brother without understanding why, or he can change his belief system (Schunk, 2012) to reflect the idea that all runners with an unchanging distance between them are running at the same speed. Hence, people assimilate reality and accommodate structures.

Piaget stated that the construction of cognition is initiated by equilibration during a person's intellectual development (Geary, 1995; McLeod, 2018). He regarded external environmental factors as secondary influences that disturb a person's system of schemata, leading to an equilibration (Geary, 1995). A schema is 'a cohesive, repeatable action sequence processing component actions that are tightly interconnected and governed by a core meaning' (Piaget & Cook, 1952, p. 7). In other words, it is the basic mental structure that organises information and knowledge (Ertmer & Newby, 2013; McLeod, 2018). This is also referred to an organised pattern of behaviour (Ginsburg & Opper, 1979).

Even though Piaget focused on children's development, grasping the theoretical underpinnings of his theory is important in gaining a better understanding of the concepts of learning and development, and the theory is useful for teachers in their teaching practice. However, Piaget's theory of cognitive development has been criticised by other researchers (Matusov & Hayes, 2000; Siegler, 1991), who argue that children may not demonstrate Piaget's stages of cognitive development at the expected age range due to several factors, such as exposure to 'relevant stimuli, … not relating information to prior knowledge or using ineffective means to retrieve information' (Schunk, 2012, p. 239).

Piaget's theory of cognitive development took an individualistic, biological view of development and maturation (Duncan, 1995; Geary, 1995). It did not consider social and other external factors to be of the same importance. Other researchers (Geary, 1995) insisted on the importance of cultural influence in children's cognitive growth. For example, children's mathematical achievements differ internationally and are directly influenced by the curriculum in each nation (Geary, 1995). Hence, the influences of cultural and other external factors are of the same importance as biological maturation. Vygotsky, who introduced the sociocultural theory, considered the external sociocultural world key in deriving psychological processes of mutual interpretation (Duncan, 1995).

3.3.2.2 Vygotsky's Sociocultural Theory

Vygotsky's theory was proposed many decades ago; however, it was not widely known until his book *Thought and Language* was translated to English in 1962 and published by MIT Press (van der Veer & Yasnitsky, 2011; Vygotsky, 1986). Vygotsky's sociocultural theory, unlike Piaget's theory of cognitive development, had a strongly sociocultural orientation (Duncan, 1995; Karpov & Haywood, 1998; Matusov & Hayes, 2000). Vygotsky argued that learning and development cannot be dissociated from their context (Duncan, 1995). This means that the school building is far more than just a physical structure. It is also a place of sociocultural interaction that promotes learning. As Gredler (2009) stated, as learners interact with the world, the meanings of concepts change.

Human development is subject to three key elements identified by Vygotsky: the interaction of interpersonal, cultural, historical and individual factors (Schunk, 2012). Social interaction with people in the environment 'stimulates [the] developmental process', leading to cognitive growth (Schunk, 2012, p. 242). It is argued that traditional teaching does not usually lead to useful interaction, as information is seen as being transferred from teacher to student. In contrast, interactive collaborative teaching is argued to be more useful for student development and construction of knowledge (Matusov & Hayes, 2000). Vygotsky's theory is therefore categorised as constructivist, as it promotes more student-centred practices (Duncan, 1995; Karpov & Haywood, 1998; Chen, 2008). For Vygotsky, the individual element is more specifically related to students with disabilities: he mentions that the characteristics that students inherit produce different learning trajectories from other students without disabilities (Schunk, 2012; Vygotsky, 1986).

Vygotsky's sociocultural theory has two key features: mediation and the Zone of Proximal Development (Karpov & Haywood, 1998; Kozulin, 1986). Mediation takes place through psychological tools, such as language, signs and symbols, which help the learner with communication and other psychological processes, such as learning, designing and searching (Karpov & Haywood, 1998; Livingstone, 2012). Hence, cognitive development is influenced by psychological tools (Bruning et al., 2004).

To determine a learner's intellectual level and gauge the level that a learner can reach given the appropriate instructional conditions, Vygotsky introduced the concept of the Zone of Proximal Development. This is defined as 'the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers' (Vygotsky, 1978, cited in Puntambekar & Hubscher, 2005, p. 2).

Many researchers (e.g., Bruning et al., 2004; Puntambekar & Hubscher, 2005; Ryba & Brown, 2000) have highlighted how teachers work with students on a difficult task that the student could not solve alone, sharing cultural tools that result in cognitive change. Similarly, one feature of the LMS is that teachers can work with students individually through the system platform. Teachers can target the Zone of Proximal Development by uploading specific materials aimed at a certain intellectual level, prompting students' development to that new level (Ouadoud et al., 2018).

However, not all students behave in the same way because students construct knowledge based on their understanding and experience in the context (Puntambekar & Hubscher, 2005; Ryba & Brown, 2000). Learning is not always a gradual accumulation of knowledge; sometimes it happens suddenly (Schunk, 2012).

There have been several attempts to help students acquire cognitive mediators through the social environment. These include instructional scaffolding (Bruning et al., 2004; Chen, 2008; Kim et al., 2013; Puntambekar & Hubscher, 2005), reciprocal teaching (Greeno, 1989; Karpov & Haywood, 1998; Ratner et al., 2002), and apprenticeship (Ertmer & Newby, 2013; Levin & Wadmany, 2006; Radziszewska & Rogof, 1991).

This section has reviewed some examples of influential theories in psychological research and specifically in educational research. The following sections review previous attempts to understand behaviour through theoretical frameworks.

3.4) Theoretical Behavioural Frameworks

To understand teacher behaviour, it is important to review the literature regarding beliefs, as these are key in the formation of attitudes (Adzharuddin & Ling, 2013; Ajzen, 1991; Ajzen & Fishbein, 1977; Anderson & Maninger, 2007; Asiri et al., 2012; Bandura, 1991, 2002; Chen, 2008; Davis, 1989; Fishbein & Ajzen, 1975). Researchers have recommended a focus on teachers' beliefs in order to understand their behaviour (Chien et al., 2014; De Smet et al., 2012; Pajares, 1992). Other researchers have assumed that beliefs are the best predictors of decision making (Bagozzi, 2007; Bandura, 1991; Ertmer & Ottenbreit-Leftwich, 2010).

Beliefs are acquired throughout a person’s life. Once a belief is formed, the person tends to explain surrounding situations through aspects of the beliefs. Beliefs that are acquired earlier in life and incorporated into basic belief structures are more difficult to change than newer beliefs (Pajares, 1992; Tarling & Ng'ambi, 2016). Over time, acquired beliefs become more rigid and fixed within the belief system, even those that are based on incorrect information. These rigid beliefs often do not change when challenged with scientifically proven findings (Ertmer & Ottenbreit-Leftwich, 2010; Pajares, 1992). Raths (2002) took the position that it is hopeless to try to change a teacher’s beliefs (Ertmer & Ottenbreit-Leftwich, 2010, p. 275).

However, all beliefs are not equally rigid. Three assumptions are made by Rokeach (cited in Pajares, 1992, p. 318) in his analysis of beliefs. First, the intensity and power of beliefs differ. Second, beliefs vary along a central-peripheral dimension. Third, the more central a belief is, the more resistant it is to change.

Fishbein and Ajzen (1975, p. 131) defined beliefs as ‘the subjective probability of a relation between the object of the belief and some other object, value, concept or attribute’ (Teo, Luan & Sing, 2008). Fishbein and Ajzen (1975) differentiated between two types of beliefs: descriptive and inferential beliefs. Descriptive beliefs are formed through direct experiences, such as seeing or feeling (for example, seeing an orange that has an orange colour). Inferential beliefs are more conflicting and consist of indirect relationships between the objects of beliefs. For example, a teacher who has a negative view of technology and positive views of collaborative work who is asked about how technology could assist in marking quizzes would probably express a negative view and say it would be a waste of their time and effort. However, technology could provide an autocorrect function, such as in the LMS, based on 'Heider's (1944, 1955) notions concerning casual attribution and balance' (Fishbein & Ajzen, 1975, pp. 143-144).

In conclusion, beliefs are a critical component of attitudes, which inform human intention. Fishbein and Ajzen (1975) illustrated that in their Theory of Reasoned Action (TRA). This framework consists of two main determinants of behaviour. The following sections review their TRA framework and its development into the Theory of Planned Behaviour (TPB) by Ajzen in 1985 (Ajzen, 1991). Both theoretical frameworks were used as a basis for later frameworks, such as TAM and DTPB.

3.4.1 The Theory of Reasoned Action

The TRA provides a useful framework for conceptualising thoughtful, systematic, rational behaviour (Legris et al., 2003; Shimp & Kavas, 1984; Teo, Luan & Sing, 2008). The theory uses attitudes and subjective norms to predict intentions and uses intentions to predict behaviour (De Smet et al., 2012; McCoy et al., 2005; Sheppard et al., 1988). Intention has been regarded as a central factor that 'captures the motivational factors that influence behaviour' (Ajzen, 1991; Lai, 2017).

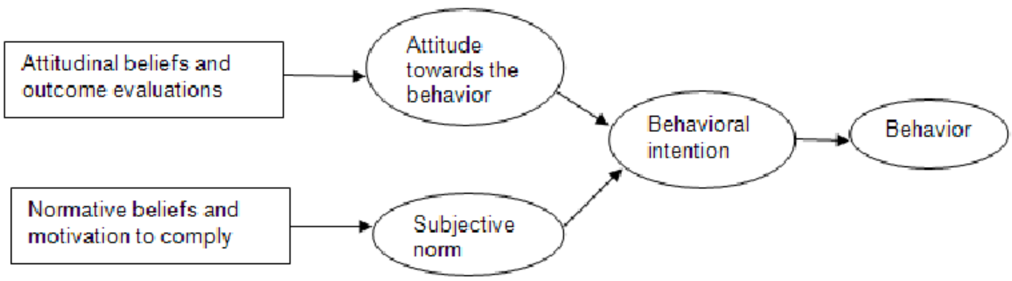

Figure 4. Theory of reasoned action (Legris, Ingham, & Collerette, 2003, p. 192).

Attitude is ‘the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question’ (Ajzen, 1991, p. 188). Subjective norms are ‘the perceived social pressure to perform or not to perform the behaviour’ (Ajzen, 1991).

Beliefs have an indirect relationship with behavioural intentions, in that they represent the opinions and information held by an individual towards a certain object (Fishbein & Ajzen, 1975). ‘Therefore, the whole of individual’s beliefs constitutes the informational foundation which determine the individual’s intentions and behaviour towards performing a certain task’ (Asiri et al., 2012, p. 130).

The TRA was used by Shimp and Kavas (1984, p. 795) in a study aiming to determine consumer intention to use coupons by focusing on their ‘attitudes and perceptions of whether important others … think should or should not expend the effort to clip, save and use coupons’. Sheppard et al. (1988) found the framework to be useful when investigating behaviour. They also recommended the inclusion of some factors that the framework did not account for due to its generality, such as goal intention (the theoretical framework focused on behaviour rather than goal, e.g., ‘taking a diet pill’ rather than ‘losing weight’; Sheppard et al., 1988, p. 326). One limitation indicated by Ajzen was ‘dealing with behaviours over which people have incomplete volitional control’ (1991, p. 181). He also indicated that other research has shown that ‘other predictors may have to be added to the theory’ (Ajzen, 2001, p. 48). Therefore, Ajzen (1985) developed a theoretical framework that included an additional component to the initial framework. The next section will review the elaborated framework.

3.4.2 Theory of Planned Behaviour

The TPB was introduced by Ajzen in 1985 (1991). He added an extra component to the original TRA, perceived behavioural control (Ajzen, 1991). He stated that ‘people act in accordance with their intention and perceptions of control over the behaviour’ (Ajzen, 2001, p. 43). Intention is influenced by three elements: two from the TRA, attitude and subjective norms, and the third element, perceived behavioural control (Ajzen, 2001). Perceived behavioural control has both direct and indirect effects on behaviour. The indirect effect is via intention, whereby perceived behavioural control affects intention, which then affects behaviour (Madden et al., 1992). This is ‘based on the assumption that perceived behavioural control have motivational implications for behavioural intentions’ (Madden et al., 1992). As Ajzen (1991, p. 181) stated, ‘[i]ntentions are assumed to capture the motivational factors that influence’ a behaviour.

Figure 5 below presents the relationships between elements of the TPB. Ajzen (1991, p. 188) defined perceived behavioural control as ‘the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipate impediments and obstacles’. The relative importance of these determinants is expected to vary across behaviours and situations (Ajzen, 1991).

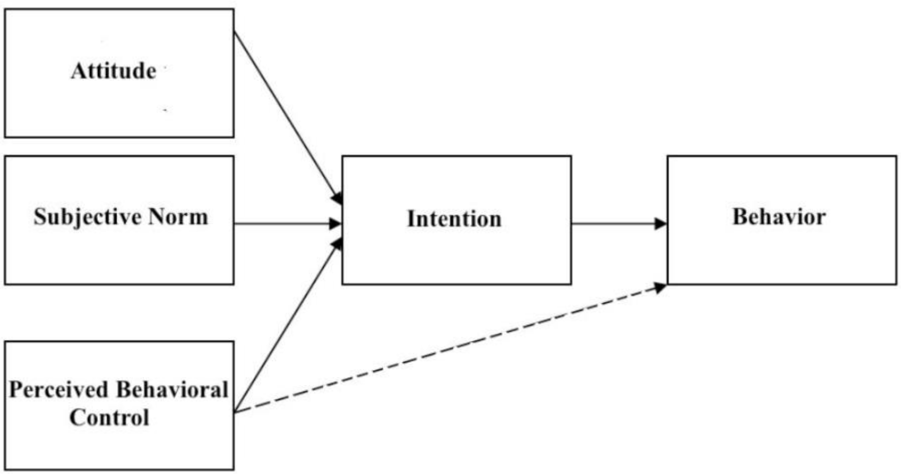

Figure 5. The Theory of Planned Behaviour (Ajzen, 1991, p.182)

Perceived behavioural control is a significant predictor of intention, as Ajzen and Madden (1986) showed by controlling attitudes and subjective norms in the TPB. In terms of the prediction of targeted behaviour, it is argued to be better than TRA (Madden et al., 1992). This is more evident when volitional control is violated by the behaviour (Madden et al., 1992).

Research by Bandura et al. (1980) found that behaviour is strongly influenced by people's confidence in their ability to perform the behaviour (Ajzen, 1991; Madden et al., 1992). This confidence in one's own capabilities is known as self-efficacy, a term introduced by Bandura (1982). Bandura's self-efficacy had highly constructed Ajzen's knowledge of perceived behavioural control. Ajzen's and Bandura's findings are compatible, as self-efficacy is 'concerned with judgments of how well one can execute courses of action required to deal with prospective situations' (Bandura, 1982, p. 122).

A person's performance depends to some degree on non-motivational factors, such as skill, resources, money and time (Ajzen, 1991). As such, a person's actual control over his or her behaviour can be represented. If a person has the required resources and opportunities, and 'intend[s] to perform the behaviour, he/she should succeed in doing so' (Ajzen, 1991, p. 182).

Self-efficacy beliefs add to the non-motivational factors influencing a person's performance by affecting their preparation for an activity, performing the activity, and their thought patterns and emotional reactions (Bandura, 1982, 1991). As explained earlier, behaviour is a function of belief. Ajzen (1991) stated that behaviour is a function of salient beliefs. Salient beliefs are the predominant determinants of behaviour (Ajzen, 1991). There are three kinds of beliefs: behavioural beliefs, normative beliefs and control beliefs (Ajzen, 1991).

Normative beliefs are a person's beliefs about whether important people will approve or disapprove of a particular behaviour (Ajzen, 1991; Trafimow, 2008). For example, how students engage with LMSs might reflect the approval or disapproval that teachers feel towards the LMS. Normative beliefs are considered determinants of subjective norms (Ajzen, 1991). 'The beliefs influencing subjective norm were normative beliefs about colleagues, learners, the principal and parents' (Kriek & Stols, 2010, p. 445). Control beliefs are the individual's beliefs about resources and factors that may enhance or hinder their perceived control over the behaviour (Ajzen, 1991, 2001). An illustration of how the parts of this theoretical framework connect is in the figure below.

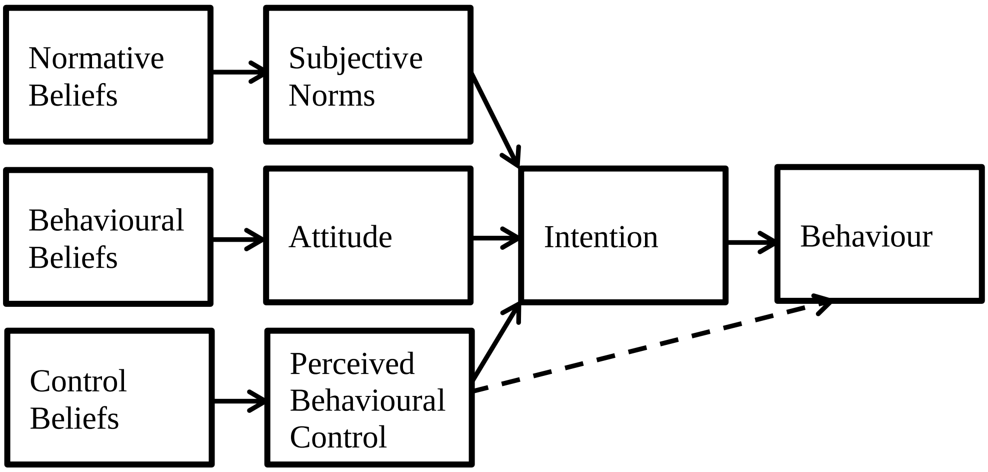

Figure 6. Details of the Theory of Planned Behaviour (Taylor & Todd, 1995, p. 146).

The theory has been used to support and explain findings in many studies (e.g., Ajzen, 1991; Davis & Venkatesh, 1996; Taylor & Todd, 1995; Venkatesh et al., 2003). An extensive list of its applications across different domains can be found in the work by Ajzen (2001, p. 44). However, the static explanatory nature of the theory has been criticised in the literature because it 'doesn't help to understand the evidenced effect of behaviour on cognition and future nature' (Sniehotta et al., 2014, p. 2). The limited predictive validity of the theory has been the main focus of criticism (Sniehotta et al., 2014).

One key domain that has been extensively influenced by the TRA and TPB is technology usage. Researchers (e.g., Davis, 1989; Davis & Venkatesh, 1996; Taylor & Todd, 1995) have drawn upon these theories to create theoretical behavioural frameworks that focus on technology acceptance and usage. One of the most applied theoretical frameworks is the Technology Acceptance Model (TAM), which was created by Davis (1989). Davis introduced the elements of Perceived Usefulness (PU) and Perceived Ease of Use (PEU) as determinants of users' technology acceptance. The following section reviews technology-related theoretical behavioural frameworks.

3.5) Technology-Related Theoretical Behavioural Frameworks

3.5.1 Technology Acceptance Model

The TAM investigates the relationships between usage, beliefs, and attitudes (Davis, 1989). The TAM can be used to 'explain how users' beliefs and intentions influence their technology use' (Chien et al., 2014, p. 199). For example, Hermans et al. (2008, p. 1506) stated that teachers' beliefs about their teaching practices are 'a significant determinant in explaining why teachers adopt computers in the classroom'. They found that constructivist teacher beliefs are a strong predictor of technology use in the classroom and that traditional teacher beliefs tend to 'have a negative impact on integrated' technology in the classroom (Hermans et al., 2008, p. 1506). However, the TAM is less general than the TRA and the TPB, as it neglects the elements of subjective norms and perceived behavioural control. This is due to its focus on the relationship between users' beliefs and their intentions to accept and use technology. The two main determinants of technology acceptance, as mentioned earlier, are PEU and PU. The PEU is the degree to which the user believes that the technology is easy to use (Davis, 1989). The PU is the degree to which the user believes that the technology will be useful (Davis, 1989).

When people consider an integrated technology to be useful and easy to use, they tend to develop positive attitudes towards it (Dündar & Akçayır, 2014). These two factors therefore have a clear influence on behavioural intention. Behavioural intention determines actual behaviour, in this case technology use (Chien et al., 2014; Davis, 1989). In the literature, the degree of importance for PEU and PU in predicting behavioural intention differs. Chesney (2006) found that PEU did not have a significant effect on user intention. In contrast, Saeed and Abdinnour-Helm (2008) found that, although PEU had a significant effect on intention, it was not the strongest factor. Yet other researchers found that PEU was the most significant factor in influencing intention (Chang & Tung, 2008; Peng et al., 2009). PU seems to have a more consistent effect on behavioural intention. Davis (1989), for example, found that PU has a stronger correlation with behavioural intention than PEU (Tarhini et al., 2015). Similar results were found by other researchers (Chang & Tung, 2008; Liu et al., 2010). Users tend to use technology mainly due to its functions (Davis, 1989). As with PEU, the degree of significance differs for PU. Sometimes, it is the most influential factor (Liu et al., 2010), and sometimes it is not the most influential factor (Saeed & Abdinnour-Helm, 2008). The following is an illustration of the framework model.

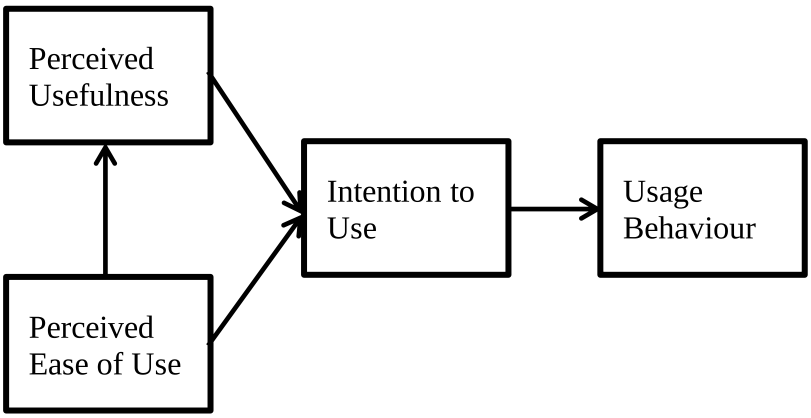

Figure 7. Technology Acceptance Model (Kriek & Stols, 2010, p. 442).

Research has shown that the TAM is one of the most influential models explaining user acceptance of technology (Dündar & Akçayır, 2014). It has gained considerable attention due to its inclusion of psychological interactions between the user and the technology

(Dündar & Akçayır, 2014). Other research has also emphasised the importance of PEU and PU as critical factors (Legris et al., 2003). For example, Ngai et al. (2007) conducted research in seven universities in Hong Kong and found that student attitudes towards using technology were most strongly affected by the factors PEU and PU. Teo, Luan & Sing (2008) similarly conducted research in Malaysia and Singapore and found that the same factors, PEU and PU, were the most significant determinants of intentions for technology usage. Hence, it is clear why many instrument developers target these factors in their attitude surveys (Teo & Noyes, 2008). Adzharuddin and Ling (2013) found that, to successfully utilise an LMS, it is also important to know whether the teacher and students accept it.

Even though the TAM has high acceptance and usage across different fields of research, there are some criticisms about its theoretical contribution. For example, it does not fully explain technology usage and integration (Bagozzi, 2007; Benbasat & Barki, 2007; Straub Jr. & Burton-Jones, 2007). Tarhini et al. (2015) mentioned that the TAM neglects other important factors that might affect technology acceptance and integration, including social, individual, and organisational factors. Other researchers argued that, due to those same factors, TAM is not sufficiently comprehensive (Chien et al., 2014; Smarkola, 2008; Taylor & Todd, 1995). The theory has also been criticised for showing bias when applied in a cross-cultural context (McCoy et al., 2005; Straub et al., 1997). Therefore, researchers have attempted to extend the model to cover those limitations. The following section reviews some of these extensions.

3.5.2 Extensions of the Technology Acceptance Model

There have been several attempts to extend the TAM and address its limitations. Depending on the researchers' aims, extra factors are added or modifications are made to the original model. The original creator of the TAM also extended the model in conjunction with other researchers. First, TAM 2 was introduced by Venkatesh and Davis in 2000. This revision included the previously neglected element of subjective norms (Al-Busaidi & Al-Shihi, 2010; De Smet et al., 2012). Second, Venkatesh et al. (2003) introduced the unified theory of acceptance and use of technology, which included four key determinants and four key moderators (Bagozzi, 2007; Lai, 2017). Third, TAM 3 was proposed by Venkatesh and Bala in 2008 (Lai, 2017, p. 21). They added two groups of components related to PEU: anchor and adjustment (Lai, 2017).

Another extension (Tarhini et al., 2015), included four additional factors to capture what the original model could not capture. These factors were social norms, quality of work life, computer self-efficacy, and facilitating conditions. A similar approach was attempted in the Kingdom of Saudi Arabia (Asiri et al., 2012). As mentioned earlier, Saudi Arabia has an LMS system integrated into their higher education institutions. This system is known as Jusur, and it is used by both teachers and students in Saudi universities. Asiri et al. (2012) focused on creating a theoretical framework that described the factors influencing the use of the Jusur system. Their theoretical framework combined the TRA and TAM and added recommendations from previous research on their specific Jusur system (Asiri et al., 2012). Another relevant TAM extension is the Decomposed Theory of Planned Behaviour (DTPB) created by Taylor and Todd (1995).

3.5.3 The Decomposed Theory of Planned Behaviour

Another extension and revision of the TAM (Taylor & Todd, 1995) combined the TPB and TAM for a more comprehensive understanding of technology use with the inclusion of various factors grouped under subjective norms, attitudes and perceived behavioural controls (Chien et al., 2014; Smarkola, 2008). These three groups represent the three salient beliefs mentioned in Ajzen's (1991) TPB: normative beliefs, behavioural beliefs and control beliefs

(Smarkola, 2008). Redefining these groups for clarity, normative beliefs are beliefs about whether important people desire the person to perform a behaviour (Chien et al., 2014; Taylor & Todd, 1995). This is decomposed into two components: peer influence and supervisor influence (Smarkola, 2008; Taylor & Todd, 1995). Control beliefs are defined as a reflection of 'perceptions of internal and external constraints on behaviour' (Taylor & Todd, 1995). This group of beliefs is decomposed into self-efficacy, technology-facilitating conditions, and resource-facilitating conditions (Chien et al., 2014; Smarkola, 2008; Taylor & Todd, 1995). Finally, behavioural beliefs are defined as 'the favourableness or unfavourableness towards performing a behaviour' (Taylor & Todd, 1995). This is decomposed into the components of TAM, PEU, and PU (Chien et al., 2014).

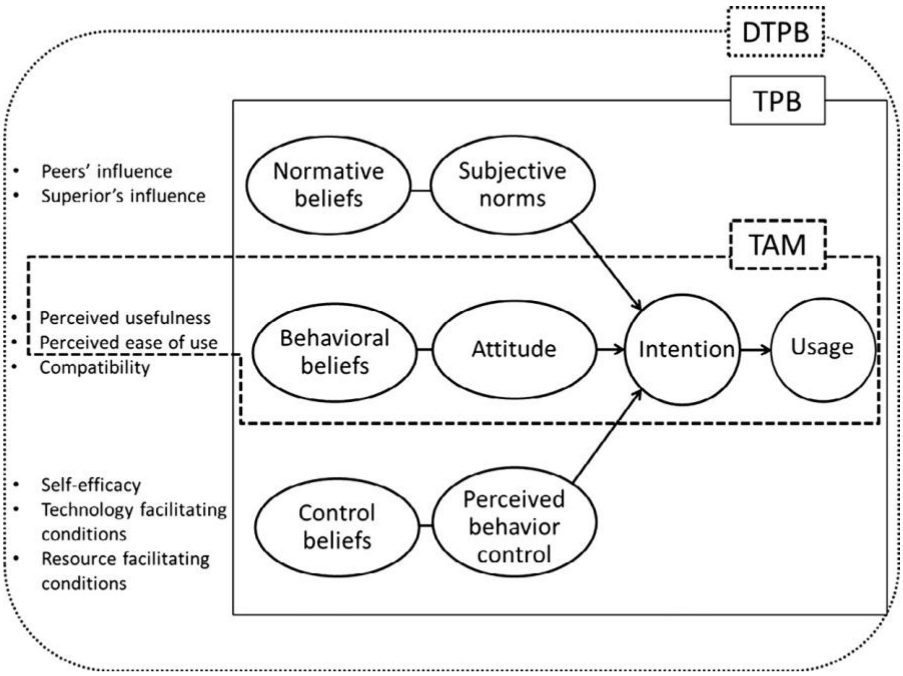

Figure 8. Decomposed Theory of Planned Behaviour (Chien et al., 2014, p. 200).

All of the theoretical frameworks described in this section have helped to show the way forward in the field by identifying related factors influencing the behaviour of teachers towards LMS integration and proposing theoretical frameworks for analysing the data. Thus, DTPB was chosen due to its detailed inclusion of influencing factors, such as social influence and control factors, which best facilitate our understanding of people's behaviour around technology integration and acceptance (Taylor & Todd, 1995).

3.6) Summary

This chapter has reviewed the literature on factors influencing teachers' integration of LMS into their practice. There are a number of different categorisation systems in the literature, each structured according to the researchers' aims and questions. Ultimately, the DTPB was selected as the main analytical framework for the study. This choice was based on the proven power of the framework in analysing detailed factors related to teachers' technology integration. The three categories in the DTPB are subjective norms, attitudes and perceived behavioural control.

In the subjective norms category, social factors are taken into consideration, such as pressure from parents and students, stakeholders' expectations and policy. In the attitudes category, technology-related factors are identified from other research in addition to what is proposed in the foundational theoretical frameworks, for example PEU and PU. Other important factors are course and curriculum design in LMSs, the system's reliability and the availability of technologies. The third category includes perceived behavioural control, individuals' beliefs about resources, and personally controllable factors that may enhance or hinder perceived control over the behaviour, such as self-efficacy, teachers' age, experience, training, time and workload. All of these factors have different levels of influence in the literature, which is probably partly due to the different research settings and the associated variations in technology, culture and participants.

Finally, a review of related learning theories and theoretical frameworks was presented in order to relate behaviour towards LMS integration back to its theoretical basis. The development of theoretical frameworks leading to the DTPB was reviewed to illustrate how the DTPB was created and why was it chosen as a guide for this research.

3.7) Gaps in the Literature

Most of the research on LMS integration has been conducted in a higher education context, with limited studies examining the K-12 context (Asiri et al., 2012; Emelyanova & Voronina, 2014; Klobas & McGill, 2010; Lonn et al., 2011). It has also been recommended that research into LMS usage behaviour, acceptance and integration be conducted in more countries and settings (Venter et al., 2012). Such technology-related studies tend to be more popular in western than eastern countries, underscoring the need for more empirical research in eastern countries (Tarhini et al., 2015) and in new cultural settings (McCoy et al., 2005). In addition, in most previous work, LMS integration occurred at the school level and was voluntarily chosen by school administrations (e.g., Hidayat, 2018; Stockless, 2018). However, in Qatar it is compulsory on a national level. This sheds light on how teachers interact with the LMS in such settings.

More specifically, it has been recommended that the factors identified in the literature be included in future research on LMS integration, in addition to the exploration of new potentially influential factors (Blau & Hameiri, 2010; De Smet et al., 2012; Nasser et al., 2011; Yildirim et al., 2014). Based on their specific research on K-Net in Qatar, Nasser et al. (2011) made several recommendations, including to conduct a follow-up study after three to four years, when the project was more established. They also recommended that further external factors be included, such as curriculum, language barriers, general structural changes and teachers' time and workload. Nasser et al. (2001) also specifically suggested that teachers be included in future research, as their research focused on students only. As far as I am aware, there has been no research published regarding schoolteachers' acceptance and use of the LMS in Qatar to date.

This study aims to contribute to our understanding of the broader field of usage behaviour, and more specifically to the use of specific e-learning systems (LMS) by exploring factors influencing teachers' LMS practices in the secondary school context in Qatar. The research questions for the study are as follows:

- What are the factors influencing teachers' behaviour regarding the integration of the Learning Management System in secondary schools in Qatar?
- How do these factors affect teachers' teaching and learning practices in relation to Learning Management System integration?
- Which factors are most important in teachers' successful integration of the Learning Management System in Qatar secondary schools?
    - Does the importance of these factors differ between different groups? (For example, between male and female teachers, science teachers and teachers of other subjects, younger and older teachers, less experienced and more experienced teachers.)

Chapter 4 – Methodology

4.1) Introduction

In this chapter, the theory and rationale behind the chosen methodology are described. Table 5 highlights the main elements of this research approach.

Table 5. The research approach

Research Philosophy	Method
Mixed methods	Exploratory sequential design
Qualitative phase	**Interviews** - Semi-structured interviews - Convenience sampling - Analysis (thematic analysis)
Quantitative phase	**Survey** - Online questionnaire - Probability cluster sampling - Analysis (factor analysis; means, frequencies)

This chapter opens with the research philosophy, illustrating how it guides the research approach and methodology. It then details the methods chosen for data collection and analysis, starting with the qualitative phase (Phase One) and proceeding to the quantitative phase (Phase Two).

4.2) Research Philosophy

A research philosophy provides a guide for the research plan. It is defined by beliefs about how data should be collected to measure the phenomenon of interest and how it should be analysed and presented (May & Williams, 2002). A research philosophy has three main components: ontology, epistemology and methodology. Ontology represents how reality is perceived by the author, including their beliefs about reality. Epistemology is concerned with the nature of knowledge, including how and where it can be learned and transferred. Methodology is the theoretical approach to conducting research; it guides researchers in the research design and data collection process. The specific means used to conduct research are called methods (Abdulrehman & Alharthi, 2016; Creswell, 2014; Kivunja & Kuyini, 2017).

The combination of a researcher's ontological and epistemological views reflect what is called a paradigm (Abdulrehman & Alharthi, 2016). These two elements guide the author in choosing the appropriate research philosophy (Guba & Lincoln, 1994). Hence, a research philosophy can be described by the research paradigm.

Figure 9 (the research onion), introduced by Saunders et al. (2019, p. 130) illustrates a breakdown of the researcher's choices in layers: philosophy, approach to theory development, methodological choice, strategies, time horizon and finally techniques and procedures. Each of these layers is detailed in the following sections. Although the research onion was introduced for the business field, it is also useful for modelling the philosophical underpinnings of educational research. Thematic analysis, which is utilised in Phase One of this research, is not specifically included in the model but could be added to the strategies layer. (An explanation of thematic analysis is provided in section 4.5.1.3.)

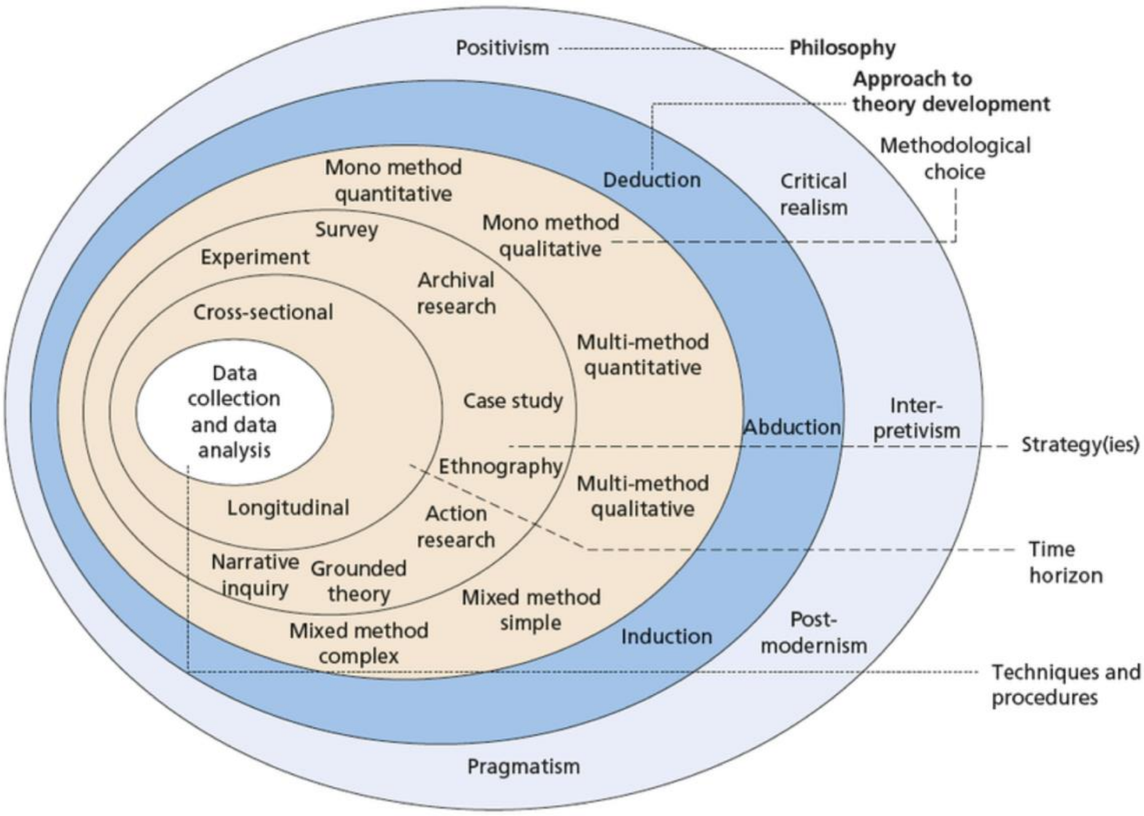

Figure 9. The research onion (Saunders et al., 2019, p. 130)

Many scholars have favoured quantitative research and positivist approaches (Denzin, 2010; Feilzer, 2010; Guba & Lincoln, 1994; Teddlie & Tashakkori, 2009), while others have favoured qualitative research and constructivism (Asiri et al., 2012; Denzin, 2010; Feilzer, 2010; Ottenbreit-Leftwich et al., 2010; Teddlie & Tashakkori, 2009). However, the practice of mixing methods within one study was not widely recognised by researchers until more recently. Some researchers claimed that qualitative and quantitative research methods could not be combined due to the differences in their ontological, epistemological and methodological components (Guba & Lincoln, 1994). One of the main debates was the issue of ‘paradigm-method fit’ (Migiro & Magangi, 2011, p. 3758). More recently, mixed methods research has become more recognised and accepted, and both transformative and pragmatic paradigms were adopted as its underpinning philosophies (Creswell, 2014; Denzin, 2010; Teddlie & Tashakkori, 2009).

This research uses a mixed methods approach underpinned by a pragmatic philosophy. The reason behind the choice of the pragmatic and not the transformative paradigm is that in the transformative paradigm the focus is on social justice and minority-related topics, such as feminism and discrimination (Creswell & Creswell, 2018; Kivunja & Kuyini, 2017). This research focuses on teachers in government schools and the use of an LMS.

Charles Sanders Peirce is considered the founder of pragmatism, having produced its seminal writings in the 1870s. Other famous pragmatists John Dewey and William James also contributed to the popularisation of the philosophy (Saunders et al., 2016; Suter & Cornier, 2013). Pragmatist philosophy is not closely bound to particular ontological and epistemological beliefs: it focuses on the research questions and considers them the determining factors in the research philosophy (Denzin, 2010; Teddlie & Tashakkori, 2009). Pragmatism accepts, philosophically, the assumption that there are singular and multiple realities. It focuses on ‘solving practical problems in the real world’ (Feilzer, 2010, p.8). Pragmatism considers knowledge to be both constructed and based on the reality a person experiences and lives in (Morgan, 2007; Shannon-Baker, 2015). Thus, the researcher is freed from the imposed constraint of choosing between positivism or constructivism (Doyle et al., 2009). Pragmatism accepts the mixing of both qualitative and quantitative approaches and does not favour one approach over another (Creswell. 2014; Morgan, 2007). By allowing mixed approaches, pragmatism supports both objective and subjective inquiries in attempting to produce knowledge (Clarke & Visser, 2019; Shannon-Baker, 2015).

4.3) Methodology

Methodology constitutes the theoretical approach and plan regarding research procedures. It includes both the broad assumptions of the research and the ‘detailed methods of data collection and analysis’ (Creswell, 2014, p.3). The following sections will detail more about each of the choices and procedures followed in conducting this research, including research design, design strategy and methods of sampling, data collection and data analysis.

As this research adopts a pragmatic philosophy, its methodology is also referred to as a pragmatic methodology (Clarke & Visser, 2019). This means that the researcher has ‘the opportunity to utilise a range of strategies to answer the research questions’ (Clarke & Visser, 2019, p. 455). However, this philosophy comes with some pitfalls, and incorrect decisions can made by researchers when they are not equipped with sufficient knowledge. Before starting to work with this strategy, it is important to have foundational knowledge of the available strategies. This gives the researcher a better understanding of which strategy to use and for what purpose (Maguire & Delahunt, 2017). Inappropriate decisions might lead to incomplete or irrelevant answers to the research questions (Clarke & Braun, 2013). The following sections will explain the reasoning behind the choices taken.

4.3.1) Research Design

This research follows an exploratory sequential design in data collection and analysis, as described by Creswell (2014). This design includes two phases of data collection and analysis. This study starts with qualitative data collection and analysis, which is used to build the instrument for the quantitative data collection and analysis phase.

The rationale behind the choice of research design is clearer when related to the research questions. Based on the literature review, it is clear that the context, setting, and LMS influencing factors vary in terms of criteria and significance. Therefore, an exploratory sequential mixed-methods design was chosen to explore the factors influencing teachers' behaviour regarding LMS integration in Qatar secondary schools. The research questions are restated below:

- What are the factors influencing teachers' behaviour regarding the integration of the Learning Management System in secondary schools in Qatar?
- How do these factors affect teachers' teaching and learning practices in relation to Learning Management System integration?
- Which factors are most important in teachers' successful integration of the Learning Management System in Qatar secondary schools?
  - Does the importance of these factors differ between different groups? (For example, between male and female teachers, science teachers and teachers of other subjects, younger and older teachers, less experienced and more experienced teachers.)

To answer these questions, it is important to gain an in-depth understanding of the phenomenon and explore influential factors based on the participants' experiences. These factors can then be measured and further explored quantitatively with a larger population.

4.3.1.1) Mixed Methods Design

Mixed methods research is the use of qualitative and quantitative methods in one study. The two methods complement each other and allow a better understanding of the phenomenon under examination (Creswell, 2014; Migiro & Magangi, 2011). Mixing methods allows researchers to benefit from each method's strengths and minimise its weaknesses. It includes diverse sources of data that can provide broader insight into the phenomenon under study. This type of research works with small and large samples and includes both open-ended and close-ended questions. However, one of the challenges is the complexity of using two methods, including the time needed to collect and fully explore the first data set, analyse it, and then repeat the process for another data set.

The different possible combinations of methods have been categorised as follows: convergent parallel mixed methods, explanatory sequential methods, exploratory sequential methods, and transformative mixed methods (Creswell, 2014). In the chosen exploratory sequential mixed methodology, the researcher first uses a qualitative research method to understand the phenomenon from the participants' point of view, then analyses the data using codes and themes to build the items and scales to be used for the survey instrument in the quantitative research method phase. Both sets of results are integrated in the discussion of the research outcome (Creswell, 2014; Migiro & Magangi, 2011).

The choice of a research design depends on certain factors, such as the research questions, the researcher's personal experience and the intended audience (Creswell, 2014, Teddlie & Tashakkori, 2010). The research questions for this study require a sequence of qualitative and quantitative inquiries, and therefore, a mixed methods design is the best choice to answer those questions.

Based on the literature review, it is clear that there is not enough research about LMS use in Qatar secondary schools. This means that it is desirable to implement an initial qualitative phase to gain an in-depth understanding of the phenomenon and explore important factors descriptively. These factors can then be tested with a large sample for validation and generalisation of findings using a quantitative design (Creswell, 2014; Creswell & Creswell, 2018; Teddlie & Tashakkori, 2010).

4.3.1.2) Exploratory Sequential Design Strategy

As the chosen methodology was an exploratory sequential design, the following strategy was used in data collection and analysis. Figure 10 illustrates the sequence of methods:

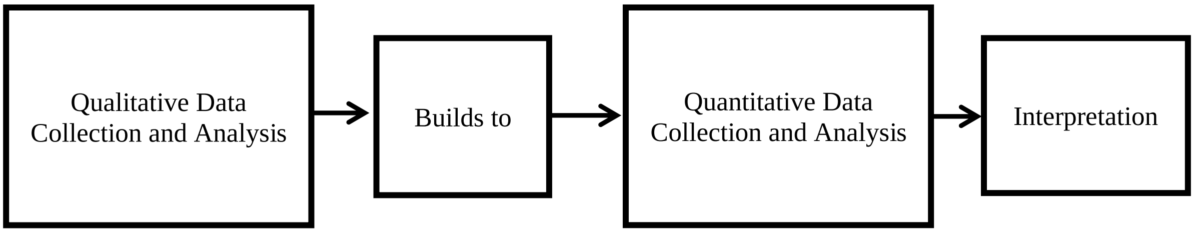

Figure 10. Sequence of mixed methods in this study

As shown in Figure 10 above, the data collection started with qualitative interviews with a relatively small number of participants, aiming to build an in-depth understanding of teachers' LMS experiences and explore potential factors affecting teachers' LMS integration.

Semi-structured interviews were used because they utilise open-ended questions and grant the interviewer flexibility to direct the flow of questions based on the conversation at hand. The data collected were analysed using thematic analysis. This was followed by a quantitative survey aiming to confirm the findings and gauge the significance of different factors with a larger number of participants. An online survey was used in this phase because it is easy to distribute to a large number of targeted participants.

4.4) Methods

The methods for this study were divided into two phases due to the choice of a mixed methods design. The first part of this section describes the qualitative phase, including its data collection and analytical method, and the second part describes the qualitative phase, including its data collection and analysis methods. Figure 11 illustrates the methods used for both phases' data collection and analysis:

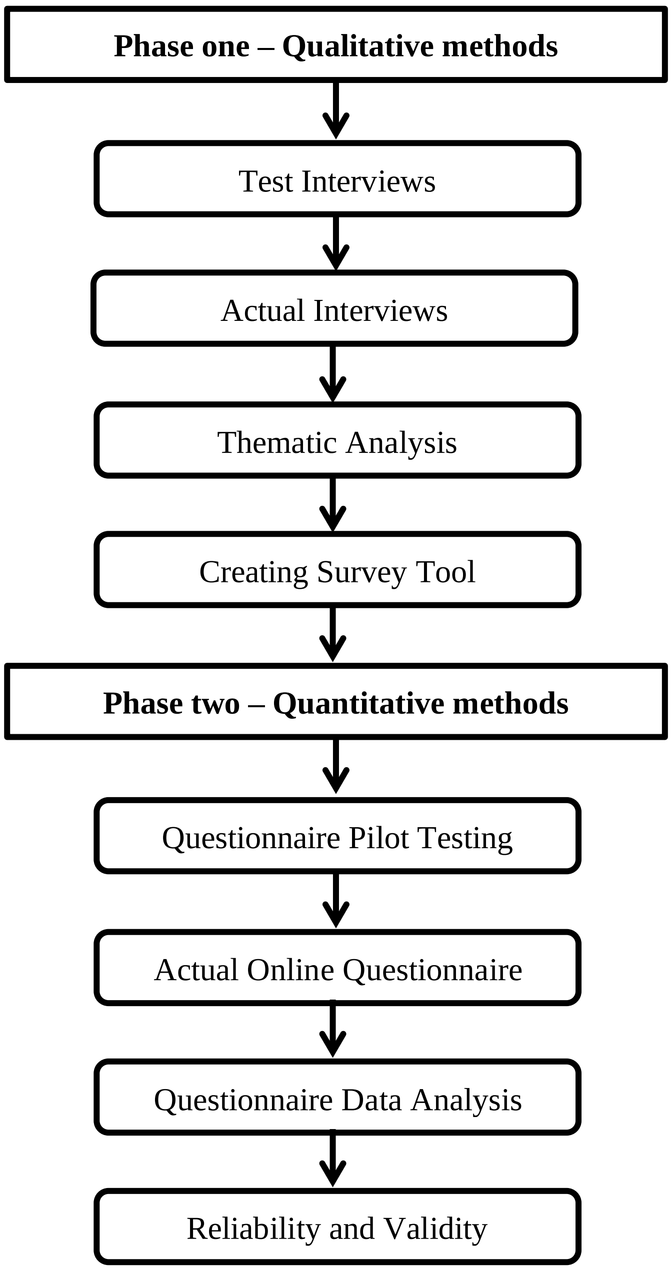

Figure 11. Methods followed for data collection and analysis in both phases

4.5) Phase One

This phase of data collection was designed to answer the first research question:

- What are the factors influencing teachers' behaviour regarding the integration of the Learning Management System in secondary schools in Qatar?

The findings were also used to build the survey for the second phase of data collection.

4.5.1) Qualitative Interviews

Interviews are commonly used in qualitative research to capture meaningful information that draws on participants' depth of experience. (Teddlie & Tashakkori, 2009). One of the drawbacks of this method is that not all participants are equally articulate and perceptive. The presence of the researcher can also introduce bias and affect the quality and reliability of the data (Cohen et al., 2011; Creswell, 2014). These factors were taken into consideration when choosing participants for this research, as explained in the sampling section (4.5.1.2.1).

Semi-structured interviews were used in this research as they grant the researcher opportunities to explore more factors experienced by participants by adding and removing questions based on the flow of the conversation. After the decision to use semi-structured interviews was made, a draft list of questions was created as a means of testing. These were trialled and edited into the final version.

4.5.1.1) Test Interviews

Before conducting the actual interviews, a list of test questions was created based on the research questions and then refined according to the literature, in particular the behavioural theoretical frameworks detailed in section 3.4. This list was updated twice, modified each time in consultation with the supervisory team for content and flow, with the third version finalised ahead of the test interviews (see appendix A.1). The interview questions focused on understanding participants' experiences of using the LMS, the e-library and e-content.

Convenience sampling was used for the test interviews. One specific secondary school was contacted to schedule interviews with the physics teachers at that school. The school administration was contacted via telephone to determine a date, time and venue for the interviews. Three interviews were conducted over a two-day period (4-5th July 2017) with three different physics teachers at the school, one interview on the first day and two on the second day.

On average the interviews lasted around an hour. They were audio recorded. All participants were given the opportunity to choose their preferred language for the interview and all chose to have it in Arabic. Participants were given the choice of whether to participate, and could withdraw at any time from the interview without giving a reason. Based on the participants' feedback, the question list was edited and refined to be more relevant to participants' experiences.

4.5.1.1.1) Refining Questions

The test interviews showed that none of the participants knew what the e-library and e-content were. Hence, those terms were dropped from the questions. A further literature search was also conducted to identify other factors that may potentially affect the integration of the LMS. Likert scale questions were also removed, as they were not found to provide useful information during this phase. Test participants were found to be distracted from the conversation when moving back and forth from Likert scale questions to open-ended questions, so it was decided to restrict this type of question to the second phase of data collection.

The new division of questions was determined based on participants' LMS experience (before and after) and focusing on three main parts: lesson planning, in-class teaching practice and after-class practice. The aim of this new division was to let participants express their experiences based on two different teaching periods and environments. This might reflect changes that occurred in their teaching practice and allow them to more easily relate how are they teaching now compared to how they were teaching before. Some of the main factors affecting LMS integration mentioned in the literature were added and divided into two categories, internal and external factors (see appendix A.1 for all questions list versions).

4.5.1.2) Actual Interviews

4.5.1.2.1) Sampling

There are 52 secondary schools in Qatar: 26 single-sex boys' schools and 26 single-sex girls' schools (MoEd, 2016). The focus was on boys' school teachers, who are all male. The reason for this decision was cultural: Qatar is a conservative Muslim society and female teachers would not be comfortable sitting with a male researcher alone in a meeting room, affecting the reliability of the data. It was considered too difficult to ask a third person to join all of the interview sessions. This cultural influence has been recognised in the literature as a factor affecting researcher positionality (Manohar et al., 2017; Milner, 2007). Even if both people present are Qatari people, a male researcher interviewing a female participant makes the researcher an outsider in terms of gender difference, which could limit the amount of information shared by the participant. In the case of interviewing male participants, the researcher is more likely to be considered to have an insider positionality (Merriam et al., 2001). Other factors also affect positionality, such as age, education, nationality, race and socioeconomic level (Manohar et al., 2017; Merriam et al., 2001; Milner, 2007).

Power is another factor that can influence the relationship between researcher and participant (Manohar et al., 2017; Merriam et al., 2001). For example, in some cases the researcher could be in a position of power over the participant, for example if the two are already in a hierarchical relationship. In other cases, the participant has power over the researcher, for example when an external researcher visits a school to interview a teacher. In this case, the teacher has the power to decide when and where the interview will take place and how long will it last (Merriam et al., 2001). In this study, the school administration and teachers had power over the researcher when they replied with their decisions about whether or not to participate, also deciding the time and location of the interviews. Schools were informed about the research in alphabetical order and those that agreed to take part were included, forming a convenience sample (Neuman, 2014; Robinson, 2014). For schools that agreed to participate, a visit was scheduled and then a time and location for the interviews was agreed upon according to the school administration and teachers' convenience.

Convenience sampling is a type of non-probability sampling technique (Robinson, 2014). It can be used in exploratory qualitative research when achieving a representative sample is less important (Neuman, 2014). The sample for this study was chosen based on certain criteria, detailed below.

Teachers chosen for this research are physics teachers because the MoEd recommended a focus on STEM subjects (Science, Technology, Engineering and Mathematics) when introduced to the research. Previous research has focused on mathematics both directly and indirectly (Dündar & Akçayır, 2014; Herbel-Eisenmann, 2006; Hubert, 2014), with several studies focusing on science subjects (Chen, 2008; De Smet et al, 2012; Levin, 2006). In addition, physics teachers are more likely to have high levels of technology usage due to the nature of the curriculum and because of laboratory classes, which involve many types of technology. Another reason is that physics teachers tend to use teaching methods that combine traditional and collaborative teaching, which also gives them opportunities to use the LMS in different teaching settings. They also combine physical theories and mathematical calculations in addition to creating graphs, and use a combination of Arabic and English language and scientific symbols.

The aim was to complete around 12 interviews, as recommended by Baker and Edward (2012); however, due to time and travel distance, mid-year exams and author's sponsor mandatory three days' work attendance during the data collection period, limited the number of interviews to nine. The interviews were held between the 25th of December 2017 and the 1st of January 2018 at four different schools. The following table shows how many teachers were interviewed at each school:

Table 6. Number of participants per school

School	Number of participants
1	3
2	2
3	2
4	2

At the first school, three interviews were conducted. This was altered for the other schools as, it was very tiring for the interviewer to stay focused during all the interviews, especially given that the time at each school was limited and the interviews were scheduled one after the other with short breaks. All of the participants were physics teachers and had been nominated by their lead physics teacher.

One school was in Al-Wakrah City and the other three were in Al-Doha City, which is the capital and where most of the population is centred. Geographical location does not have an impact on the school infrastructure for LMS integration, as the internet is spread across the whole country via fibre optic cable (Al-Sharq, 2016). For example, the internet connection is even available in desert areas that are known for camping during the winter season, indicating that the telecommunications company Ooredoo is investing in widespread internet provision (Ooredoo, 2016). Ooredoo has also established a 5G network connection in Al-Shahania, a rural area in Qatar (Al-Watan, 2019).

4.5.1.2.2) Conducting the Interviews

Once a visit to each school was agreed upon, interviews were held one-on-one in a meeting room at the school or in an empty classroom, as arranged by the school administration. Interviews were audio recorded and some notes were taken by the interviewer. The interview questions were printed in a booklet in both languages, Arabic and English.

The interviews started with an open chat about the participants themselves, including a little about the background of the author so as to build rapport. The aims and methods of the research were explained and there were opportunities for participants to ask questions. Consent forms, demographic sheets and participant information documents were shared (see Appendix B), and appropriate time was given for the participants to thoroughly read and fill in the documents and give their consent. All of the participants were eager to participate, with some of them adding that they were happy that the person doing this research was Qatari. None of the participants was Qatari, but all of them were native Arabic speakers, identifying the author with an indigenous outsider positionality (Merriam et al., 2001).

At the convenience of the participant, the interview started. The questions asked followed the order in the booklet as appropriate, and, depending on the flow of the conversation, sub-questions were asked to gain a greater understanding of particular points. At the end of the interview, the participant was given time to add relevant information or any other comments. At the end of each interview, appreciation for the participant and his contribution was expressed and the recording stopped.

4.5.1.2.3) Recording and Transcribing

All interviews conducted were recorded using a private device to which only the author had access. Recordings were then uploaded to a secure computer account by the author to be replayed and transcribed. The transcripts were all written in the Arabic language because that was the language chosen by all of the participants. All transcripts were organised and prepared for thematic analysis. While conducting thematic analysis, as detailed in the next section, only the coded Arabic text was translated to English. This was coded using English terms and underwent further analysis in English.

4.5.1.3) Thematic Analysis

The interviews were analysed thematically. The thematic approach is useful in detecting and identifying factors that influence issues related to the participants (Alhojailan, 2012). Thematic analysis is a qualitative data analysis strategy that categorises the data into themes (Alhojailan, 2012; Braun & Clark, 2006).

Thematic analysis can take an inductive approach, a deductive approach, or both (e.g., Braun & Clark, 2006; Fereday & Muir-Cochrane, 2006; Vaismoradi et al., 2013). An inductive approach focuses on generating knowledge from the data collected in the form of themes, and thus is similar to grounded theory (Creswell, 2014; Teddlie & Tashakkori, 2009). A deductive approach is appropriate for questionnaires that are based on a literature review or on previous knowledge (Alhojailan, 2012). This flexibility allows the researcher to choose the approach that best answers the research questions (Braun & Clark, 2006; Selvam & Collicutt, 2013). In this research, an inductive approach was used to explore the factors affecting teachers' LMS integration, allowing the author to form themes and codes from the data to understand the research context. It can be seen here that a thematic approach matches the pragmatic worldview as it is not bound to a particular philosophical epistemology (Joffe, 2012).

Thematic analysis is conducted in six steps, as described by Braun and Clark (2006) and Clarke and Braun (2013).

- Step one: Familiarisation with the data
- Step two: Initiating coding and translation of coded materials
- Step three: Searching for themes
- Step four: Reviewing themes
- Step five: Defining and naming themes
- Step six: Writing up

The flexibility of thematic analysis allows researchers to apply it in producing ‘data-driven or theory-driven analyses’ (Clarke & Braun, 2013, p. 3).

This phase of the research was inductively driven. However, it did start with a deductive approach when collecting data for the interview questions. This analysis aims to answer the first research question, exploring factors influencing teachers’ behaviour regarding the integration of the LMS into their practice in secondary schools in Qatar.

4.5.1.3.1) Coding

Coding is an iterative process in which important and related sentences, phrases and paragraphs are thoroughly read, labelled, and sometimes re-labelled (Braun & Clarke, 2006). It starts with a quick scan of the transcripts and initial coding, followed by a slow thorough reading and coding of the transcripts, which is repeatedly done until no new codes are identified. Those codes are then categorised based on their shared meaning. Categories are sometimes grouped to form a theme or sub-theme. In this study, a total of 602 segments were labelled under 77 codes. Main categories were at first partially dependent on the categorisation of interview questions. This yielded a total of eight categories: strategies, LMS-related factors, social factors, personal control-related factors, non-personal control-related factors, normal teaching practice, LMS teaching practice, and others. Table 7 shows an overview of categories, total numbers of codes and coded segments.

Table 7. Overview of categories, total numbers of codes and coded segments

Categories	Codes	Coded segments
Strategies	4	31
LMS related	6	57
Social factors	12	148
Personal control related factors	5	62
Non-personally controllable factors	8	70
Normal teaching practice	21	107
LMS teaching practice	17	123
Others	4	4

MAXQDA was used as the software to analyse data because it is compatible with Arabic language text. NVivo was trialled at first, but it was not compatible with the Arabic text. The use of these software packages makes it more efficient to go through transcripts and search for specific text and context.

4.5.1.3.2) Creating Themes

Two themes emerged from the data analysis: the LMS system itself and the LMS and teaching. These will be discussed in the analysis chapter. To further understand the data, a table of two columns was created for each interview in which factors were categorised as either strong attributes or as issues and barriers. Strong attributes were related to factors identified by participants as having a positive impact on their practice and experience. Issues and barriers were related to factors identified by participants as having a negative impact on their practice and experience. Another reason for this categorisation system was that some factors were placed in both categories by some participants at different points in their interviews. These factors were highlighted for further investigation. For example, see Table 8, which summarises the codes from participant 01's interview:

Table 8. Participant 01 code comparison table

Strong attributes	Issues and barriers
1) Beliefs about technology	1) Ease of use
2) Mixing teaching approaches	2) Time and workload
3) LMS effect on teaching	3) Effort
4) LMS satisfaction	4) System functionality
5) Self-efficacy	5) In-class use of LMS
6) IT Skills	6) No tablets
7) MoEd	7) Internet connection
8) School Admin	8) Using LMS consumes time from curriculum
9) IT lab (e-learning class)	9) Students
10) Training	10) Motivating students
11) Technical Support	11) Students' home factors
12) System functionality, autocorrection (saves time and workload)	12) Parents
13) Communication using LMS	13) Policy

(For the tables relating to other participants, see appendix A.2.)

4.5.1.3.3) Code Map

Using MAXQDA, the codes were illustrated in a code map, which was developed and edited through the iterative analysis process. Figures 12 and 13 below show these code maps.

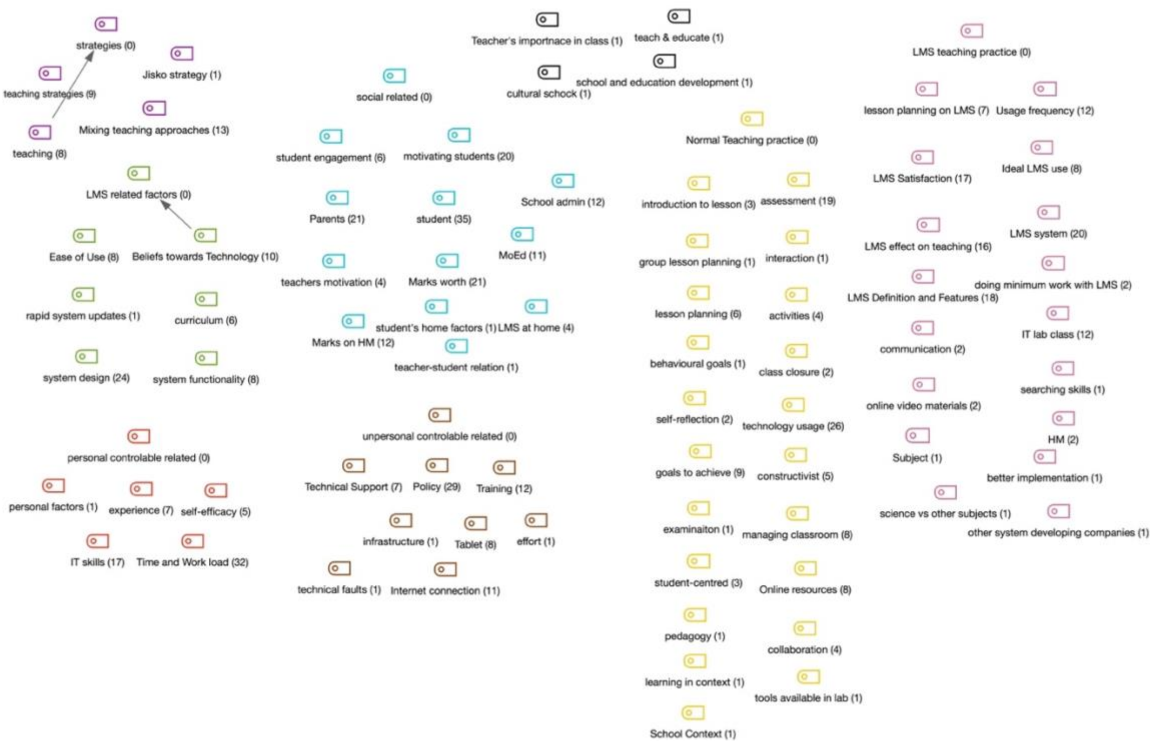

Figure 12. Code map 1

As shown in the figures below, similar codes and similar categories were combined to end up with four main categories: Teaching practices, Factors, Strategies, and Others.

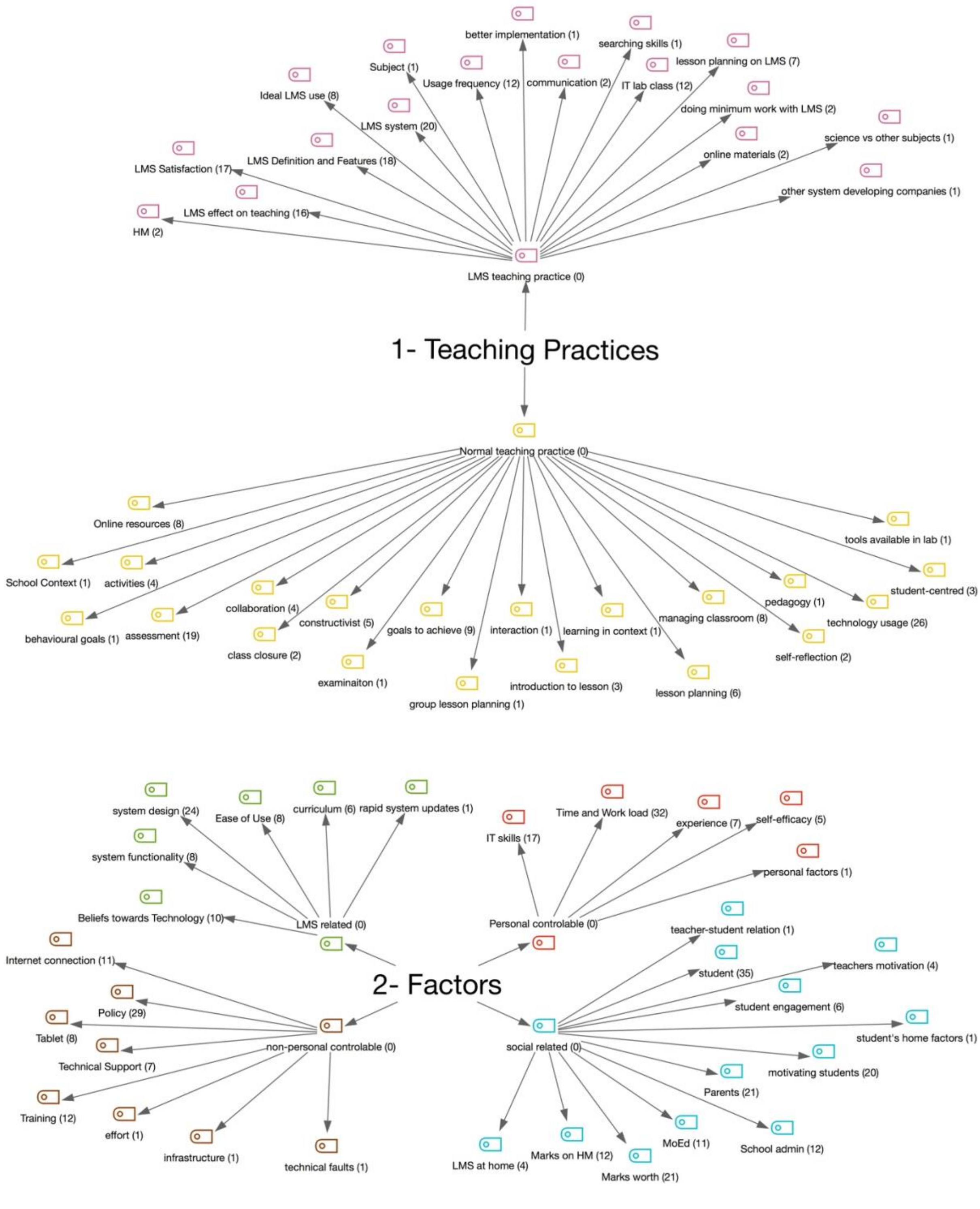

Figure 13. Code map 2

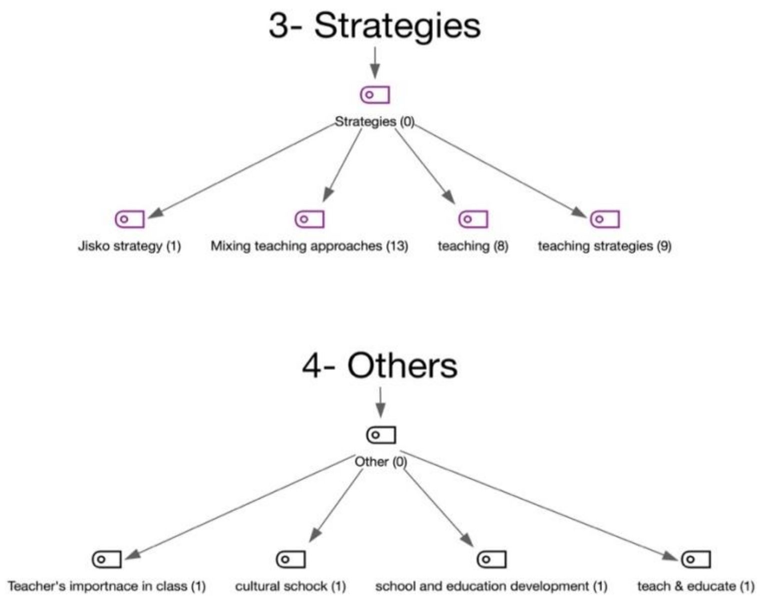

Figure 13 (continued). Code map 2

4.5.1.4) Creating the Survey Tool for Phase Two

The instrument for Phase Two was created following the recommendation of de Vaus (2014) to utilise the 'descending the ladder of abstraction' technique. The aim of this technique was to develop indicators (questionnaire items) from data collected from the interviews. The technique begins with concepts, then descends to their related dimensions, sub-dimensions, sub-sub-dimensions and sub-sub-sub-dimensions. Therefore, the codes and categories created were used in addition to the themes. Figure 14 illustrates the development of indicators that resulted from an iterative process of reviewing the data.

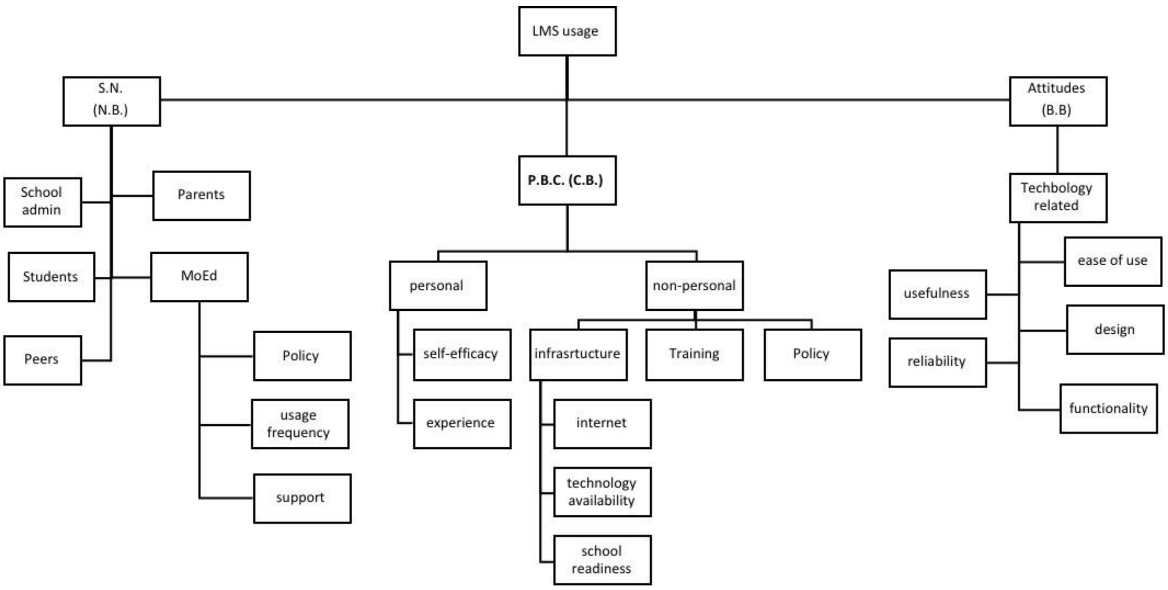

Figure 14. Developing indicators, version 1

This first version was based on the classification of the Decomposed Theory of Planned Behaviour (DTPB), with three main dimensions: social norms, perceived behavioural control and attitude. The sub-dimensions came from the interview data collection and analysis. This was developed into the second version (Figure 15).

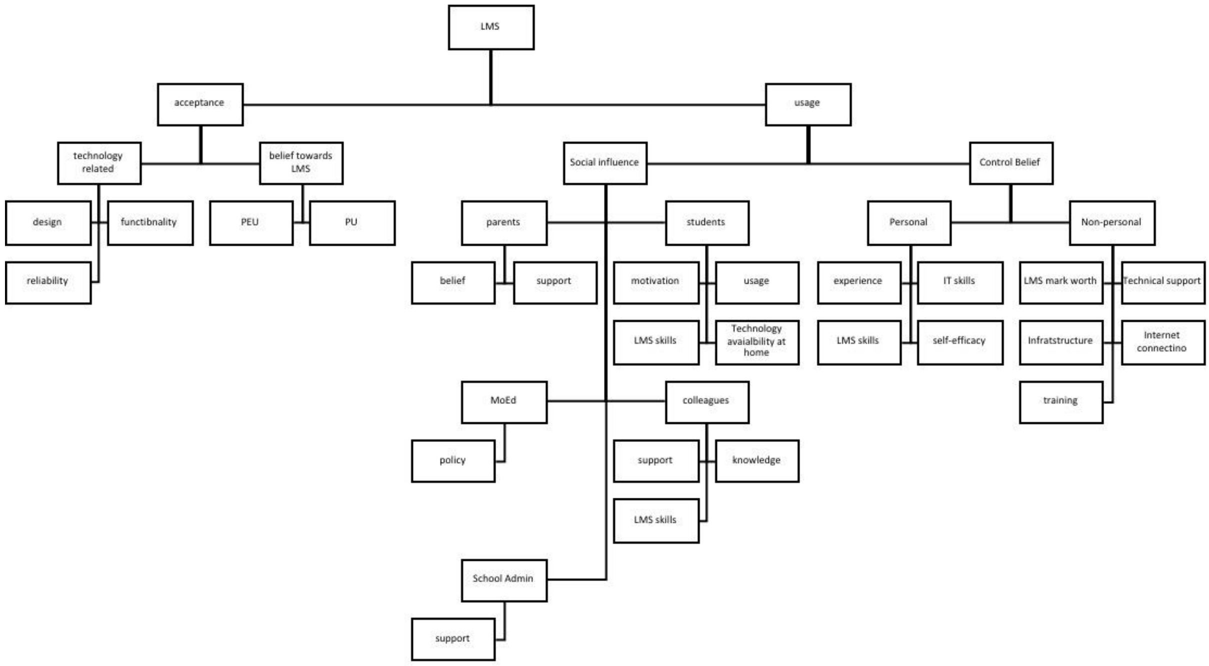

Figure 15. Developing indicators, version 2

In this version, two main dimensions were used: acceptance and usage. More items were included from the interview data and there were more sub-dimensions. For example, social influence included sub-sub-dimensions for each sub-dimension. However, having usage and acceptance as the two main dimensions did not fit all sub-dimensions. Thus, a third version was created (Figure 16).

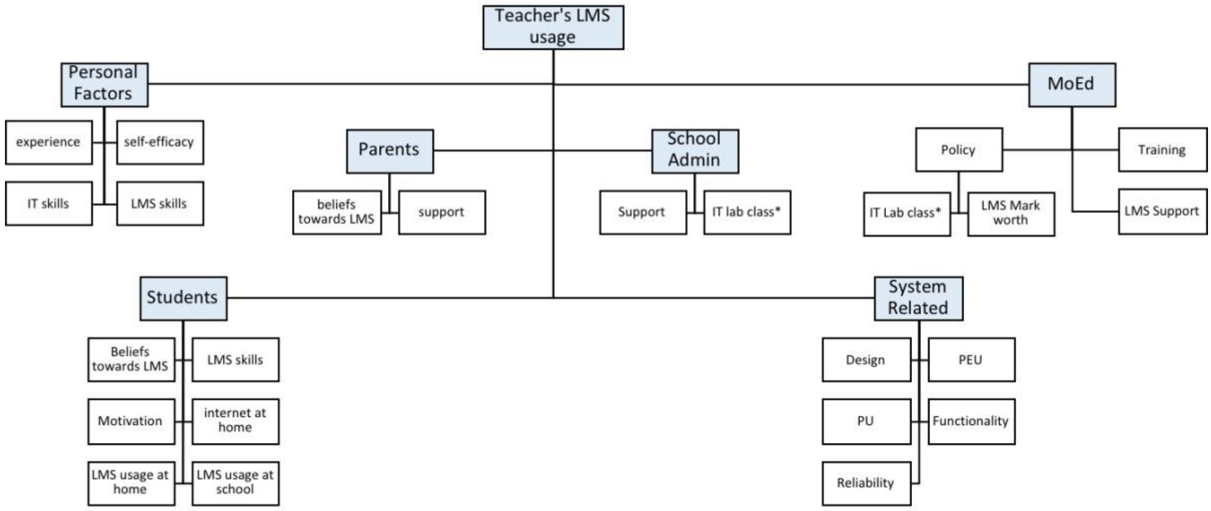

Figure 16. Developing indicators, version 3

This version had a little change in the concept. The original concept was only ‘LMS’. The modified concept became ‘teachers’ LMS usage’, which had six main dimensions, each with its own sub-dimensions. Finally, a fourth, more detailed version (Figure 17) was created to include all further sub-dimensions.

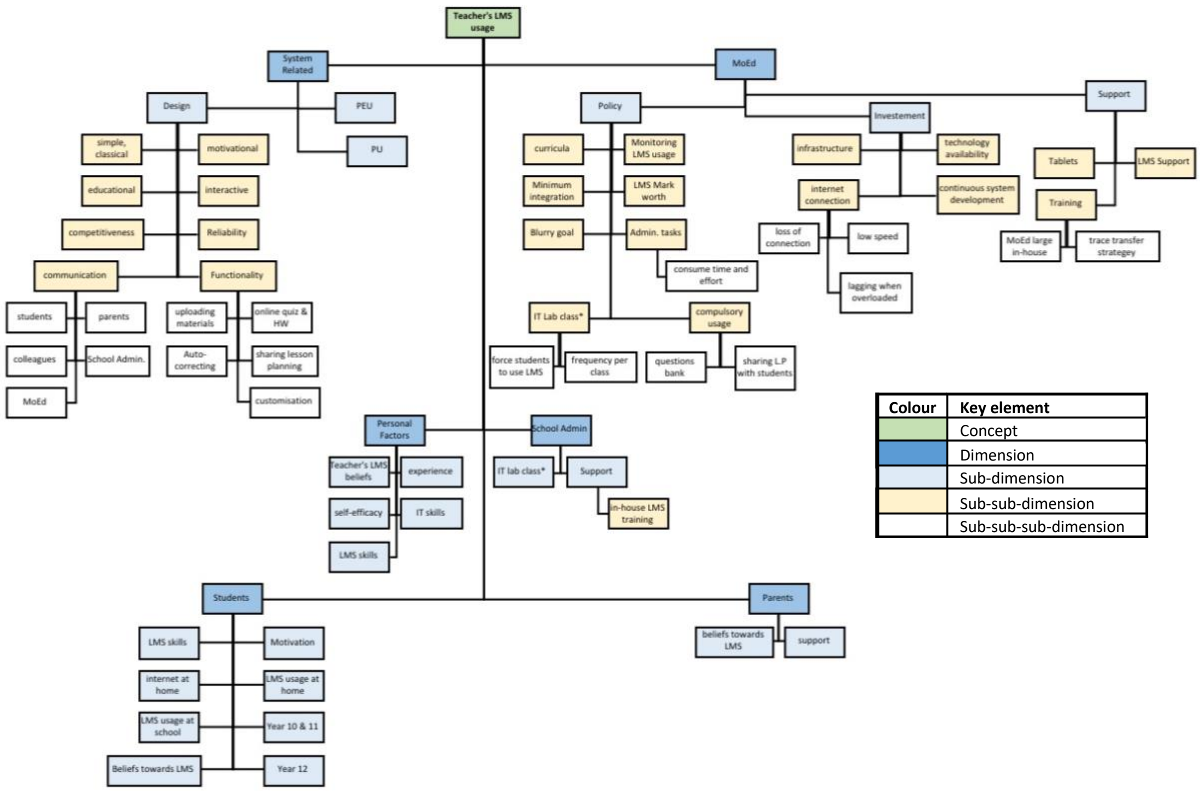

Figure 17. Developing indicators, version 4 (final version)

In total, six dimensions were found, with 23 sub-dimensions, 24 sub-sub-dimensions and 20 sub-sub-sub-dimensions. Table 9 presents the numbers of dimensions and their subdivisions.

Table 9. Numbers of dimensions and their subdivisions

Dimension	Sub-Dimension	Sub-sub-dimension	Sub-sub-sub-dimension
System related	3	8	10
MoEd	3	15	10
Personal factors	5	0	0
School Admin.	2	1	0
Students	8	0	0
Parents	2	0	0
Total	**23**	**24**	**20**

The final elements in each chain of the dimensions' sub-division were intended to be used in a question statement as an indicator (more details about these questions are discussed in section 4.6). Those indicators were the findings from Phase One. These findings were tested and explored in Phase Two. The following section describes those indicators in tables labelled according to factors (dimensions):

Table 10. System-related

Sub-Dimension	Sub-sub-dimension	Sub-sub-sub-dimension
Design	Simple/ classical	
	Motivational	
	Educational	
	Interactive	
	Competitiveness	
	Reliability	
	Communication	Students – Parents – Colleagues – School Administration – MoEd
	Functionality	Uploading materials – Online quizzes & homework – Autocorrecting – Sharing lesson plans – Customisation
Perceived ease of use		
Perceived Usefulness		

The LMS system-related factors are divided into three sub-dimensions: design, PEU and PU. PEU and PU were discussed in the literature review as essential indicators of teachers' attitudes towards LMS usage. The design sub-dimension has eight sub-sub-dimensions indicating whether the LMS design is simple/classic, motivational, educational, interactive, competitive and/or reliable. The sub-sub-dimension of communication indicates how frequently teachers communicated through the LMS with other stakeholders. The functionality sub-sub-dimension indicates the kind of LMS functions that teachers used.

Table 11. Ministry of Education

Sub-Dimension	**Sub-sub-dimension**	**Sub-sub-sub-dimension**
Policy	Monitoring LMS usage	
	Minimum integration	
	LMS use mark worth	
	Confused Objective	
	Administrative tasks	Consumes time and effort
	Compulsory usage	Question banks – Sharing lesson plans with students
	IT lab class	Force students to use LMS – Frequency per class
Investment	Infrastructure	
	Technology availability	
	Continuous system development	
	Internet connection	Loss of connection – Low speed – Server lagging when overloaded
Support	Tablets	
	LMS support	
	Training	MoEd large in-house Trace transfer strategy

The MoEd factor had three sub-dimensions. The first was policy, which was related to monitoring LMS usage, a minimum usage requirement, LMS use mark worth, a confused objective, and administrative tasks that consume time. Compulsory LMS usage had two sub-

sub-sub-dimensions: the creation of question banks and sharing lesson plans with students. The sub-sub-dimension of IT lab class had two elements: forcing students to use the LMS and its frequency of use per class per year.

The second sub-dimension included the Ministry of Education's investment in infrastructure, technology availability, continuous system development, and internet connection. Internet connection had three elements: loss of connection, low internet speed, and server lag when overloaded.

The third sub-dimension was the MoEd's support in terms of distribution of electronic devices, LMS technical support, and training. Training had two elements: the MoEd's in-house training and the trace transfer strategy.

Table 12. Personal factors

Sub-Dimension
Teachers' LMS beliefs
Experience
Self-efficacy
IT skills
LMS skills

Personal factors had five sub-dimensions: beliefs about the LMS, experience, self-efficacy, IT skills and LMS skills.

Table 13. School Administration

Sub-Dimension	**Sub-sub-dimension**
IT lab class	
Support	In-house LMS training

The school administration factor had two sub-dimensions: IT lab class and support. Support included the element of in-house LMS training.

Table 14. Students

Sub-Dimension
LMS skills
Motivation
Internet at home
LMS usage at home
LMS usage at school
Years 10 & 11
Year 12
Beliefs about the LMS

The student factor had eight sub-dimensions: LMS skills, motivation, having internet at home, using the LMS at home, using the LMS at school, Year 10 and 11 students in relation to the LMS, Year 12 students in relation to the LMS, and students' beliefs about the LMS.

Table 15. Parents

Sub-Dimension
Beliefs about the LMS
Support

The parents factor had two sub-dimensions: beliefs about the LMS and support for their children in using the LMS.

This concludes the description of Phase One data collection and analysis. Details about the Phase Two methodology can be found in the next section.

4.6) Phase Two

In this phase, the aim was to answer the following research questions:

- How do these factors affect teachers' teaching and learning practices in relation to Learning Management System integration?
- Which factors are most important in teachers' successful integration of the Learning Management System in Qatar secondary schools?
    - Does the importance of these factors differ between different groups? (For example, between male and female teachers, science teachers and teachers of other subjects, younger and older teachers, less experienced and more experienced teachers.)

4.6.1) Quantitative Survey

The questions for the quantitative survey were developed following de Vaus's (2014) guidance. The questionnaire utilised a Likert scale and Likert-type questions. In Likert scale questions, a 5-point ordinal scale was used ranging from Strongly Agree to Strongly Disagree.

An online questionnaire was used because it could be easily accessed by participants, facilitated distribution and response collection, and was low-cost (Creswell, 2014; de Vaus, 2014). As with other tools used for survey data collection, online questionnaires have both weaknesses and strengths (Ornstein, 2013; Teddlie & Tashakkori, 2009). The questionnaire was self-administered, and therefore it is not possible to verify whether the participants themselves filled in the questionnaire. However, demographic questions and other specific questions were added to the questionnaire to increase the validity and reliability of the answers collected. This combination was intended to reduce error in the questionnaire and hence increase its reliability (de Vaus, 2014; Neuman, 2014). Measures were taken to ensure that there was only one response per device, an option that is available in the SurveyMonkey tool.

There are four levels of data measurements in questionnaire surveys, as per Stevens's (1946) scale of measurement: nominal, ordinal, interval and ratio (Boone, Jr & Boone, 2012; Neuman, 2014). Table 16 details the features of each level of data measurement. (For further explanation, see Appendix A.3).

Table 16. The four levels of data measurement (Boone, Jr & Boone, 2012; Neuman, 2014)

Data	Nominal	Ordinal	Interval	Ratio
Labelled	Yes	Yes	Yes	Yes
Meaningful order	No	Yes	Yes	Yes
Measurable difference	No	No	Yes	Yes
True zero	No	No	No	Yes

In terms of precision level, the measurements are ranked in the following order from least to most precise: nominal, ordinal, interval, and ratio (Neuman, 2014; Sullivan & Artino, Jr, 2013). In the analysis of Likert items, the composite scores of ordinal questions (sum and mean) are analysed as interval data, hence parametric tests are used (Boone, Jr & Boone, 2012; Sullivan & Artino, Jr, 2013). This study had nominal, ordinal and interval levels of data measurement. Demographic questions such as nationality and school name are examples of nominal data; agreement and disagreement Likert-scale questions such as LMS usefulness are examples of ordinal data. Usage frequency of LMS functions is an example of interval data. Figure 18 presents the process followed in creating the questionnaire.

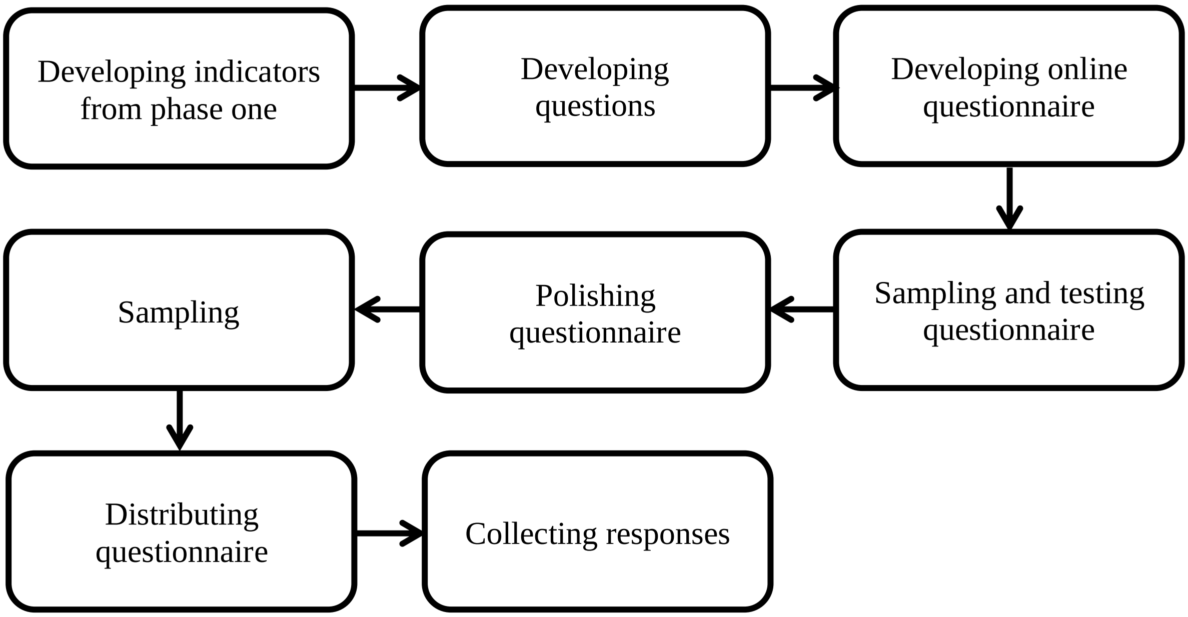

Figure 18. Flowchart showing the questionnaire creation process

4.6.1.1) Creating the Questionnaire

In creating a questionnaire, a pilot test is important to check the validity and reliability of the questions and answers (de Vaus, 2014; Sapsford, 2007). It is also helpful to administer the pilot while chatting with participants, aiming to make the questionnaire items easier to understand and complete (de Vaus, 2014; Sapsford, 2007). Three main steps were followed, as recommended by de Vaus (2014): developing questions, questionnaire development, and testing and polishing the questionnaire.

4.6.1.1.1) Developing Questions

A sample questionnaire was created for the pilot testing following the process of developing indicators discussed above. Those indicators were used as the basis for questionnaire structure and development. The questions were divided into seven sections: demographic information, LMS, personal factors, students, parents, school administration and MoEd. This order was designed to optimise the flow of questions, starting with general demographic questions, moving to general questions about the focus of the questionnaire (the LMS), and continuing to more technical questions about the LMS. After that, the focus shifts towards normative factors, starting with the personal factors, then shifting to students, parents, the school administration and the MoEd. Demographic information included questions related to participants' experience in Qatar and in teaching, as well as personal information such as school name, nationality, age range and subjects taught.

The LMS section had five parts. The first part included questions related to ease of use, usefulness and reliability. The second part had questions related to design, the third part had questions related to the functionalities used, the fourth part had questions related to communication frequency with stakeholders and the fifth part asked participants to rate ease of use for each function separately.

The sections on personal factors, students and parents had questions related to the items shown in Tables 12, 14 and 15 above, and all of them had one part. The school administration section had questions related to LMS support, training and administration of IT lab class.

The MoEd section had three parts. The first part had questions related to the MoEd's support and training, the second part had questions related to policies, and the third part had questions related to IT lab classes.

When developing final indictors, it is important to use statements that are easy to read and understand and to keep in mind the flow of questions and the answer criteria for each question (de Vaus, 2014). Examples of the specific sentences written for the indicators are shown in Appendix A.3. These were then developed and organised into tables. (For the full details of these questions, please see Appendix A.3.)

4.6.1.1.2) Questionnaire Development

The first questionnaire document was originally created in English. It was then translated into Arabic and developed more in the Arabic version only. The questionnaire document was first translated by the researcher, as his native language is Arabic and he completed both his bachelor's and master's degrees in the UK in English. The translated Arabic version was reviewed with all participants in the pilot testing phase: sentences and words used were checked to see if they made sense, reflected what the author aimed to find out, and were easy to understand. More details about the participants' feedback on language is presented in section 4.6.1.1.4.

The online questionnaire was created in Arabic only because the official language used by the MoEd in the LMS is Arabic. In addition to that, 98% of the sample population are Arabic speakers and all of the participants in the qualitative phase had chosen this as their preferred language. The software SurveyMonkey was used as a tool to design the online questionnaire using the researcher's personal account. SurveyMonkey was used due to its compatibility with the analysis software package SPSS (Statistical Package for the Social Sciences) and Excel. Another reason was its Arabic language compatibility.

4.6.1.1.3) Sampling and Testing

In the testing phase, a convenience sample was used (Ornstein, 2013; Teddlie & Tashakkori, 2009): three secondary schoolteachers with more than 20 years of experience in the field. These teachers had not participated in the Phase One test interviews. It is recommended that more experienced participants be included in the testing phase (Ornstein, 2013; Sapsford, 2007). Those participants were known to the researcher and freely agreed to participate. It was not possible to recruit more participants due to time constraints. This might have limited the reliability of questionnaire testing.

All pilot testing of the questionnaire was conducted via face-to-face interviews with the participants, each of which lasted around 30 minutes. A face-to-face administered survey questionnaire allowed the participant and researcher to discuss elements in the questionnaire and provide suggestions (de Vaus, 2014; Ornstein, 2013).

4.6.1.1.4) Polishing the Questionnaire

One of the changes made to the initial questions was a change in the structure of the subjects taught question. In the revised version, participants were given choices instead of blank spaces. This was to save time and enable better categorisation for analysis. Participants could use different versions of spelling to write in Arabic, for example the letter 'أ' could be written as 'ا' and both of them were recognised. However, the SPSS software package would consider them different words, which would complicate the analysis. The questionnaire was reviewed several times for typographical errors, unclear sentences, flow of questions and overall structure.

The participants in the test questionnaire provided some comments about some of the questions and words used. Questions 7 and 9 were edited and re-phrased. In addition, the word for 'neutral', 'معتدل', which indicated the middle choice in the Likert scale, was changed to 'متوسط'. Overall, the test participants were pleased with the survey and found it easy and interesting to complete.

4.6.1.2) Actual Online Questionnaire Development

See Appendix A.3 for the final version of the Arabic online questionnaire used for data collection. Gender was not directly included in the final Arabic online questionnaire, as the school's name served as an indicator of the teacher's gender. In Qatar, girls' schools are named after famous women, and boys' schools are named after famous men. All of the staff in all-girls' schools are female and all of the staff in all-boys' schools are male.

4.6.1.2.1) Sampling

Probability cluster sampling was used (Sapsford, 2007; Teddlie & Tashakkori, 2009). The initial plan was to use probability random sampling, but due to some limitations faced, cluster sampling was used. The sample population was all secondary stage schoolteachers in Qatar's government schools, both male and female. To recruit participants, an invitation to participate was emailed to all government secondary schools in Qatar.

Neuman (2014) stated that one of the weaknesses of online questionnaires is that some participants might not have a computer or internet access. In this study, all secondary stage teachers had internet access within their schools and had been provided with a personal laptop by the MoEd to utilise the LMS. Sapsford (2007, p. 95) introduced a useful guide when selecting a sample (Figure 19). In this case, the blocks followed are highlighted with blue borders.

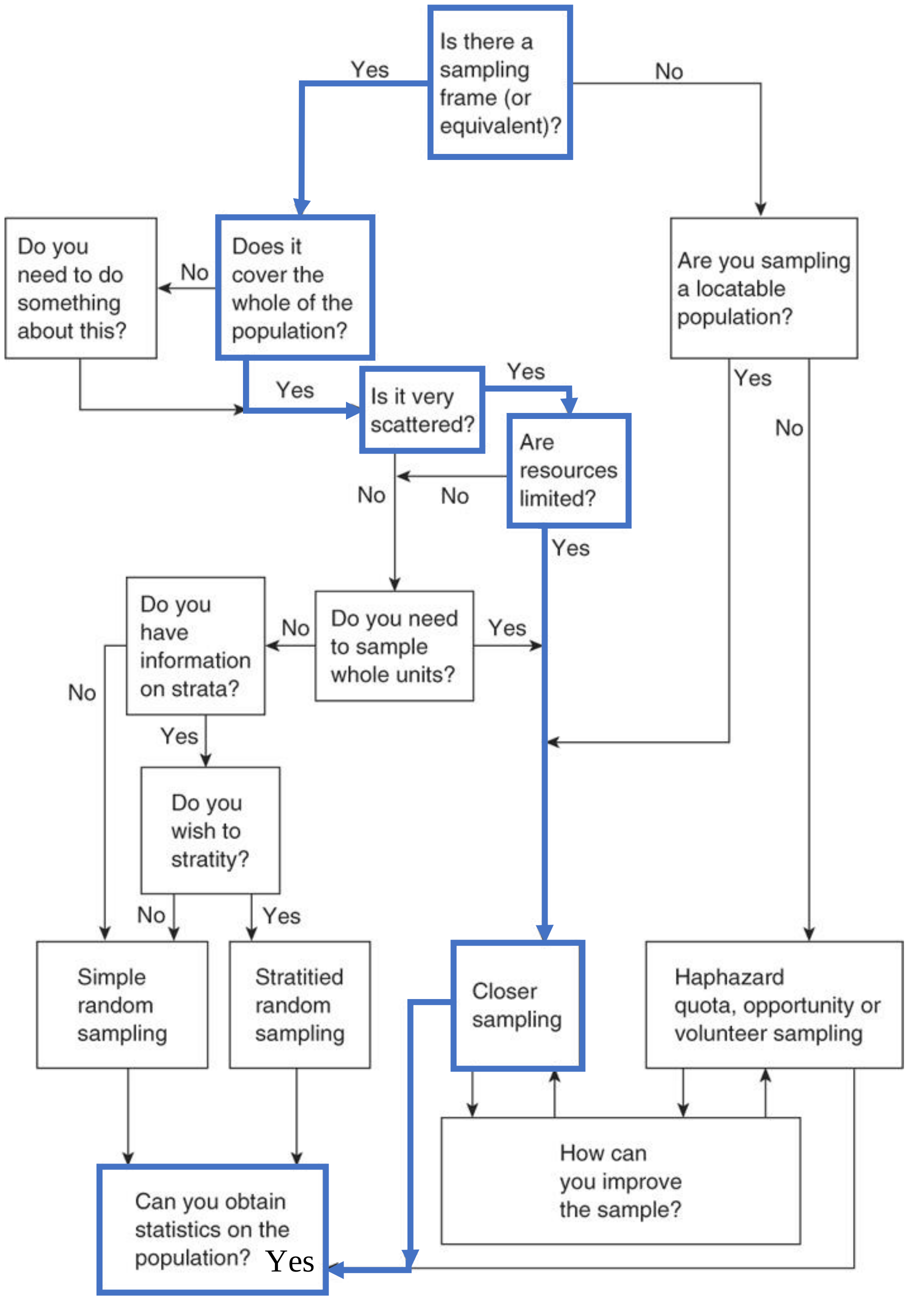

Figure 19. Sapsford's sample selection guide (2007, p. 95).

The representative sample for this research was based on Krejcie and Morgan's (1970) sampling table (see Appendix A.3). As the targeted population was 3,180, the required number of respondents would be 351 with a 95% confidence level and a 5% sampling error.

4.6.1.2.2) Distributing the Questionnaire

The Ministry of Education and Higher Education provided a complete list of schools' administration email addresses and the researcher distributed the on-line questionnaire link via his university e-mail. There were 52 schools, 26 all-male and 26 all-female, with a total of 3180 teachers, 1515 male and 1665 female, with a proportion of 48 males: 52 females (MoEd, 2016).

The questionnaire was sent in October 2019 and was open for participation until January 2020, with the aim to acquire at least 351 responses, as described above. A total of 399 responses were received. At the end of the participation period, the responses were downloaded to the author's personal, securely protected account in two formats: one compatible with SPSS and another compatible with Excel. A SurveyMonkey report of all responses was also downloaded that included tables and figures relating to responses across all questionnaire items.

Before conducting the analysis, it is important to check the reliability and validity of the data collected. The next section details the reliability and validity testing for this study.

4.6.1.3) Reliability and Validity

Reliability refers to 'the consistency of a measure' (Heale & Twycross, 2015, p. 66). In other words, how consistent is a measuring tool in replicating outcomes across similar situations? The reliability of a tool indicates the quality of the research (Heale & Twycross, 2015). In questionnaires, the reliability of individual items in an instrument can be measured using different statistical calculations. Cronbach's alpha coefficient was used to calculate the reliability of questionnaire items and internal consistency. Cronbach's alpha takes into consideration the consistency of items presented for a certain sample in a certain situation (Brown, 2002).

A Cronbach's alpha of 0.8 indicates that 80% of the responses are reliable and 20% are not reliable. The other 20% is error variability in the score. A Cronbach's alpha of 0.7 has generally been reported as acceptable (Abdullah & Maliki, 2017; Moss et al., 1998), while any lower than that might cause some issues and inconsistency (de Vaus, 2014). The following is a table showing Cronbach's alpha coefficient for each ordinal question.

Table 17. Cronbach's alpha, all applicable questionnaire items included

Question number	Cronbach's alpha
Q7	0.89
Q8	0.84
Q10	0.71
Q11	0.84
Q12	0.84
Q13	0.91
Q14	0.89
Q15	0.90
Q16	0.84
Q17	0.76
Q18	0.80

All of the Likert scale questions had a reliability higher than 0.7, which shows that this tool is reliable despite the small pilot sample.

Validity indicates whether the research measures what it intends to measure and the degree of truthfulness of the research findings (Heale & Twycross, 2015). The use of mixed methods and pilot testing the tool increases the validity of this research. The questionnaire was pilot tested to validate its content, questions' meaning, clarity, language, and flow of questions. The content and construct validity of the questionnaire was reviewed by the researcher with participants during the testing phase and all recommendations provided were taken into consideration, in addition to other items noted by the author (see section 4.6.1.1).

4.6.1.4) Data Analysis

Quantitative data analysis was conducted according to the following steps:

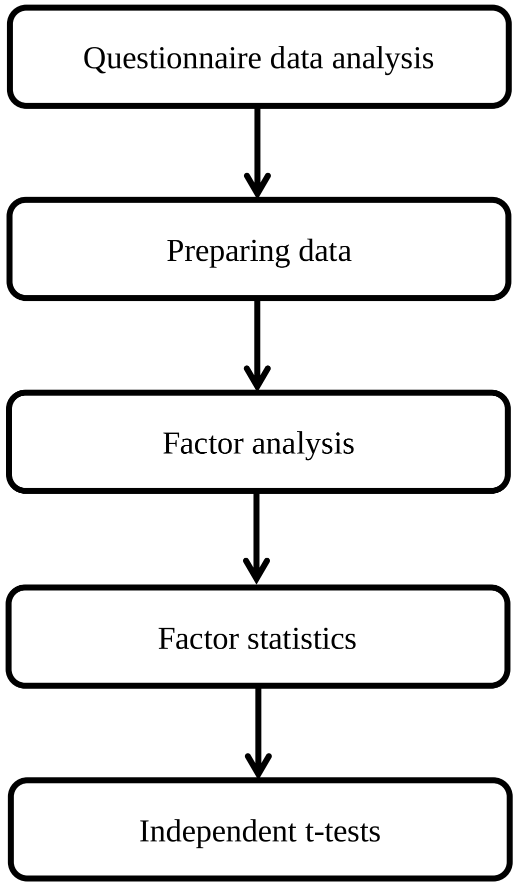

Figure 20. Steps followed for quantitative data analysis

The methods used for analysing quantitative data depend on the research questions and the type of data to be analysed. Data analysis for this study included both descriptive and inferential statistics, such as frequencies, means and correlations (Greasley, 2007). Before conducting the data analysis, it was important to cleanse the collected responses of incomplete and missing data responses. The following sections describe the steps taken to prepare the data for analysis.

4.6.1.4.1) Preparing Data

To prepare the data, three main areas were examined: incomplete responses; missing data; and reversed scoring. Incomplete responses were removed from the data set, as they would complicate the analysis (de Vaus, 2014). This was done using a function in SurveyMonkey that detects incomplete responses and filters them out automatically.

4.6.1.4.1.1) Missing Data

In this research, the percentage of responses with missing data was 0.05%, which is very low. Following the steps recommended by Hair et al. (2014), a ‘complete case approach’ was taken, which means that only complete responses were included. Responses with missing data were deleted for validity reasons. The missing value function ‘NMISS’ in SPSS was used to delete those responses, as it was specifically designed to identify responses with missing inputs for each questionnaire item or variable (Tabachnick & Fidell, 2007). Figure 21 illustrates the steps followed.

4.6.1.4.1.2) Reverse Scoring

Some questions had a negative orientation, for example ‘I don’t believe the LMS is useful’. These questions needed to be reverse scored for the analysis. The reason for this calculation is to avoid having values that would negate variables with positive or negative loadings (de Vaus, 2014) and to have valid scores for data analysis by making sure that all items relating to a particular topic are set in the same direction (de Vaus, 2014; Hair et al., 2014).

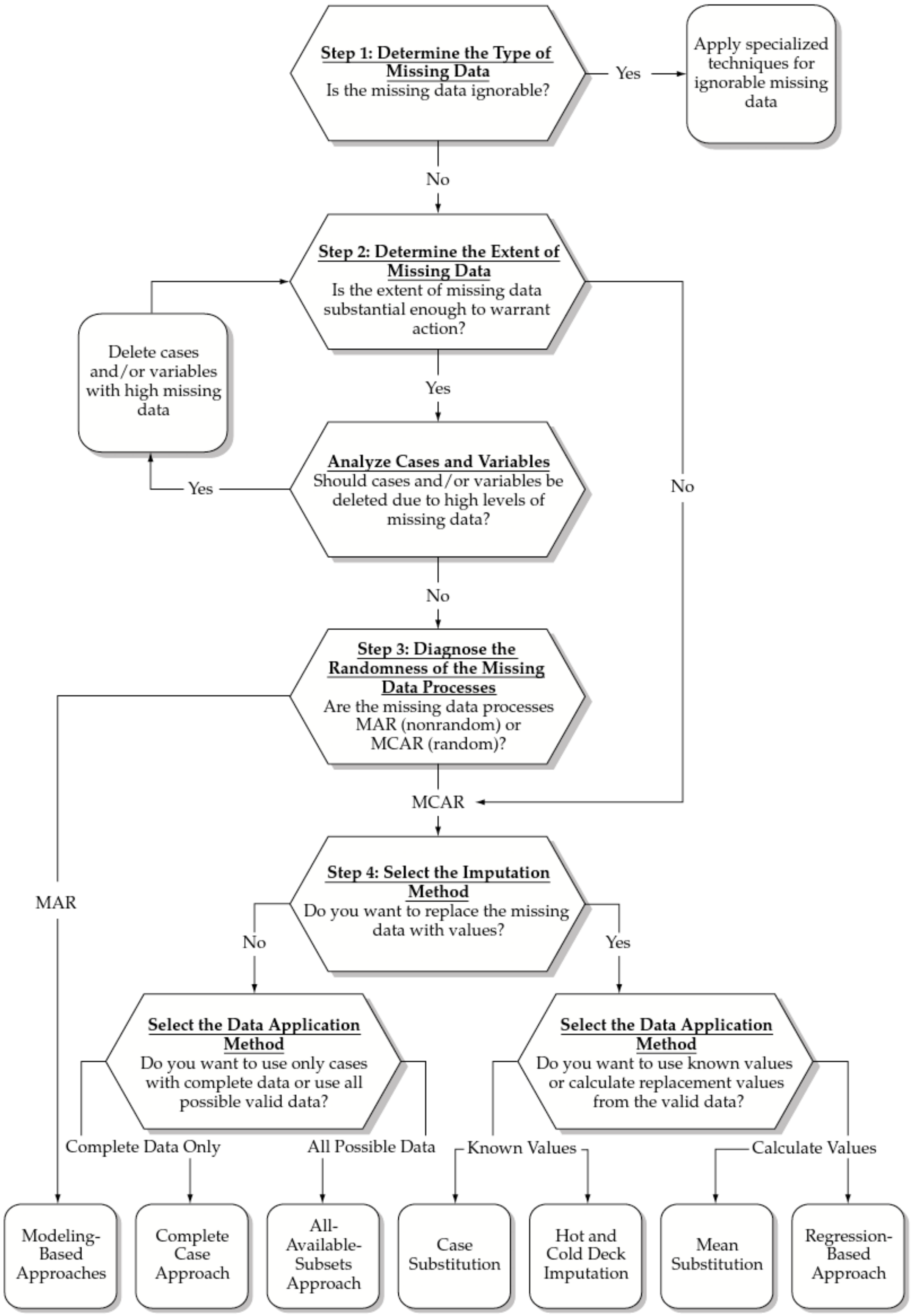

Figure 21. A four-step process for identifying missing data and applying remedies (Hair et al., 2014, p. 43)

In case one, which is the best case, if a factor F1 has a value of 5 as the highest and another factor F2 has a value of 0 as the highest, when they are summated, this would result in a total of 5. In case two, which is the worst case, the value of F1 is 0 and the value of F2 is 5, and when they are summated this would result in a total of 5. These results show that there is no difference between the two cases. However, if the score of F2 were reversed, the highest score for both would be 5 and the summated value would be 10 for case one, and the summated value for case two would be 0. Now the difference can be distinguished between the best and the worst cases (Hair et al., 2014).

The reversed score approach was used for some of the questionnaire items. The table below shows the original scores in relation to their Likert scale answer and then the equivalent reversed score:

Table 18. Reverse scoring example

Original score	Likert scale answer	Reversed score
1	Strongly Disagree	5
2	Disagree	4
3	Neutral	3
4	Agree	2
5	Strongly Agree	1

4.6.1.4.2) Data Tests and Analysis

Four main analyses were conducted in this phase starting with factor analysis, factor statistics and independent t-test. Factor analysis is a multivariate statistical approach used to analyse the interrelationships of a large number of variables. It groups and explains these variables under a common factor (component/dimension). Factor analysis does this by condensing the high number of variables into a smaller representative number of factors that retain most of the information (Hair et al., 2014; Tabachnick & Fidell, 2007; de Vaus, 2014).

This research utilised exploratory factor analysis, in which factors can be explored without knowing the number and nature of variables used. Factor analysis was conducted in five main steps, as shown in Figure 22 below.

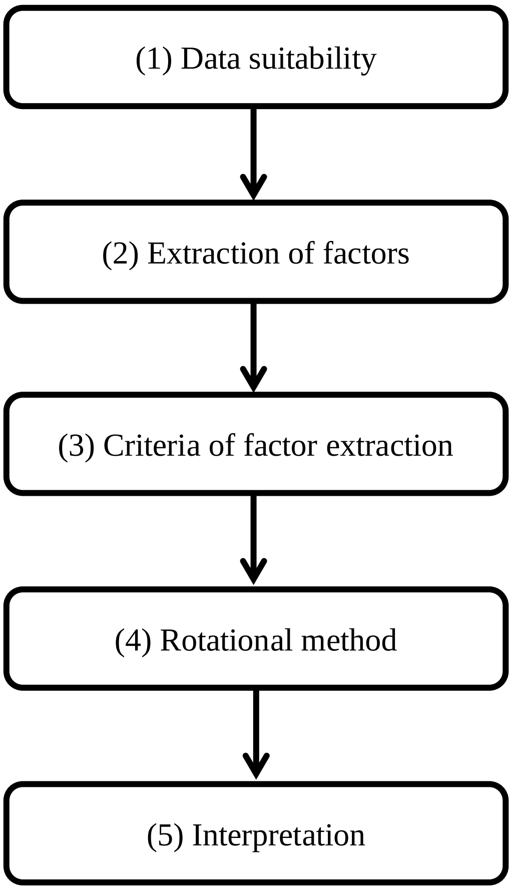

Figure 22. Steps for conducting factor analysis

(1) Data is checked to be suitable for factor analysis by looking at different elements and tests such as the sample size, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Bartlett's test of sphericity and communality. A sample size of 100 or more is considered acceptable for factor analysis (Hair et al., 2014; Samuels, 2017). This study's sample size was 247. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is conducted through SPSS. If the KMS value exceeds 0.7 then it is deemed suitable. Bartlett's test of sphericity is also conducted through SPSS to check the sphericity significance value. If that is less than 0.01 then it is considered suitable. Finally, a communality calculation is used for all of the variables. Variables with scores of more than 0.3 are considered suitable (Samuels, 2017; de Vaus, 2014). More details of each step will be found in the analysis chapter when findings are presented.

(2) The extraction of factors can be carried out in several ways, such as principal components analysis, principal axis factoring, maximum likelihood, image factoring, canonical factorisation and alpha factoring. The most common methods of extractions are principal components analysis and principal axis factoring. This study utilised principal components analysis.

(3) Factor extraction uses what are known as eigenvalues and the cumulative percentage of variance. Both of those are calculated in SPSS. In the literature it is recommended that variables with eigenvalues of greater than 1 be examined. Eigenvalues reflect the variance explained by the factor.

(4) Rotational methods are used to clarify which variable mostly belongs to which extracted factor, as many variables may load on many factors in the unrotated extraction, making it unclear. There are various types of rotations. However, varimax rotation, which is an orthogonal rotation, was used in this research to maximise high correlations and minimise lower correlations between variables and factors (de Vaus, 2014; Hair et al., 2014; Samuels, 2017).

(5) The final step is interpretation, where the resulting factors are labelled based on the variables constructing them. For example, one factor had four variables: self-efficacy, IT skills, LMS skills and experience. These factors can be labelled as personal factors affecting LMS integration. More detail on each step is presented in the analysis chapter for Phase Two (see section 5.3).

Statistical descriptions of each factor were then obtained by calculating means and standard deviations. All corresponding variables were summarised in terms of frequencies, variable mean and standard deviation.

Correlation is a bivariate approach used to find the relationship between two variables and a type of inferential statistic (de Vaus, 2014; Hair et al., 2014). It measures the size and direction of linear relationships between variables (Hair et al., 2014). Correlation is determined by the correlation coefficient r (de Vaus, 2014). The value of r is between -1 and 1. If the value of r is equal to 1, the two variables are perfectly correlated. A negative value indicates an inverse relationship: as one variable increases the other variable decreases. A positive value indicates a positive relationship: as one variable increases, the other variable also increases (de Vaus, 2014; Greasley, 2007). r^2 is used to measure the strength of the association between the two variables (Hair et al., 2014).

Significance p-value is a statistical test that assesses the reliability of the association between two variables. p-values of less than 0.05 are considered statistically significant, which means that it is unlikely that this association occurred by chance (Greasley, 2007; Teddlie & Tashakkori, 2009). Pearson's correlation was used in SPSS as data were composed and were considered interval.

The description of the strength of a relationship using the r coefficient is indicated in Table 19 using Davis's (1971), Cohen's (1988) and de Vaus's (2014) descriptions, which apply equally to positive and negative relationships.

Table 19. Coefficient r and related strength descriptor

Coefficient r	Strength descriptor
0.00	No relationship
0.01 – 0.09	Very low relationship
0.10 – 0.29	Low to moderate relationship
0.30 – 0.49	Moderate to substantial relationship
0.50 – 0.69	Substantial to strong relationship
0.70 – 0.89	Very strong relationship
0.90 +	Nearly perfect relationship

In statistical analysis, to compare the difference between two nominal groups such as male and female against an interval variable, an independent t-test is used. In this study, t-tests were used to compare the differences in gender (male/female), subjects taught (science/ other), age (younger/older), and experience (less/more) against the important factors identified from the factor statistics.

4.7) Ethical Considerations

Ethics approval from the University of Northumbria was obtained before starting the data collection. It was granted on 13/09/2017. Following this, approval from the MoEd was also granted. A participant consent form was provided for both the interview phase and the survey questionnaire phase prior to the start of the data collection process (see Appendix B). Participants were clearly informed about their freedom to participate or withdraw from participation; they were also debriefed about the research aims. Following data collection, all participant information was anonymised, with each given an individual code. All data was securely saved and stored on a protected offline computer account, to which only the author had access.

4.8) Summary

This chapter has reviewed the rationale for the chosen methodology. It started with a description of the pragmatic philosophy adopted and its influence on shaping and guiding the research methodology. The exploratory sequential mixed methods design used for data collection was described, including sampling, testing and analysis for both phases: the qualitative interviews and the quantitative online survey. One of the main benefits of using mixed methods is that the two different methods complement each other; however one of its main challenges is its complexity: the use of two methods requires more time for analysis. Reliability, validity and ethical considerations were also discussed.

The next chapter presents the analyses of each phase separately, starting with the qualitative data analysis for Phase One and followed by the quantitative data analysis for Phase Two.

Chapter 5 – Findings

5.1) Introduction

This chapter presents the results from both of the phases described in Chapter 4. The analysis occurred in three stages. The first stage was thematic analysis of the data collected using semi-structured interviews. The findings from this phase answered the first research question. The second stage of analysis involved the quantitative data that was collected using the online questionnaire and analysed using factor analysis and t-tests. These findings answer the second and third research questions.

The third stage of analysis combined the findings from Phases One and Two of data collection in order to further understand the data and illustrate key findings.

5.2) Phase One – Qualitative Analysis

5.2.1) Introduction

Thematic analysis was used for the data collected through semi-structured interviews. The transcripts were repeatedly reviewed and analysed in order to organise the codes into meaningful categories that would result in an in-depth understanding of participants' experiences with the LMS.

Two main themes emerged through the analysis. The first theme was the LMS system itself. Examining this theme provides an in-depth understanding of participants' experiences of the LMS system in terms of the system's educational, technical, teaching and learning aspects.

The second theme was the change in teaching practice prompted by the LMS. Examining this theme provides an in-depth understanding of the effects of the LMS on participants' current practices in comparison with their prior teaching practices, capturing three subthemes: no effect, minor effect and major effect.

5.2.2) Theme One: The LMS System

This theme presents data related to participants' experiences with the LMS. It provides an understanding and analysis of the system, the policy and standards set by the Ministry of Education (MoEd). It then analyses broad aspects related to the technicalities of the LMS. A more specific analysis follows, which is presented in teaching systems. Finally, it analyses data relating to a 'learning system'. Four sub-themes are described, including the education system, the technical system, the teaching system and the learning system.

5.2.2.1) Education System

The education system theme gives an overall picture of the Ministry of Education and Higher Education's investment in and support of LMS integration, in addition to the expected standards of integration by teachers and students.

As the following two interview quotes illustrate, the MoEd have invested a great deal in school infrastructure, specifically to embed the LMS.

> *'It is true that the MoEd paid for and made everything' (P03)*
> '*Here they have paid a lot, made the infrastructure*' *(P05)*

The LMS is compulsory for both teachers and students.

> *'No-one would take your place for e-learning, so you have to do it, it is one of the requirements' (P07)*

Teachers' use of LMS is monitored and failure to use it regularly is highlighted.

> '*Yes, he [MoEd's LMS administrator] would notify him [teacher] to include electronic content and use its tools, meaning it would be easier for students, meaning if they see someone not engaging, meaning there is someone neglecting the whole*

> *thing, no plans, there is nothing, no homework, in this situation he is told he must upload homework, must upload quizzes' (P09)*

The MoEd expects to see at least a minimal level of integration of the system into teaching practice. Participant 02 explains this as follows:

> *'We have a system here, for example, two homework tasks a month and a quiz a month' (P02)*

As the MoEd is imposing the LMS, it was expected that some participants would express negativity towards the idea of integrating the system. However, all participants felt positive about the idea of integrating the LMS into their practice, with many stating that integrating technology is no longer a luxury, it is a necessity.

> *'No, it is very important, it isn't a choice anymore, it isn't a luxury anymore, meaning we are not in a place to choose, we are forced' (P04)*

Several participants complained about the MoEd's policies:

> *'It is their [MoEd] policies that hinder [LMS] usage' (P05)*

Teachers are asked to do administrative tasks such as documentation, which is an archiving job, as expressed by some of the participants. They indicated that this documentation job consumes a great deal of their time and is potentially overrunning their teaching practice, whilst the LMS was intended to ease their workload.

> *'We have paperwork that keeps us occupied from using it [LMS], especially given that the LMS was integrated to ease my work a little, ... No we are still sticking to paper, there's too much documentation ... Documentation is important to them [MoEd], it can overshadow the teaching itself, for example if you teach everything 100% but you haven't documented it, then it's like you didn't do it ... Documentation*

> *is a tiring job, and it is an archiving job, not mine. I did not learn archiving at university' (P05)*

The same participant felt that whoever paid for the system was more concerned about claiming that we are using the system than about the real benefits of using the system for educational purposes.

> *'OK, you [MoEd] want me to implement e-learning, give me a chance to implement it, you want me to integrate e-learning, you want me to do it on paper, you want me to document it and create folders, join competitions, make activities, OK, when will I be able to do all that! It seems you [MoEd] don't want to successfully implement it, only to claim that we've implemented it, to make sure that you didn't pay all this and then, at the end, have no-one use it!' (P05)*

This sub-theme gave an overall picture of the participants' awareness of MoEd investment and experiences with the policies and standards enforced by the MoEd. It showed that there is a pull between the MoEd's purpose towards LMS integration if it was for learning purposes or management purposes. The following sub-theme focuses on more technical data regarding the participants' LMS experiences.

5.2.2.2) Technical System

In this sub-theme, the LMS design and functionalities discussed by the participants are analysed in order to understand the technical aspects of the system in broad terms.

As with other online platforms, LMSs contain a system design element. This is the first interface with which the user interacts. This element allows the user to explore and use the system and connect to other functionalities, either embedded in or connected to the system. Participants indicated that the system is simply designed, like a page of questions and answers that supports cognitive approaches:

‘It is a normal page, questions and answers, he would answer or ask his colleagues if they were discussing it’ (P07)

Another participant stated that the system design was not suitable for students at their development age level: it should be more interactive, motivating and educational. For example, if a student was given the task of answering some questions about a topic and they got them wrong, the LMS should support the student in understanding why and should provide the correct responses. If the student answered correctly, this could open further opportunities for development through more challenging questions.

‘The LMS is static [not user-friendly], … it does not attract students … It has to be interactive; this is what we want … it has to be educational … They [MoEd admin] have to look for plans to resolve issues’ (P03)

Those participants did not question the usefulness of the LMS system in education, but they did believe that it would be more supportive to learning if it was up-to-date in relation to its competitive level and functionality compared to other platforms.

‘E-learning is amazing, but what is the idea? You have to give it a higher value, percentage and develop the software to a competitive level’ (P04)

System functionality relates to system design: the relationship between them can be represented as a box of tools (system design) and the tools within (system functionality). In broad terms, the system is designed to support communication between teachers, students, parents and administrators. It also supports teachers’ practice through the use of different functionalities, such as the ability to upload materials (documents, videos, audios, pictures etc.), online homework and quizzes, grading students’ performance and recording attendance. Those aspects can also be accessed by parents who are interested in tracking their children’s development.

'It is similar to an electronic webpage. It can be used for communication between teachers and students, and between parents and administrators … For example, you can send materials, homework, quizzes and discussions to students … Parents can use it to track their son at school' (P08)

However, the LMS is an online portal that can only be accessed through an internet connection. This makes internet connectivity one of the elements without which the LMS cannot work. Nearly all participants indicated issues with their internet connection. Some examples of internet issues at school are loss of connectivity, lagging when using LMS and low internet speed.

'The internet connection is heavy, yes, the internet can't sustain connectivity, weak, at school, of course. At home it could be stronger but at school it is too slow, so you struggle to load other things, not only the LMS' (P01)

The repeated occurrence of such issues impacted participants' motivation and led them to stop relying on the LMS for their teaching practice.

'Here they have paid a lot, made the infrastructure, but it seems they didn't succeed. The network collapses if it is overloaded, for example if a few classes use it [LMS/ internet] at the same time, … If I have a problem, as soon as a problem occurs twice or three times, I get bored and leave it. I told you, I am not a machine, so I would have a reaction. I wouldn't be motivated. It would waste my time, so I would say it is better to go back to traditional teaching' (P05)

The LMS is intended to save teachers time and effort. Few participants agreed that this was currently the case, but they indicated that it would do so in the long run. This is because the MoEd requests that many tasks be completed and many system functionalities be used by teachers to a high level. This requires considerable time investment on the part of teachers.

'At the beginning, yes, [time was a problem]. If you had to prepare a bank of stored questions, you would need a lot of time, yes. But if you already have a bank or store [of questions], after this you can draw on that, so it's a little easier. In the long run it gets better' (P07)

The general technical aspects of the system discussed by interview participants included the LMS platform design, its functionalities and some of the general issues with infrastructure such as internet connection. The following sub-theme presents a more specific analysis of issues related to teaching through the LMS.

5.2.2.3) Teaching System

The actual teaching practices of participants integrating the LMS included a number of interesting aspects. Participants had previously shown an appreciation of the system, with some comments on potential development and updates. In this section, more specific examples are provided.

One important teaching experience mentioned by some of the participants was their shared lesson planning and communication. Teachers of the same subject collaborated in lesson planning. For example, if there were three teachers and they had three chapters of the curriculum to cover in one semester, they could divide the lesson planning between them, one chapter for each teacher. Then they could share their lesson plans with each other to complete the whole set of three chapters' lesson planning.

'Even here, they [MoEd] have created "share with" as well' (P06)

The LMS shows great potential in assisting teachers, as it offers them new tools that can be used in their practice. Some of these tools can be customised based on teachers' preferences supporting constructivist approaches. For example, the LMS gives teachers the option to send materials to the whole class or to selected students only. This allows teachers to target specific students' needs. Some of the participants indicated that the LMS allowed them, for example, to provide a low-performing student with suitable materials targeting their needs, as well as to provide high-performing students with more challenging materials.

> *'There are some students who are at a low performance level, who need more homework. I can send it to one student alone, as there is a choice to send to all students or choose a single student. So, you can start to support that student a little … And for higher-performing students, you can send them materials that are more related to their level that can increase their interest' (P09)*

However, when trying to create online materials for students using LMS tools, participants experienced difficulties. As they are teaching physics, they need to use Greek symbols and mathematical equations. The system does not easily accept these symbols, increasing the time and effort that teachers must put in.

> *'For me to create them [diagrams and worksheets] it will take a long time. Also I can't [upload] something like this, it would take too much effort. I could take a picture and [upload] it like that, but it would take a very long time for me …' (P01)*

The continuing presence of such issues would clearly hinder teachers' LMS integration. However, these issues were reported, and the issue seems to have been resolved.

> *'You have certain characteristics, yes you can upload pictures, before it wasn't possible; now everything is OK' (P06)*

Since the interviews were conducted within a short period of time, it is unlikely that an issue reported earlier would be resolved during that same period. This leads to another point: Why are some schools no longer having this issue while others are? There could be several reasons; however, one of the potential reasons mentioned by participants was the lead teachers, whose interviews will be analysed under the next sub-theme.

Teachers' integration of the LMS into their practice differs for Years 10 and 11 and Year 12 students. Participants indicated that students in Years 10 and 11 are more engaged with LMS than students in Year 12. One of the reasons is that LMS usage for Year 12 students is not marked, making students reluctant to continue engaging with it. Participant 02 explains this, indicating that the LMS is 'acceptably useful' at Years 10 and 11 but not useful for Year 12 students. Another participant said that this was a problem affecting their successful integration of LMS in this age group.

> *'Year 12 don't have [marks on LMS], this is another problem ... If there are more marks held with the teacher, then the student would be more interested in those marks with the teacher ...' (P07)*

Therefore, participants indicated that Year 12 students are not motivated to work with the LMS. Even the minimum level of integration required by the MoEd, one homework task and one quiz per month, is difficult to fulfil for this group. Participants struggled with this, as they tried to motivate students to log into the system, but only around 30% of the Year 12 students would do so (as estimated by one of the participants).

> *'The students ... you would say 30% accept it and the rest are not bothered' (P05)*

Participants sometimes resorted to forcing students in Years 10, 11 and 12 to use the LMS through what they referred to as IT lab class or e-learning class. They would take their students to the computers lab so each student had a computer to use and log into the system to access the materials, homework or quizzes planned by the teacher.

> *'You have to take students to lab class, and force them to go back and solve equations, things like that' (P03)*

Some teachers use these e-learning classes to teach the students how to use the LMS.

> *'The school is really interested in e-learning, and sometimes they assign specific classes to lab. For example, when I take the whole class now for an e-learning class, I take them to the lab. Every student sits at a computer and logs in using his account, and I have the e-learning coordinator with me in-class with a computer and an LMS teacher.' (P01)*

Participants added that students at secondary level are not taught the skills necessary to use the LMS, instead being taught scientific subjects. Therefore, it is not their job to teach students LMS skills.

> *'It is not us who should teach them the LMS ... you don't teach students skills, you teach them a scientific subject ... So we are not responsible for the LMS, the students have had it since 4th Grade, so the student must reach us ... knowing what the LMS is' (P06)*

Students' interaction with LMS at home compared to when they are at school showed an interesting contradiction. Participants indicated that students are actually happy to hear about e-learning classes and are keener to use the LMS at school.

> *'The student at school says honestly that he doesn't have a problem, he even gets happy when there's an e-learning class.' (P07)*

However, if the students are told to log into the LMS to do homework or a quiz at home, they would start to give excuses, which sometimes could be true. As a teacher, there is not much that can be done.

> *'The students are a bit reluctant. They say, I don't have a laptop, I don't have access to the internet at home. What can you do? I will have to wait for an e-learning class' (P01)*

Some of these excuses have to do with students' parents. Parents have an important role in their children's learning and can facilitate or hinder the use of LMS at home. Participants indicated that the LMS granted them the opportunity to communicate with parents and for parents to track their children's performance.

> *'It is a way of communicating with parents … It is also possible for a parent to check his son's performance and see what we are giving him' (P09)*

Participants indicated that parents' beliefs about the LMS affect the student's use of the system. The majority of parents do not appear to be convinced about the utility of the LMS.

> *'The problem we have … [is that] parents are not very convinced about it. I am honestly telling you, the majority aren't convinced' (P06)*

This section has presented data related to participants' experience with integrating LMS into their teaching. It reflected on the potential of the LMS in assisting teachers' practice and the issues hindering successful integration of the LMS. The following sub-theme relates to learning about the LMS and the skills necessary to use it.

5.2.2.4) Learning the System

This sub-theme focuses on learning about the system, including training sessions, workshops and courses. Prior to learning about the LMS, teachers are expected to have basic computer skills. One of the MoEd requirements is that teachers have an ICDL (International Computer Driving License). If a teacher is employed but is lacking this license, the teacher is funded by the school to attend a four-month ICDL course.

> *'When a teacher is employed here [in Qatar], the first thing they [MoEd] do is check one of the requirements, the ICDL. If you have this, you will get points over other candidates. If you don't have it, like me, I didn't have it … I'd never heard of it, the school funded me for about four months. They bring us here and teach us here and they tested us online on a specific date, … Word, Excel, PowerPoint … etc.' (P06)*

In the initial phase of the LMS project, the MoEd held and led LMS-specific training courses for most teachers. They assigned the classes on a non-teaching date and a large group of teachers attended the course.

> *'Before using it [LMS], there is training' (P09)*

Several years after e-learning (LMS) implementation, the MoEd stopped providing large-scale training sessions and introduced another teacher training strategy, which was described by one of the participants as the 'trace transfer strategy'. Under this strategy, certain teachers are assigned the role of 'leaders' or 'lead teachers'. These teachers are responsible for learning about new updates and changes to the system through workshops held by the MoEd. They are then expected to go back to their departments and transfer the knowledge to other teachers.

> *'At the beginning they took a certain group and used a 'transfer strategy': The person who was chosen was trained, then they came back to school and started to teach others … and they took from different disciplines' (P03)*

> *'And whenever there was a new thing, there would be a workshop. There is a thing here called "leaders", each section would have someone responsible for it, so if there was a new thing, he would attend a meeting, take a workshop, learn what is new, then go back to his school and teach others' (P09)*

It is important to distinguish between lead teachers and LMS or e-learning coordinators. The lead teacher is assigned to one subject department. There is, for example, a lead teacher for the math department, another lead teacher for the physics department, and so on. Those lead teachers must come from the department they are responsible for; they are always teachers at the school. The LMS e-learning coordinator is usually one person at a school and acts as coordinator for the whole school. His or her role is to provide new teachers at a school with LMS training and to provide training for the whole school in any new technology introduced by the MoEd.

> *'The e-learning coordinator, every time there was a new update from MoEd, he would conduct a training for the whole school' (P07)*

New teachers employed at school receive considerable support from the school administration and their colleagues when it comes to LMS training. The school organises basic in-house LMS training for new teachers.

> *'We do internal training for new teachers, and you can ask your colleagues' (P06)*

Several participants complained about how some of the training sessions were held. They stated that large-scale training would usually involve general discussions, not allowing teachers to ask more specific and complicated questions.

> *'Sometimes the [training] course would be open to everyone. Sometimes there are great benefits to this, but when it is for each section by itself, there is more benefit.*

Why? You can discuss with him [instructor], talk to him, the interaction is more active' (P07)

In regard to students' LMS skills, as mentioned earlier, participants expressed that students often reach secondary school without being ready to use the LMS. Teachers recommended that students be taught how to use LMS starting from Year 4. This is because students at that age and development level are typically more enthusiastic about working with computers and online systems than when they are older.

'Especially in elementary stages, more than preparatory and secondary stages ... because the child is more encouraged' (P06)

However, unfortunately, children do not receive enough LMS training when they are in the elementary stages (Years 4 – 6).

'It is not because they are not bothered [to use the LMS], it is because they didn't get enough interaction, they were not taught' (P06)

However, with the current issues at secondary level, some school administrations have identified the issue and assigned specific IT lab classes for students to learn how to engage with the LMS, including accessing it, doing homework, completing quizzes and communicating with others.

'Also, here at school they have made some of the computer classes like training sessions for students, because most of the computer classes are in computer labs. It was a move made by the school administration' (P08).

This sub-theme related to training and preparing teachers and students to use the LMS. The participants' contributions here showed how the MoEd prepared teachers to use the LMS at the beginning of implementation and how they developed ongoing training through the new strategy of cooperating with a lead teacher. Participants reflected on some of the issues they had with training sessions and stressed the importance of training students to use the LMS from an early stage so they are more engaged with the system in their senior years at school.

In this section, an analysis of data regarding the LMS was presented. The Ministry of Education's investment in and focus on successfully integrating the system is clear in the data, and the participants are generally accepting of the idea of integrating the LMS in their practice. However, they expressed some issues with system design, training and implementation. Some of these issues have already been resolved and some have not. The idea of integrating the LMS into education was aimed at supporting and enhancing teachers' and students' experiences. This aim leads to the next theme: the effect of the LMS on the participants' teaching practice.

5.2.3) Theme Two: The LMS and Teaching

The LMS has had different levels of effect on teaching practice. In this section, the effects are classified into three categories: no effect, minor effects and major effects.

5.2.3.1) No Effect

No effect means that LMS implementation did not change or have any direct effect on participants' practice.

Several participants reflected on their lesson planning prior to and after LMS integration, finding no difference in the structure of their lesson plans. The structure of the lesson plan is provided by the Ministry of Education and Higher Education in a template for teachers to fill in, and LMS integration did not alter this pre-existing template.

For Year 12 students, participants reflected that the LMS usage during the academic year did not count for any marks towards the student's final total mark. Therefore, the LMS was rarely used by Year 12 students and had no effect on their learning (evidence presented in 5.2.2.3).

Some participants indicated that even though they used the LMS for Years 10 and 11 in practice, it did not have any effect on their final examinations.

> *'Another thing: You focus on the students utilising e-learning and then at the end of the year you test them using pen and paper, how can that be!' (P01)*

Nevertheless, there were minor effects of the LMS on lesson planning and other aspects of teaching practice. The following section discusses such minor effects.

5.2.3.2) Minor Effects

One of the challenges that participants had when planning for their lessons was choosing the best strategy to fit students' learning differences and achieve the goals stated in the lesson plan.

> *'Sometimes the lesson plan takes an hour and sometimes takes two or more, only to look for the best strategy to achieve the goals set' (P06)*

This section analyses data on the minor effects of the LMS on participants' teaching practice. In this sub-theme, we find that the LMS supports teachers by increasing their options in terms of teaching strategies. This occurs either without affecting the process or by changing from paper-based practice to electronic practice, such as creating lesson plans electronically in the lesson planner software (P02).

When planning, other than creating lesson plans electronically, the LMS is not always used in the classroom; its use depends on the goals stated in the lesson plan. Teachers indicate in the lesson plan where they will be utilising LMS functions and for what purpose.

> *'In lesson planning, if you planned to use the LMS [for the lesson], you would indicate it in your plan. For example, a homework task will be uploaded to the LMS, a discussion will be started, or a quiz will be administered using the LMS' (P08)*

Some participants indicated that they used the LMS to upload activities for students to work on, in addition to paper- or class-based activities (not using the LMS) where they print paper copies of activities for students to take home. This is due to the low student engagement with the system; these LMS-based activities have a positive effect on students' learning.

> *'I like activities, not just a piece of paper with questions to solve … No, the student would see questions that when he answers he would understand the lesson without asking me … I have all of the activities uploaded on the LMS' (P06)*

Other than activities, participants share additional types of materials with students, for example lesson plans, worksheets and useful electronic sources. All of the participants said that they used the PhET virtual lab, which helps students in their learning. Via the LMS, students can access links to specific physics-related experiments shared by teachers.

> *'A student cannot see the magnetic field, but in those [virtual lab] programs it can be visible' (P05)*

LMS has also provided participants with more diverse means of communication, such as online discussions with students and their parents outside of school time.

> *'There is a shared page in the LMS where anyone can post, edit and reply. This page made one of my students more present and engaged – he was the student who interacted most with the page' (P04)*

In terms of communication, the LMS facilitated the sharing of materials between teachers, students, parents and the administration. Participants indicated that teachers could easily share their lesson plans with their colleagues (as shown under the previous theme – 1.3). Sharing lesson plans has increased collaboration between teachers within the same discipline (evidence presented in previous theme 1.3).

Despite the great potential of the LMS in enhancing communication between stakeholders, it had little effect on online communication with students through the system. This was because of competition with other social media software: some participants discussed their use of other platforms that are more popular with students.

> *'All of the classes have a WhatsApp group, it competes with us [using the LMS]. When I want to share something with them, I share it through [WhatsApp]' (P04)*

To assess students' understanding and learning, teachers are required by the MoEd to hand out homework and quizzes. With the LMS, they are now required to administer two homework tasks and a quiz via the LMS (analysed in previous theme 5.2.2).

Some participants said that the LMS had little effect on students' learning because of the limited student integration of the LMS. This low level of integration was due to its low mark worth and other elements analysed in the previous theme (5.2.2.2 and 5.2.2.3).

Participants indicated that the LMS was a very useful support tool for their teaching practice. Its major effects will be discussed in the following section.

5.2.3.3) Major Effects

Two categories emerged from the data describing major effects of the LMS. The first category was the effect of the LMS on changing existing teaching practices significantly. The second category was the effect of the LMS forming new practices for teachers.

5.2.3.3.1) Changed Practices

This section presents data related to aspects of the LMS that changed teachers' practices significantly. A major benefit of the LMS is its potential in providing teachers with the ability to customise learning materials to specific students based on their learning preferences and their performance levels (evidence presented in 5.2.2.3). This helped participants to communicate with every student when required based on their needs. It also gave students the opportunity to ask teachers questions and seek support outside of class.

Alongside the introduction of the LMS in schools, some of those schools received tablet devices. Those tablets had a significant effect on teaching practice when they were used in class.

> *'When we first started using the LMS … We used to have tablets. In the beginning it was very good, and we used them a lot because they were useful' (P08)*

Some participants have also reflected on a particular functionality in the LMS that significantly affected teachers' practice in the classroom: the HP classroom. However, this functionality was only discussed by teachers working at schools that had received tablets for their students. Using this function, a teacher could connect all of the students' tablets to their own device and use functions such as voting and choosing answers (P08, P09). This functionality was last available in 2017, and its loss was probably due to licensing issues, according to one of the participants (P09).

The original vision shared by the MoEd (Supreme Educational Council at that time) was that all students and teachers would be provided with a tablet or a laptop. However, this programme was discontinued and no devices were given to new generations at schools who had received it in the early stages nor to other schools. The reasons behind this decision were not known to the participants.

Some participants commented that the LMS has too many functions for a teacher to use. In addition to their regular tasks, participants stated that they were required to use too many LMS functions and to record all of their LMS use, adding to their workload and diminishing the potential benefits (as presented in 5.2.2.1).

> *'They [MoEd] are not allowing us to benefit from it due to the excessive workload … There is extra work that is not useful [in the LMS], and they are asking us to do it, but in the end, it is not worth any marks for the students' (P05)*

Participants agreed that the LMS did afford the possibility of online materials, homework and quizzes; however, the MoEd currently requires teachers to use both online and paper-based materials, homework and quizzes, which overloads them.

> *'In our lesson planning, we are required to have homework. Sometimes I have to create paper-based homework and other times I have to do it online' (P03)*

> *'For me, the paper-based lesson plans are the problem … Every day a piece of paper is printed and stored in the folder … The [LMS coordinator] already has an electronic copy, which is also more organised' (P06)*

The LMS also affected how teachers were assessed. Prior to LMS integration, teachers used to have a meeting with the academic deputy, hand in their lesson planner book and allow the academic deputy to observe one of their lessons. With the LMS, those tasks were significantly changed: instead of having an academic deputy contact teachers to arrange for a visit and a meeting, they would just show up in the classroom.

> *'He [the academic deputy] has a timetable, so he wouldn't go to the teachers' room first – he would join the morning school assembly, then he would go directly to the classroom, and he would have already printed out the lesson plan [from the LMS]' (P04)*

5.2.3.3.2) New Practices

This section presents data related to the effect of the LMS in forming new practices for teachers. For example, participants stated that they are required to electronically share their lesson plans with their students via the LMS, even if they do not see the benefit in doing so. Prior to LMS integration, they did not have to do this.

> *'There are things in the LMS called lesson planning. I am obliged [by the MoEd] to upload lesson plans and to share them with students. But why? No student looks at it, and even if they did, they would not understand' (P05)*

After the introduction of the LMS, a new task was required from teachers, one mentioned by all of the participants. Teachers are now required to create a bank of questions within the LMS. The creation of this bank of questions seems to be difficult for some participants, mainly due to two factors: the first is related to the difficulty of using the system and the second is related to the limited types of questions that can be created due to system limitations (presented in theme one). The first difficulty tends to be resolved with time, as teachers become more experienced with the system; the second difficulty requires some development to the system to enable teachers to include a wider range of characters and symbols in their questions.

'It is not easy to create questions with physics symbols, which are mostly Greek letters. You have to write an equation with powers and symbols, which takes a lot of time … Therefore it is difficult [to do it in the LMS] and a barrier for us. Even when I try to copy it [an equation] from a word document, sometimes it does not accept it' (P01)

Participants suggested that a customised question bank created by experts in the field in coordination with the MoEd be made available for all teachers, instead of having teachers create questions by themselves (P05).

One of the main effects of the LMS was the introduction of a new practice, known as the IT lab class, by the MoEd. Some participants referred to this as an e-learning class. IT lab classes were usually used for the computing curriculum.

'They [MoEd and school administration] provide specific classes for each module to use IT lab as an e-learning class' (P01)

IT lab classes assist teachers to utilise LMS in the classroom, as every student can connect with the LMS through computers (P01). This introduces a challenge for controlling the classroom.

'For example, you cannot check on each and every one of 30 students on a computer, a minute per student, for example to check that they are all connected and accessing the page you want on the LMS … this will consume class time' (P03)

To overcome this challenge, teachers are provided with an in-class support team:

'Every student logs into his account using the computer available [in IT lab class]. I have the e-learning [or LMS] coordinator and the e-learning teacher, who is actually the computing teacher, with me' (P01)

However, participants mentioned different uses of the IT lab class in relation to curriculum coverage. Some of the participants introduced new subjects from the curriculum, while others built on previous subjects or used it to allow students to work on online homework and quizzes.

> *'Students for example have homework to do, they would log in [to the LMS, during IT lab class] and do it … Of course it would take time away from classes and from the curriculum. For me, if the student is interacting with materials from the curriculum then he is not wasting the classes' (P02)*

Some participants expressed their disapproval of IT lab class scheduling, as sometimes it interrupts their plans in covering the curriculum and occupies important teaching time (P09). However, the frequency of IT lab sessions per teacher per class is very limited as indicated by the participants, as it occurs only twice per semester for each teacher. This means that students would have around two classes per module per year.

> *'For a teacher per semester, about two sessions. It is the LMS coordinator who creates the timetable … probably so that all classes have the same number of IT lab sessions' (P08)*

In general, participants expressed that IT lab classes motivate students to engage with the LMS. They also enhance students' collaborative learning.

> *'[In the IT lab class through the LMS] students start to answer some questions. The answers are shown on your screen, whatever you choose, and you present them on the [big] screen. That way the students can see and learn what their classmates have answered, what was correct and was incorrect, how to improve, this is also important' (P07)*

This section has presented data related to the LMS's effect on teaching according to three levels: no effect, minor effects and major effects. Based on the data presented, the LMS had different effects on different areas of teaching practice and participants had different experiences of approving or disapproving of those effects.

The data presented in this part of the chapter guided the second phase of data collection, which was conducted using a cross-sectional online survey.

5.2.4) Summary of Factors Explored

RQ1) What are the factors influencing teachers' behaviour regarding the integration of the Learning Management System in secondary schools in Qatar?

The following tables show the factors that were extracted from Phase One findings to be used in the creation of the instrument for Phase Two. These factors address the first research question. Two main groups of factors were created. The first group consists of factors originally found in the relevant literature. The second group consists of factors that were not found in the relevant literature.

Table 20. Group one: Factors supported by the literature

#	Factor explored in qualitative data	Reference(s)
1	Teacher beliefs	(Chen, 2008) (Nasser et al., 2011) (Tondeur et al., 2008)
2	Communication/colleagues	(Nasser et al., 2011) (Ertmer & Ottenbreit-Leftwich, 2010)
3	Curricula	(Martin-Rodriguez et al., 2015) (Wilkins, 2008) (Livingstone, 2012) (Chen, 2008)
4	PEU	(Martin-Rodriguez et al., 2015) (Nasser et al., 2011)
5	Technology availability	(Smarkola, 2008) (Chen, 2008)
6	Teachers' experience	(Nasser et al., 2011) (Klobas & A, 2010)
7	Infrastructure	(Nasser et al., 2011) (Livingstone, 2012) (Chien et al., 2014) (Tarling & Ng'ambi, 2016)
8	Internet at home	(Livingstone, 2012) (Nasser et al., 2011) (Dündar & Akçayır, 2014) (Lonn et al., 2011)
9	Teachers' IT skills Teachers' LMS skills	(Adzharuddin & Ling, 2013) (Peng et al., 2009) (Nasser et al., 2011) (Browne, 2015) (Al-Busaidi & Al-Shihi, 2010) (Chen, 2008) (Dündar & Akçayır, 2014) (Liu et al., 2010)
10	Parent support	(Chien et al., 2014) (Keengwe et al., 2014) (Kriek & Stols, 2010) (Livingstone, 2012) (Nasser et al., 2011) (Wilkins, 2008) (Blau & Hameiri, 2010) (Ertmer et al., 2001) (Schunk, 2012)
11	Policy	(Chien et al., 2014) (Chen, 2008) (Livingstone, 2012) (Tarhini et al., 2015) (Asiri et al., 2012) (Awang et al., 2011) (Browne, 2015) (Montrieux et al., 2015) (Nasser et al., 2011) (Shieh, 2012) (Tarling & Ng'ambi, 2016) (Teo et al., 2008) (Teo et al., 2008) (Tondeur et al., 2008)
12	PU	(Chesney, 2006; Liu et al., 2010; Saeed & Abdinnour-Helm, 2008; Tarhini et al., 2015)

13	Self-efficacy	(Nasser et al., 2011)
14	LMS usage at home LMS usage at school	(Dündar & Akçayır, 2014) (Adzharuddin & Ling, 2013) (Peng et al., 2009)
15	Students' LMS Skills	(Peng et al., 2009) (Wilkins, 2008) (Liu et al., 2010) (Nasser et al., 2011)
16	Motivation	(Keengwe et al., 2014) (Wilkins, 2008)
17	Customisation	(Yildirim et al., 2014)
18	Reliability	(Lonn et al., 2011) (Peng et al., 2009) (Yildirim et al., 2014) (Chen, 2008)
19	Tablet issues in class	(Montrieux et al., 2015)
20	LMS Support	(Smarkola, 2008) (De Smet et al., 2012) (Chen, 2008)
21	Uploading materials Online quizzes & homework Auto-correction Sharing lesson plans Question bank	(Martin-Rodriguez et al., 2015) (Yildirim et al., 2014) (Nasser et al., 2011)
22	Consumes time & effort	(Chien et al., 2014) (Smarkola, 2008) (Ertmer & Ottenbreit-Leftwich, 2010) (Awang et al., 2011) (Browne, 2015) (Chen, 2008) (Dündar & Akçayır, 2014) (Emelyanova & Voronina, 2014) (Klobas & A, 2010) (Ottenbreit-Leftwich et al., 2010)
23	Training/large in-house Training/trace transfer strategy	(Smarkola, 2008) (Nasser et al., 2011) (Chen, 2008) (Ertmer, 1999) (Browne, 2015) (Al-Busaidi & Al-Shihi, 2010) (Livingstone, 2012) (Stevenson, 2013) (De Smet et al., 2012) (Dündar & Akçayır, 2014) (Ertmer & Ottenbreit-Leftwich, 2010) (Yildirim et al., 2014) (Tarling & Ng'ambi, 2016) (Anderson & Maninger, 2007)
24	Loss of connection Low speed Lagging when overloaded	(Peng et al., 2009)
25	Design (simple, classic)	(Montrieux et al., 2015)
26	Workload	(Awang et al., 2011) (Dündar & Akçayır, 2014) (Emelyanova & Voronina, 2014) (Nasser et al., 2011) (Shieh, 2012)

Table 21. Group two: new factors explored

#	Factor explored in qualitative data
27	LMS design is motivational
28	LMS design is educational
29	LMS design is interactive
30	LMS Design is competitive
31	Communication with students
32	Communication with parents
33	Communication with school administration
34	Communication with MoEd
35	Student motivation
36	Years 10 & 11
37	Beliefs about LMS
38	Year 12
39	School administration and IT lab classes
40	School in-house training
41	Parents' beliefs about LMS
42	MoEd monitoring LMS usage
43	MoEd minimum integration
44	LMS mark worth
45	MoEd unclear goal
46	IT lab classes force students to use LMS
47	IT lab class frequency per class
48	MoEd support continuous system development
49	MoEd and tablet distribution

With this final step, Phase One data analysis was concluded. The next section presents an analysis of the quantitative data collected in Phase Two.

5.3) Phase Two – Quantitative Analysis

5.3.1) Introduction

This section of the chapter analyses and interprets the data collected during the quantitative phase, aiming to further explore the qualitative phase findings and highlight important factors influencing teachers' LMS practice. The chapter starts with data preparation and cleansing, followed by factor analysis and mean comparisons using t-tests.

5.3.2) Preparing Data for Analysis

Before conducting the analysis, the data collected was reviewed for consistency, completeness of responses and missing data. The following sections describe the process of reviewing the data and filtering incomplete and missing responses. The results for the key factors targeted in research question three (years of experience, gender, age and subjects taught) are presented before and after the filtration process. For all other unfiltered results please see Appendix C.

5.3.2.1) Responses Collected – Descriptive Statistics

The online survey was distributed in October 2019 and was kept open until January 2020. A total of 399 unfiltered responses were collected, with 306 completed questionnaires according to SurveyMonkey. Completed questionnaires were those in which the participant has reached the last page and successfully submitted the questionnaire. Table 22 shows the total number of participants that answered or skipped questionnaire items.

Table 22. Questions answered or skipped by participants

Scale item	Answered	Skipped	Total
Q01	396	3	399
Q02	387	12	399
Q03	368	31	399
Q04	359	40	399
Q05	391	8	399
Q06	378	21	399
Q07	329	70	399
Q08	328	71	399
Q09	326	73	399
Q10	328	71	399
Q11	328	71	399
Q12	317	82	399
Q13	315	84	399
Q14	313	86	399
Q15	313	86	399
Q16	305	94	399
Q17	304	95	399
Q18	305	94	399

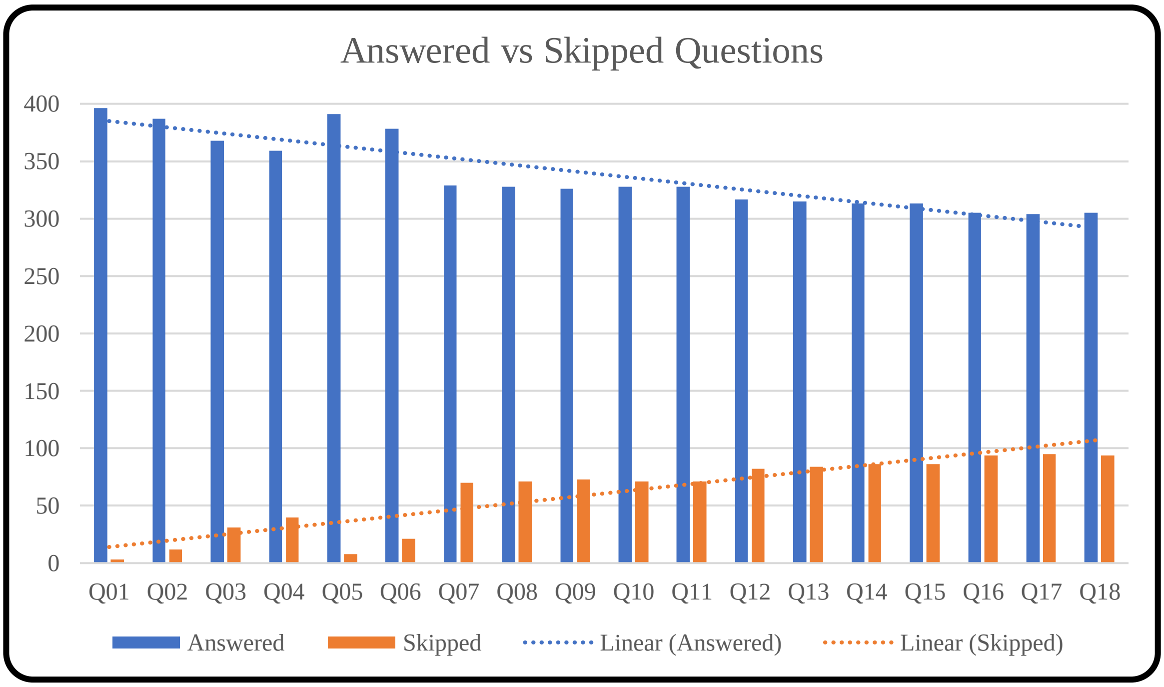

Figure 23. Graph showing answered vs skipped questions

It can be seen in Figure 23 above that the number of participants skipping questions gradually increased as participants advanced in filling out the questionnaire. Questions 3 and 4 showed considerable drops in participation, and then suddenly in question 5 the number of participants declining to answer decreased to 8 only. Questions 3 and 4 asked about years taught and school names, so these questions may have served as a filter for respondents who were not within the scope of this study. The drop between questions 6 and 7 indicated the end of the demographic information section and the beginning of the LMS-specific section. Some of the respondents may have decided not to continue as they were not from the targeted sample, did not know what to answer or had other personal reasons for withdrawing.

5.3.2.2) Demographic Results

The following figures 24 illustrates an example of unfiltered demographic responses to highlight how results changed after filtering process presented next (see Appendix C for all other unfiltered demographic statistics). The majority of the participants had worked for a prolonged period of time in Qatar. More than 120 of the participants had 16 or more years of experience in teaching.

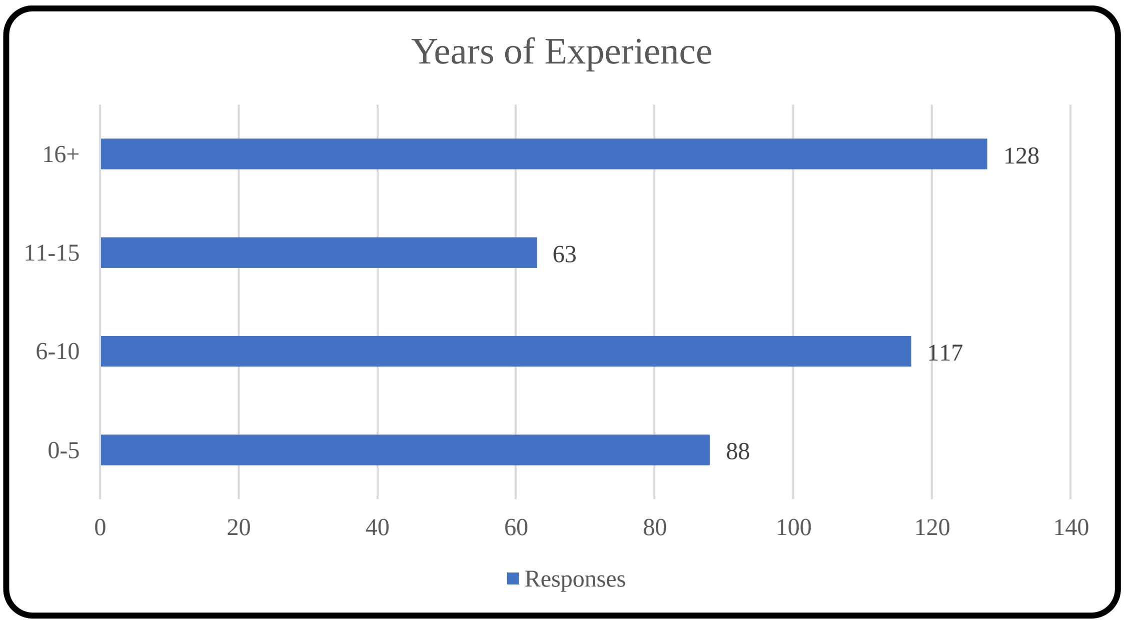

Figure 24. Years of experience in Qatar

5.3.2.3) Filtering Responses

Responses with missing data were removed before the analysis. The NMISS function in SPSS was used to identify only those respondents who had completed all questions and left no missing values. This resulted in a data set of 261 completed questionnaires. A further 14 respondents were excluded because they were outside of the sampling frame, being teachers at elementary and preparatory schools. This left a final data set of 247 eligible respondents with valid responses to all questionnaire items. Further descriptions follow in the sections below.

5.3.2.4) Filtered Responses

The following figures show the updated demographic results, excluding the responses with missing values and the 14 responses outside of the sampling frame.

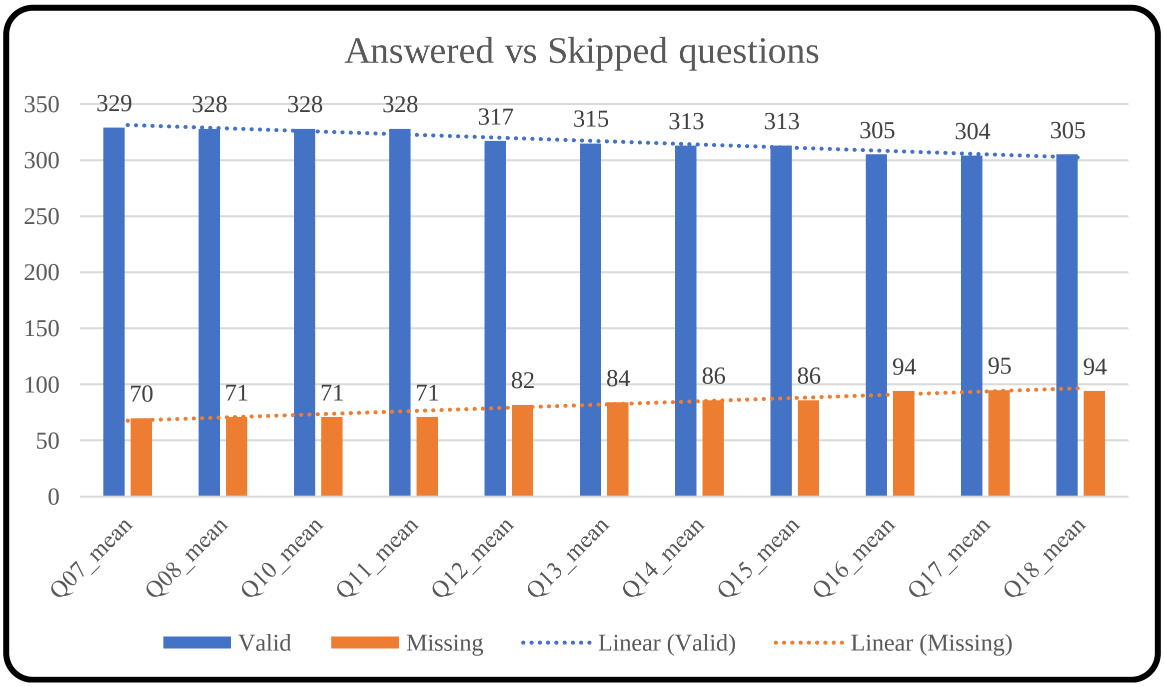

Figure 25. Graph showing answered vs skipped questions for filtered responses

Figure 26 below shows the years of experience that participants had teaching in Qatar. The highest number of responses was in the 16+ years category, with 81 responses; the lowest was 11-15 years, with 40 responses. Compared to figure 24, the responses retained their distribution across the question items.

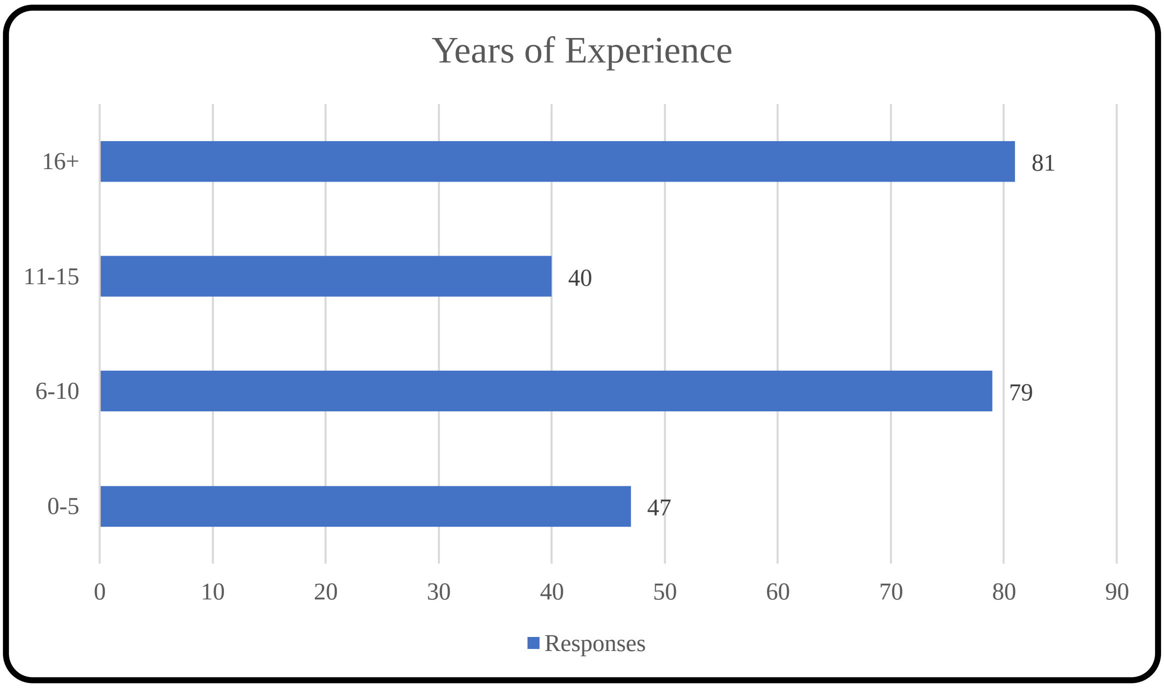

Figure 26. Graph showing participants' years of experience teaching in Qatar

Figure 27 below shows the participants' nationalities. After filtering the responses, the number of nationalities was 18, with three participants' nationalities unknown due to incomplete responses. The highest number of participants were Qataris, with 74 responses. The lowest number of participants was shared by Algeria, Belgium, Canada, Morocco, Oman and Pakistan, with only one participant each. Figure 30 shows the distribution of participants' nationalities.

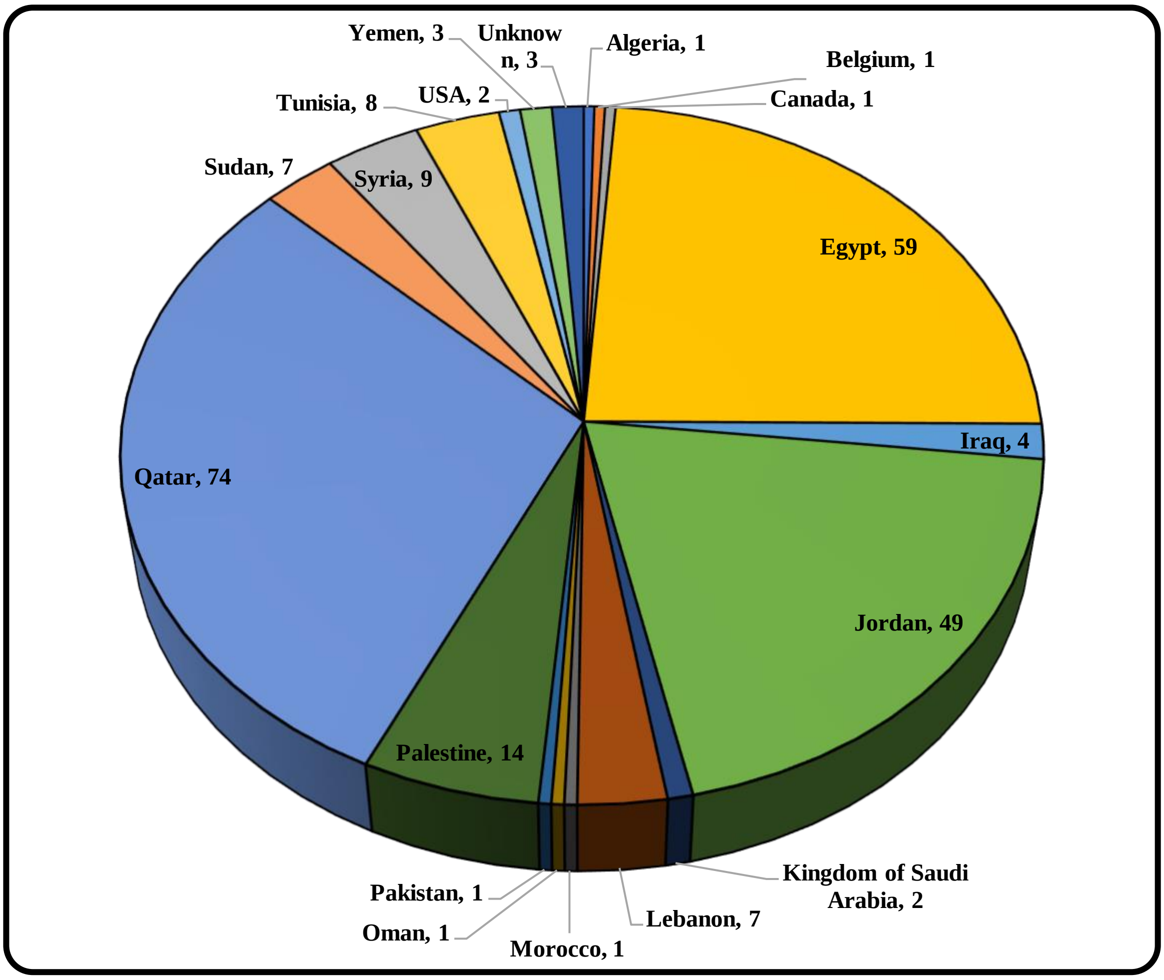

Figure 27. Graph showing participants' nationalities

Figure 28 below shows the school years taught by survey participants. Some of the participants taught at two or three different year levels, so the total is higher than the number of valid surveys. Year 12 was the year level most taught by the participants, with 128 respondents teaching at this level, whilst Year 10 level was the least taught, with 95 respondents teaching at this level.

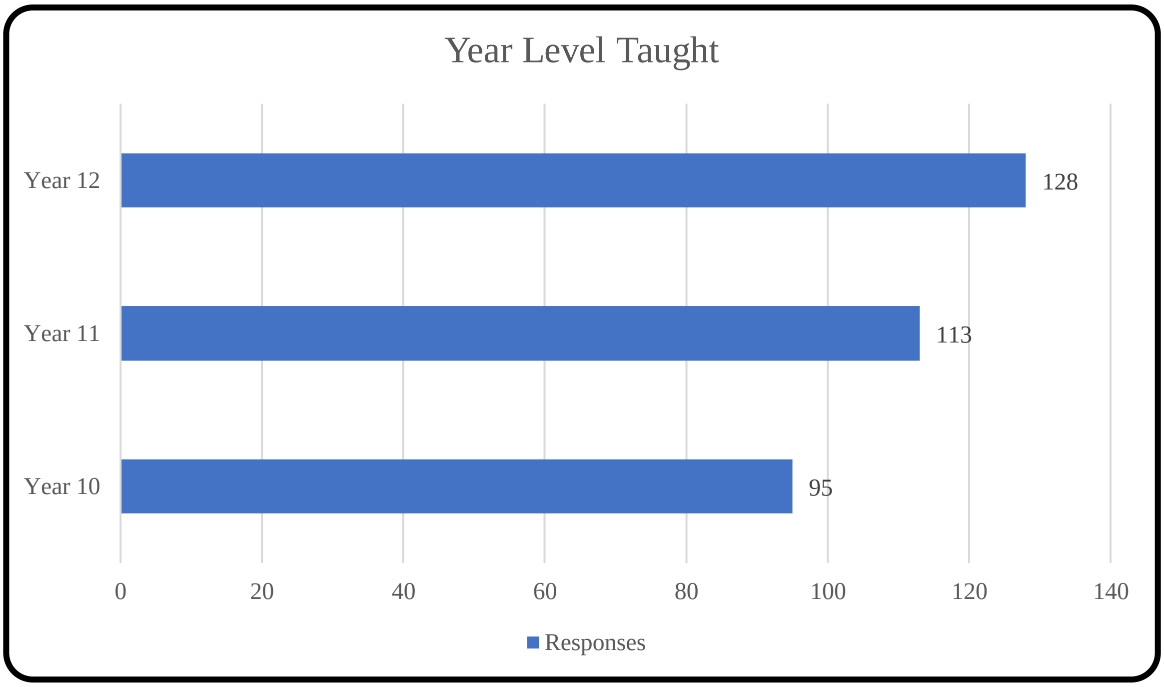

Figure 28. Year level taught (all responses included/missing responses removed)

A total of 26 male teachers filled out the questionnaire. However, eight of them were from outside the sampling frame, resulting in 18 usable surveys from male participants. The questionnaire had a total of 208 female participants, six of whom were outside the sampling frame, resulting in 202 usable surveys from female participants. Twenty-seven participants could not be identified in terms of gender, as they did not state their school's name.

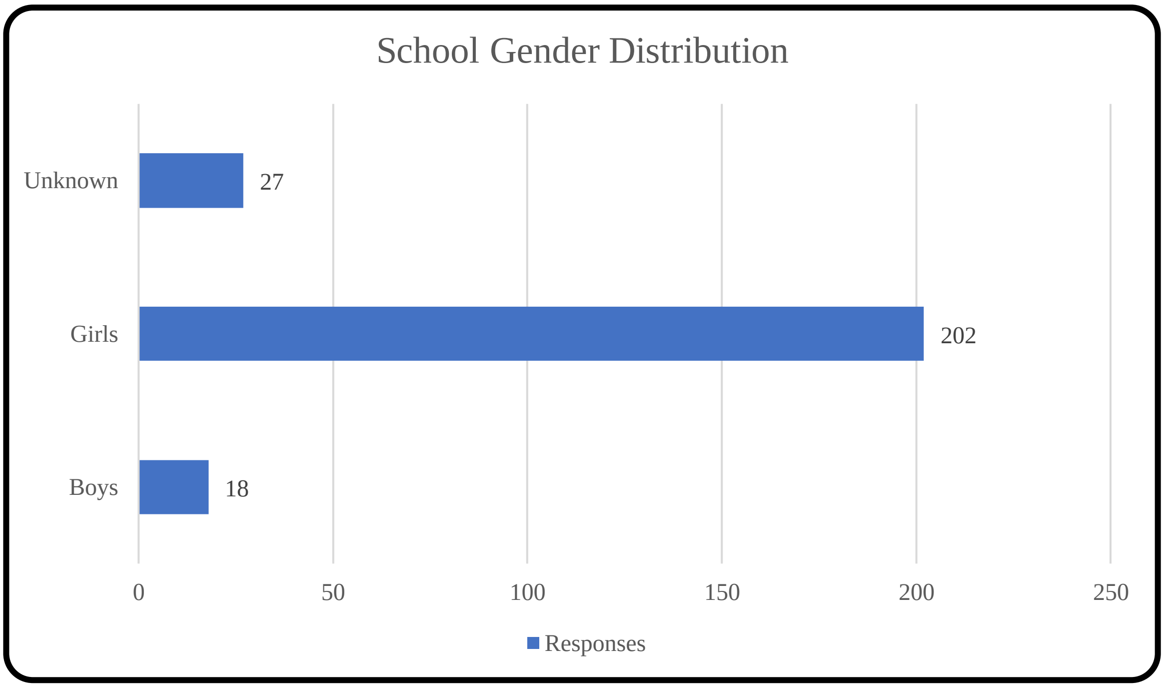

Figure 29. Gender of participants' schools

Figure 30 below identifies participants' gender using a combination of Q02 and Q04. The input of school name helps in identifying gender, as only female teachers are allowed to teach in girls' schools and only male teachers are allowed to teach in boys' schools. In addition to this, when a participant writes his or her nationality in Arabic, the answer often indicates their gender. For example, if a male participant from Qatar writes his nationality, he uses the word 'قطري' (pronounced 'Qatari'), whereas if the participant is female she uses the word 'قطريه' (pronounced 'Qatarriah'). This little difference also served as an indicator of gender. There were a few cases in which participants either used their country's name instead of the adjective or used English letters to type their nationality. In those cases, the school's name was included, so the participants' gender could be identified that way. Two participants preferred not to share either their school's name or nationality. Hence, there were a total of 29 male participants, 216 female participants, and two whose gender remained unknown.

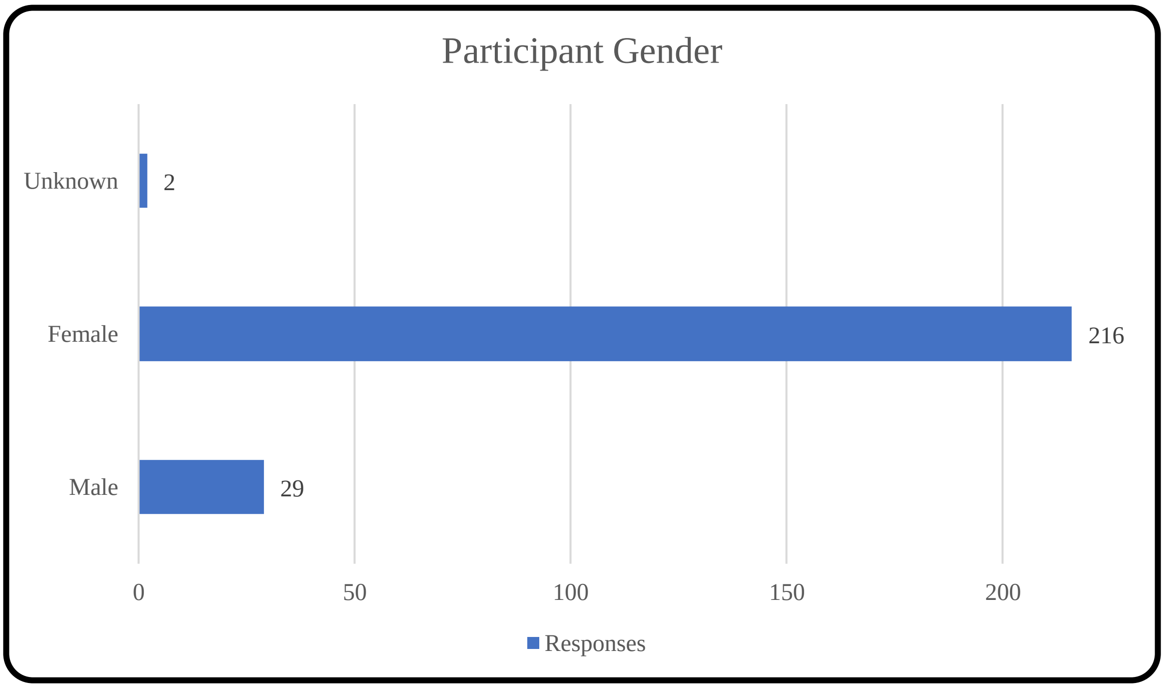

Figure 30. Graph showing participant gender

Figure 31 shows the average age of the participants. One hundred and eleven participants were between 32 and 41 years old, the age category with the highest number. Six participants were 21 years old or below, with the lowest number belonging to this age group.

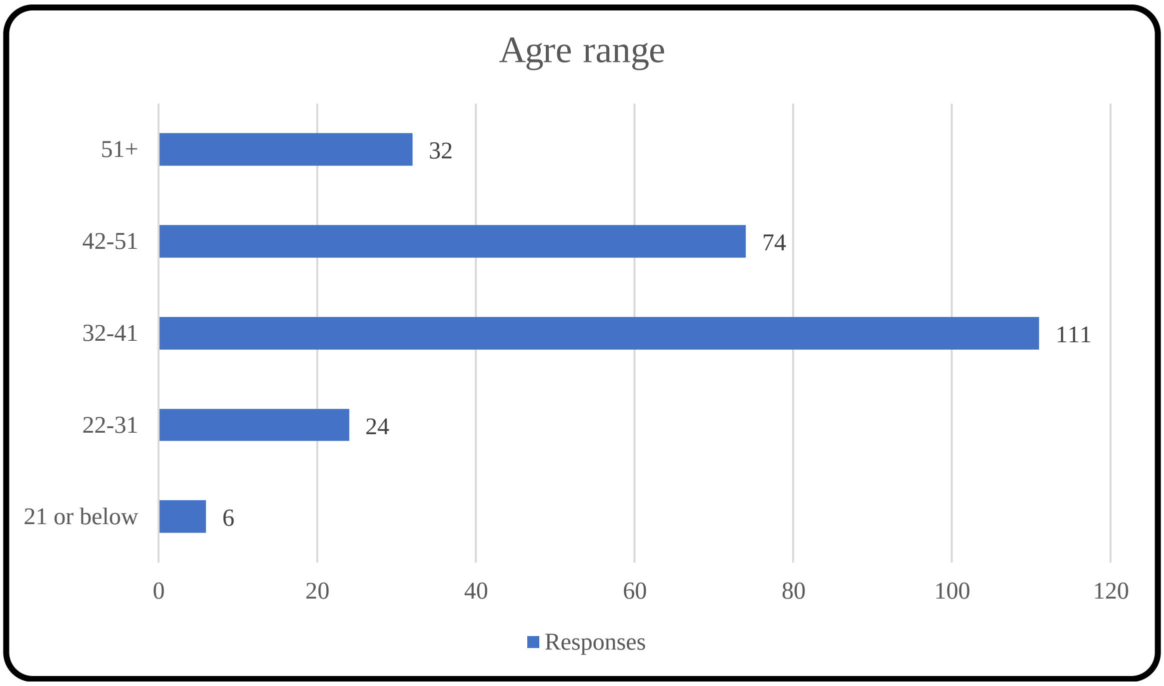

Figure 31. Participants' age range

Figure 32 shows the subjects taught at all schools. Biology remained the most-taught subject by participants in this questionnaire, with 44 participants, while elective subjects (which generally have a lower priority compared to other subjects) remained the least-taught option, with seven participants.

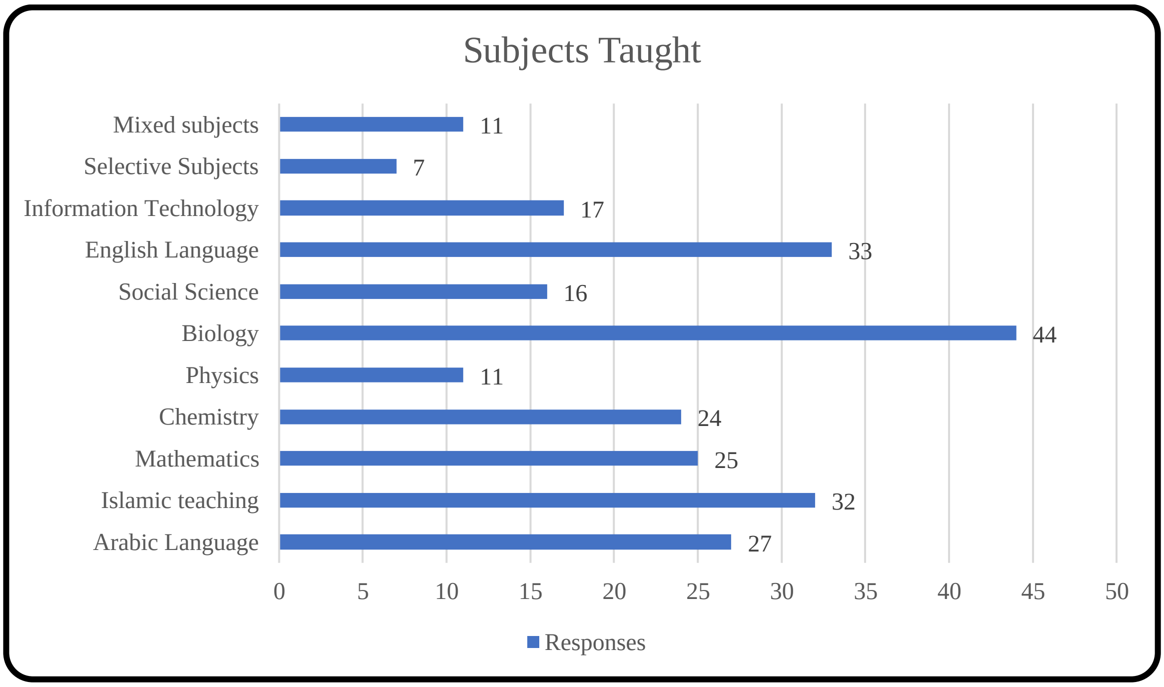

Figure 32. Subjects taught by participants

With this last graph, the demographic results filtration process was completed, with all relevant data presented. The next section will describe the preparation of the data for factor analysis.

5.3.2.5) Reversed Scoring

As described in section 4.6.4.1.3 and shown in Table 18, reversed scoring applied to some items. Table 23 shows all of the questionnaire items in this study that took a reversed scoring approach.

Table 23. List of questionnaire items that were reverse scored

Number	Questionnaire item code (before)	Questionnaire item code (after)
1	Q08_01	Q08_01_R
2	Q17_03	Q17_03_R
3	Q17_04	Q17_04_R
4	Q17_05	Q17_05_R
5	Q17_06	Q17_06_R
6	Q18_03	Q18_03_R
7	Q18_05	Q18_05_R
8	Q18_06	Q18_06_R
9	Q18_07	Q18_07_R

5.3.2.6) Reliability

To re-check the reliability of the questionnaire items, Cronbach's alpha was used. Table 24 shows Cronbach's alpha after the responses were filtered.

Table 24. Cronbach's alphas without missing values

Question number	Cronbach's alpha
Q7	0.88
Q8	0.84
Q10	0.71
Q11	0.83
Q12	0.83
Q13	0.91
Q14	0.89
Q15	0.91
Q16	0.83
Q17	0.75
Q18	0.81

After removing the responses with missing values, Cronbach's alpha coefficient for all of the questions was still higher than 0.7, which means that the items' reliability has been maintained (Abdullah & Maliki, 2017; de Vaus et al., 2014; see section 4.6.1.3). After preparing and cleansing the data, factor analysis was conducted to reduce the high number of variables examined in the questionnaire.

5.3.3) Factor Analysis

Factor analysis was used to reduce the total number of indicators by grouping them together. This process was conducted in the following order:

- Step 1. Selecting the variables to be analysed
- Step 2. Extracting an initial set of factors
- Step 3. Extracting a final set of factors by rotation
- Step 4. Constructing scales based on the results at Step 3 and using them for further analysis.

5.3.3.1) Selecting the Variables

Excluding demographic information questions 1 to 6 and 9, questions 7, 8 and 10 to 18 were selected for the factor analysis. This resulted in a total of 61 item codes to be included in the initial stage of factor analysis. Some of these are shown in Table 25 below as an example, For the full table, please see Appendix C.2.

Table 25. List of some of the coded items selected for factor analysis (1)

Item codes						
Q07_01	Q08_05	Q11_04	Q13_01	Q15_01	Q16_05	Q18_02
Q07_05	Q10_04	Q12_01	Q13_05	Q15_05	Q17_03_R	Q18_06_R
Q08_01_R	Q10_05	Q12_02	Q13_06	Q16_01	Q17_04_R	Q18_07_R
Q08_02	Q11_01	Q12_03	Q13_07	Q16_02	Q17_05_R	Q18_08

Using the SPSS software package, the factor analysis function was employed. All item codes shown in Appendix C.2 were included. The factor analysis function in SPSS executes additional tests to check whether those items can be used for the analysis, such as the KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) and Bartlett's tests, which were discussed in section 4.6.

Table 26. KMO and Bartlett's results table (1)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.92
Bartlett's Test of Sphericity	Approx. Chi-Square	11268
	df	1830
	Sig.	0

The KMO value helps to identify whether if factor analysis would be suitable and meaningful for the variables in the correlation matrix. KMO values over 0.7 are considered appropriate for factor analysis (Hair et al., 2014; de Vaus, 2014). Based on the list of codes, a KMO test was conducted, resulting in a value of 0.92; this is higher than 0.7 and therefore it was considered appropriate to continue with factor analysis using this data set.

Bartlett's test of sphericity, which is also used as an indicator of data appropriateness for conducting factor analysis, was also performed on the data. Similarly, data was tested through SPSS and a sphericity significance value of 0.00 resulted, which is less than 0.01, demonstrating the data's appropriateness for factor analysis (Tabachnick & Fidell, 2007).

Another indicator for variable inclusion is communality. Communality is a statistical calculation for a variable that adds the squared values of each correlation with other variables. The result should be between 0 and 1. A communality of less than 0.3 is considered very low and these variables can be removed from the factor analysis, as they would not have much influence on the results (de Vaus, 2014). Table 28 below shows examples of the communalities of variables calculated by SPSS. All of the variables had communalities of above 0.3 and as a result, all variables were included.

Table 27. Variables' communalities (1)

Communalities

Item code	Extraction	Item code	Extraction	Item code	Extraction
Q07_01	0.66	Q11_06	0.58	Q15_05	0.76
Q08_01_R	0.51	Q12_04	0.71	Q16_05	0.79
Q08_02	0.76	Q12_05	0.77	Q16_06	0.80
Q08_05	0.66	Q13_03	0.74	Q17_03_R	0.62
Q10_01	0.62	Q13_04	0.57	Q17_04_R	0.75
Q11_01	0.71	Q14_02	0.70	Q18_03_R	0.72
Q11_05	0.61	Q15_04	0.65	Q18_07_R	0.48
Extraction Method: Principal Component Analysis.				Q18_08	0.62

5.3.3.2) Factor Analysis Results (1)

After selecting the initial variables for factor analysis based on the tests described above, it was decided to try to refine the high number of potential factors for subsequent analysis, as the initial number was very high. An eigenvalue calculation was used to reduce the number of factors. An eigenvalue is a statistic that indicates the amount of variance in the variables that the factor explains (Hoyle & Duvall, 2004; de Vaus, 2014). Variance is a measure of data dispersion for the variables (de Vaus, 2014), so, the higher the eigenvalue of a variable (component as referred to in the table) the 'more variance the factor explains' (p. 187). Researchers tend to keep only components with eigenvalues greater than 1 (de Vaus, 2014; Ngai et al., 2007; Ogan-Bekiroglu, 2009). Table 28 shows the top five components and their corresponding eigenvalues. See Appendix C.2 for the full detailed table.

Table 28. Components extracted and their eigenvalues (1)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.54	32.04	32.04	19.54	32.04	32.04	7.94	13.02	13.02
2	5.32	8.73	40.77	5.32	8.73	40.77	5.94	9.73	22.75
3	3.21	5.26	46.03	3.21	5.26	46.03	4.70	7.71	30.46
4	2.48	4.06	50.09	2.48	4.06	50.09	4.36	7.15	37.60
5	2.14	3.50	53.60	2.14	3.50	53.60	3.47	5.68	43.28
⋮	⋮	⋮	⋮						
61	0.06	0.10	100.00						

Extraction Method: Principal Component Analysis.

After finalising the number of factors, a component matrix is created that captures the correlation of each variable with the factors. This is also known as factor loading. Factor 1 explains the greatest degree of variance, Factor 2 explains the second-greatest, and so on. This results in a large table containing the factor loadings across components.

Table 29. Component matrix (1)

Component Matrix [a]												
Component	1	2	3	4	5	6	7	8	9	10	11	12
Q07_01	0.69	-0.23	0.00	-0.02	0.13	0.14	-0.12	0.21	-0.09	-0.03	-0.16	-0.06
Q08_01_R	0.46	0.18	0.36	-0.08	-0.18	0.04	0.03	0.04	-0.06	-0.07	0.11	0.27
Q08_02	0.79	-0.16	0.00	-0.09	0.10	-0.01	-0.21	0.11	-0.17	0.00	-0.08	-0.04
⋮												
Q18_06_R	0.23	-0.22	0.43	0.34	-0.05	-0.16	0.21	0.14	0.03	0.17	0.06	-0.01
Q18_07_R	0.22	-0.20	0.37	0.29	0.06	0.01	0.16	0.08	-0.11	0.09	0.34	0.08
Q18_08	0.39	0.55	-0.12	0.09	0.10	-0.22	-0.20	0.04	0.18	0.03	-0.01	-0.11
Extraction Method: Principal Component Analysis.												
a: 12 components extracted.												

Note: For the full table, see Appendix C.2.

To minimise the number of factors and maximise explained variances, variables with low factor loading values (below 0.3) were removed (de Vaus, 2014). One way to extract final factors is by using factor rotation. This step results in variables loading on one factor only or loading more on one factor than another. In this research, varimax rotation was used in SPSS. An example of the results is shown in Table 30.

Table 30. Rotated component matrix (1)

Rotated Component Matrix [a]												
Component	1	2	3	4	5	6	7	8	9	10	11	12
Q07_01	0.28	0.64	0.09	0.10	0.03	0.08	0.14	0.20	0.13	0.20	0.17	0.08
Q08_01_R	0.06	0.16	0.05	0.47	0.22	0.18	0.19	0.16	0.02	-0.03	0.13	-0.31
Q10_03	0.19	0.19	0.13	0.11	0.03	0.09	0.27	-0.15	0.18	0.46	0.43	-0.04
Q11_05	0.18	0.26	0.02	0.33	0.24	0.15	0.03	0.15	-0.01	0.13	0.02	0.53
Q17_02	0.48	0.38	0.08	0.12	0.20	-0.09	0.17	0.11	0.34	0.11	-0.03	0.18
Q18_02	0.50	0.38	0.19	0.09	-0.05	0.15	0.39	0.08	0.34	0.07	0.07	0.15
Extraction Method: Principal Component Analysis.												
Rotation Method: Varimax with Kaiser Normalisation. [a]												
a Rotation converged in 9 iterations.												

Note: For the full table, see Appendix C.2.

5.3.3.3) Variable Reduction

As can be seen in the rotated component matrix calculations in Table 30 above, there were some complex components (variables) that did not load heavily on any of the factors or loaded on more than one factor with low values of less than 0.5 (Chesney, 2006; Liu et al., 2010).

As a result, six components were removed: Q18_02, Q17_02, Q07_04, Q08_01_R, Q11_05 and Q10_03. The following table highlights the main reasons behind their removal.

Table 31. Variables removed from factor analysis

Variable	Reason
Q18_02	Loads on three different factors, 1, 2 & 12, with low values
Q17_02	Loads nearly equally on three different factors, 1, 2 & 9
Q07_04	Loads nearly equally on three different factors, 2 & 4
Q08_01_R	Weighs relatively low on two factors (4 & 12) less than 0.5
Q11_05	Weighs relatively low on all factors (maximum is 0.37 on factor 4)
Q10_03	Loads nearly equally on three different factors 10 & 11

It was also found that factor 12 did not have any variable with a high loading value, suggesting that factor 12 could be removed with little impact on the model. However, nothing was done at this stage. The next section explains the second factor analysis done after removing the complex variables identified and shown in the table above.

5.3.3.4) Factor Analysis Results (2)

Based on the above analysis, a new factor analysis calculation was conducted, with the results shown in the following tables. The communalities table is available in the appendices (see Appendix C.4). The previous sequence of steps and tables presented in section 5.3.3.3 was repeated for this section.

Table 32. KMO and Bartlett's test results (2)

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.92
Bartlett's Test of Sphericity	Approx. Chi-Square	9950
	df	1485
	Sig.	0

KMO and Bartlett's Test of sphericity's values are still within appropriate ranges.

Table 33. Components extracted and their eigenvalues (2)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	17.42	31.67	31.67	17.42	31.67	31.67	6.96	12.65	12.65
2	5.18	9.42	41.09	5.18	9.42	41.09	5.81	10.57	23.22
3	3.06	5.57	46.65	3.06	5.57	46.65	4.62	8.39	31.61
4	2.43	4.42	51.07	2.43	4.42	51.07	3.71	6.74	38.35
5	1.99	3.62	54.69	1.99	3.62	54.69	3.39	6.17	44.52
⋮	⋮	⋮	⋮						
55	0.08	0.15	100						
Extraction Method: Principal Component Analysis.									

Note: See Appendix C.4 for the full table.

After the variable reduction step, number of components with eigenvalues of more than 1 was reduced to 11.

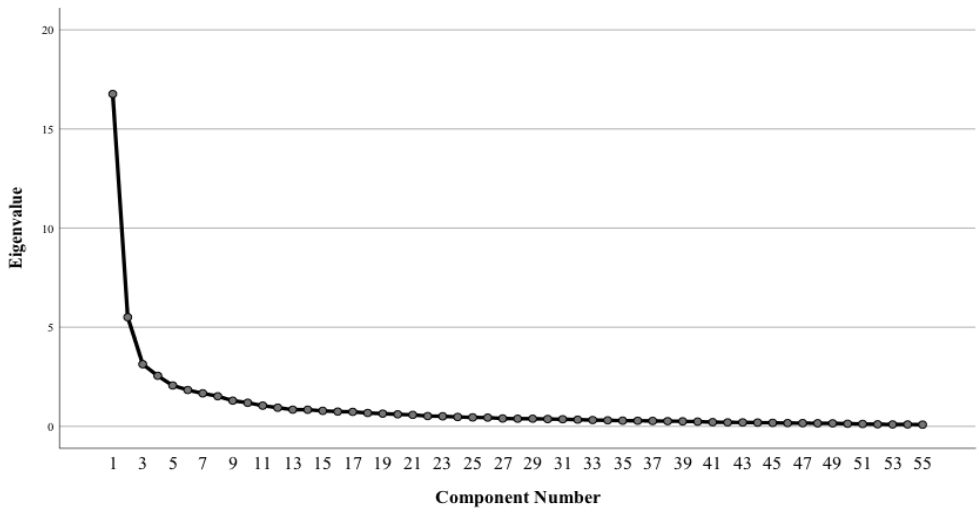

Figure 33. Scree plot

The first 11 components reflect most of the change in the line. It can be seen that component 1 has the highest eigenvalue, at 17.42, and when the line reaches component 11 it becomes nearly horizontal, with very little change in the eigenvalues afterwards.

Table 34. Component matrix (2)

Component Matrix [a]

Component	1	2	3	4	5	6	7	8	9	10	11
Q07_02	0.81	-0.19	0.04	-0.07	-0.13	0.12	-0.22	0.10	-0.12	-0.02	-0.05
Q08_03	0.81	-0.22	-0.05	-0.04	-0.02	0.07	-0.21	-0.03	-0.15	-0.10	-0.11
Q08_02	0.79	-0.17	0.00	-0.10	-0.12	0.05	-0.23	0.03	-0.17	-0.01	-0.09
Q07_03	0.78	-0.27	-0.02	-0.12	-0.20	0.06	-0.23	0.03	-0.05	-0.03	-0.09
Q12_01	0.77	-0.29	0.03	-0.15	-0.18	0.11	-0.14	-0.08	0.01	0.07	-0.08
Q18_04	0.76	-0.18	-0.08	-0.04	-0.15	0.04	0.00	-0.08	-0.02	0.16	0.17
Q13_02	0.74	-0.26	-0.22	-0.04	0.08	-0.16	0.16	-0.04	0.22	-0.18	0.06
Q18_01	0.73	-0.26	-0.04	0.06	-0.18	0.02	0.03	-0.10	0.04	0.12	0.10
Q08_04	0.71	-0.08	-0.15	0.00	0.00	0.09	-0.23	0.07	-0.30	-0.05	-0.08
Q13_05	0.69	-0.34	-0.33	-0.01	0.06	-0.20	0.08	-0.04	0.17	0.01	0.11
Q07_01	0.69	-0.24	0.01	-0.03	-0.14	0.19	-0.14	0.21	-0.11	-0.02	-0.08
Extraction Method: Principal Component Analysis.											
[a] 11 components extracted.											

Note: For the full table, see Appendix C.4.

Table 34 shows that 11 factors were extracted from the factor analysis. Table 35 shows some of the rotated component matrix using varimax rotation to extract the final factors and their components. Highlighted cells are the variables with the highest loading value in that factor.

Table 35. Rotated component matrix (2)

Rotated Component Matrix [a]											
Component	1	2	3	4	5	6	7	8	9	10	11
Q13_05	**0.83**	0.24	0.06	0.04	0.05	0.02	0.10	0.11	0.09	0.08	0.09
Q08_02	0.35	**0.71**	0.15	0.15	0.09	0.17	0.16	0.12	0.12	0.01	0.08
Q15_03	0.08	0.10	**0.85**	0.21	0.17	0.14	0.05	-0.01	-0.05	-0.02	0.05
Q11_02	0.13	0.08	0.18	**0.78**	0.07	0.09	0.16	-0.04	0.06	0.08	0.15
Q16_05	0.10	0.14	0.19	0.21	**0.82**	0.07	0.09	0.11	0.06	0.11	0.02
Q12_02	0.06	0.09	0.11	0.14	0.09	**0.86**	0.07	0.05	0.14	-0.04	0.09
Q17_04_R	0.13	0.16	-0.02	0.13	0.05	0.09	**0.78**	0.18	0.12	0.06	0.09
Q18_07_R	0.18	0.23	-0.03	-0.02	0.06	0.00	0.24	**0.70**	0.01	-0.01	-0.06
Q16_04	0.13	0.19	0.06	0.12	0.14	0.08	0.04	0.04	**0.87**	0.03	0.05
Q10_05	0.18	0.09	0.00	0.10	0.10	-0.01	0.08	0.03	0.01	**0.82**	0.05
Q10_02	0.10	0.24	0.07	0.06	0.05	0.10	0.06	0.01	0.07	0.09	**0.76**
Extraction Method: Principal Component Analysis.											
Rotation Method: Varimax with Kaiser Normalisation.											
[a] Rotation converged in 8 iterations.											

Note: For the full table, see Appendix C.4.

5.3.3.5) Constructing Scales

Based on the factor analysis, each factor's components were regrouped into a newly named dimension. Table 36 shows each dimension's reliability alpha coefficient. Subsequent tables show the titles of the new dimensions, the related components (indicators) and their loading scores. Those tables are known as scales (de Vaus, 2014). The order of these factors is not based on importance at this stage; it is based on the order in which they appeared in SPSS, which was related to the explained variations and eigenvalues.

Table 36. Cronbach’s alpha coefficients for the new factors

No.	Factor	(Code)	Cronbach’s alpha coefficient
1	Students and Parents	(SP)	0.93
2	LMS Design and Usefulness	(LMSS)	0.94
3	School Administration	(SA)	0.91
4	LMS Functions	(LMSF)	0.84
5	MoEd Support	(MEdS)	0.89
6	Personal Factors	(PE)	0.89
7	MoEd Policies	(MEdP)	0.79
8	IT Lab Class	(ITL)	0.75
9	Tablets	(T)	0.89
10	Communication – 1	(COM1)	0.73
11	Communication – 2	(COM2)	0.61
	COM 1 & 2	(COM)	0.61

As shown in Table 36 above, extracted factors 10 and 11 are a division of the same dimension: communication. When the components of both of these factors are combined and Cronbach’s alpha is recalculated, the factor COM 1&2 had a low alpha value of 0.61, which would introduce more complexity and would not add value in the explanation of the model. Hence, factors 10 and 11 were removed from further analysis. Each remaining factor is discussed below.

1- Students and Parents

Figure 34 below shows the details of the SP factor extracted and its components with their factor loading values. The following Table 37 presents the reliability coefficient, mean value and standard deviation for this factor, followed by Table 38, which relates each component code to its indicator questions in the questionnaire.

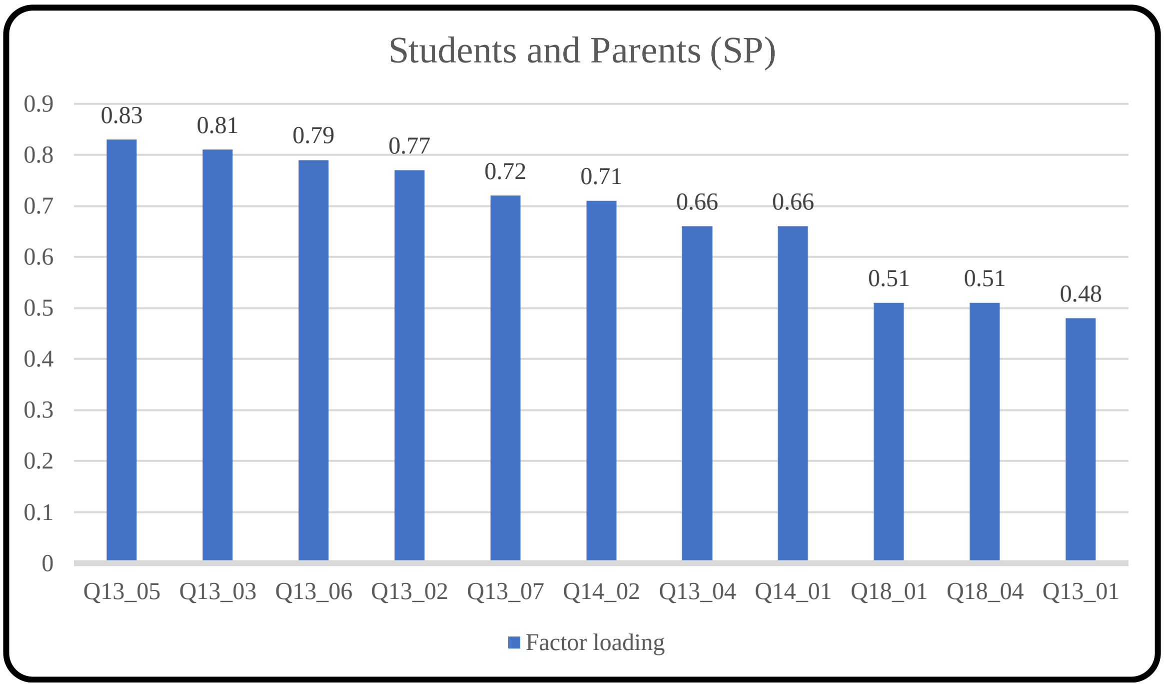

Figure 34. SP factor loadings

Table 37. SP reliability, mean and standard deviation

Reliability alpha coefficient	**0.93**
Mean Value	2.53
Standard Deviation	1.049

Table 38. Factor 1: Students & Parents

Indicator code	Indicator question
Q13_05	Students believe the LMS enhances their learning practice
Q13_03	Students use the LMS at home
Q13_06	Year 10 & 11 students are interested in using the LMS
Q13_02	Students are motivated to use the LMS
Q13_07	Year 12 students are interested in using the LMS
Q14_02	Parents provide support at home for their children to use the LMS
Q13_04	Students use the LMS at school
Q14_01	Parents believe the LMS is useful for their children’s learning
Q18_01	IT lab classes are important for students’ learning
Q18_04	IT lab classes motivate students to use the LMS
Q13_01	Students have the skills to use the LMS

2- LMS System (Design and Usefulness)

Figure 35 below shows the details of the LMSS factor extracted and its components with their factor loading values. Table 39 presents the reliability coefficient, mean value and standard deviation, followed by Table 40, which relates each component code to its indicator questions in the questionnaire.

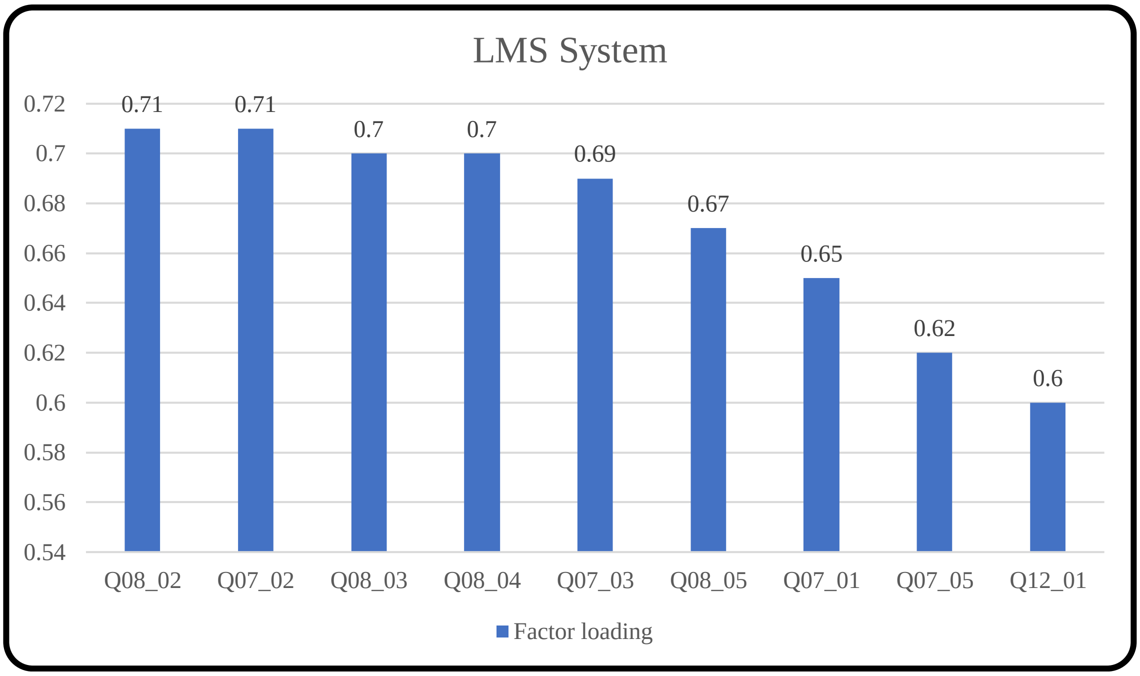

Figure 35. LMSS factor loadings

Table 39. LMSS reliability, mean and standard deviation

Reliability alpha coefficient	**0.94**
Mean Value	2.95
Standard Deviation	1.140

Table 40. Factor 2: LMS System

Indicator code	Indicator question
Q08_02	Educational
Q07_02	Useful for teaching practice
Q08_03	Motivates students and teachers to use
Q08_04	Competitive related to Blackboard
Q07_03	Supports student learning
Q08_05	Communication competitiveness in relation to WhatsApp
Q07_01	Useful for administrative tasks
Q07_05	Reliability
Q12_01	Belief that the LMS is useful for my teaching practice

3- School Administration

Figure 36 below shows the details of the SA factor extracted and its components with their factor loading values. Table 41 presents the reliability coefficient, mean value and standard deviation, followed by Table 42, which relates each component code to its indicator questions in the questionnaire.

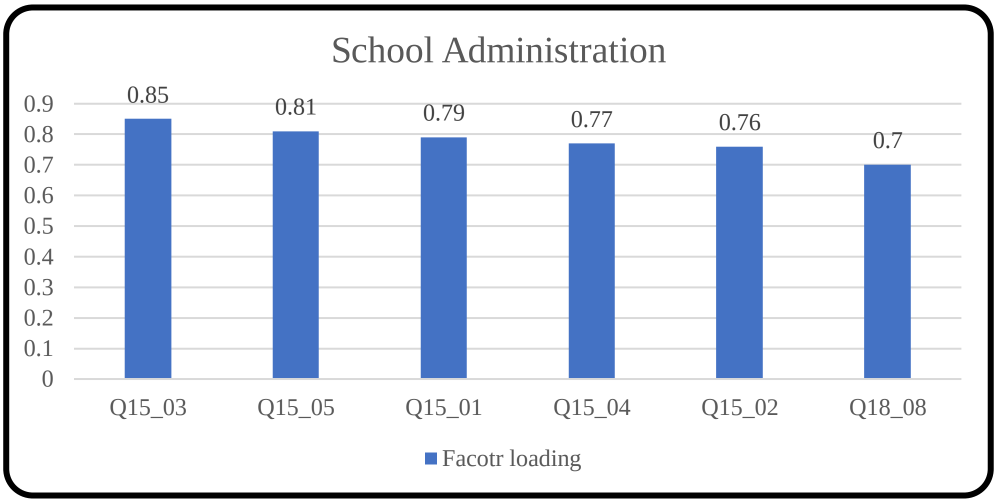

Figure 36. SA factor loadings

Table 41. SA reliability, mean and standard deviation

Reliability alpha coefficient	**0.91**
Mean Value	4.22
Standard Deviation	0.876

Table 42. Factor 3: School Administration

Indicator code	Indicator question
Q15_03	SA manages e-learning classes
Q15_05	SA forces teachers to follow its policies regarding the LMS
Q15_01	School support for LMS usage
Q15_04	SA controls how much of the LMS should be integrated
Q15_02	SA provides training for teachers to use the LMS
Q18_08	SA supports e-learning classes

4- LMS PEU

Figure 37 below shows the details of the LMS PEU factor extracted and its components with their factor loading values. Table 43 presents the reliability coefficient, mean value and standard deviation, followed by Table 44, which relates each component code to its indicator questions in the questionnaire.

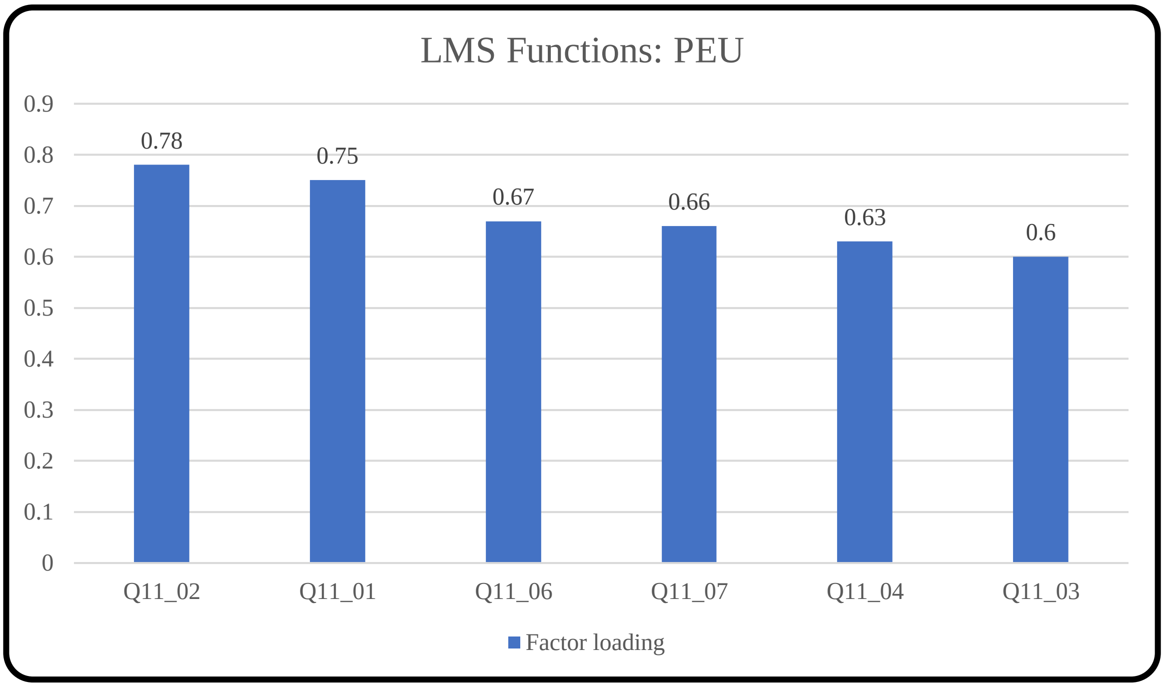

Figure 37. LMS PEU factor loadings

Table 43. LMS PEU reliability, mean and standard deviation

Reliability alpha coefficient	**0.84**
Mean Value	3.9
Standard Deviation	0.783

Table 44. Factor 4: LMS functions PEU

Indicator code	Indicator question
Q11_02	Online quizzes
Q11_01	Uploading materials
Q11_06	Auto-correction
Q11_07	Creating questions bank
Q11_04	Sharing lesson plans with colleagues
Q11_03	Online homework

5- MoEd Support

Figure 38 below shows the details of MEdS factor extracted and its components with their factor loading values. Table 45 presents the reliability coefficient, mean value and standard deviation, followed by Table 46, which relates each component code to its indicator questions in the questionnaire.

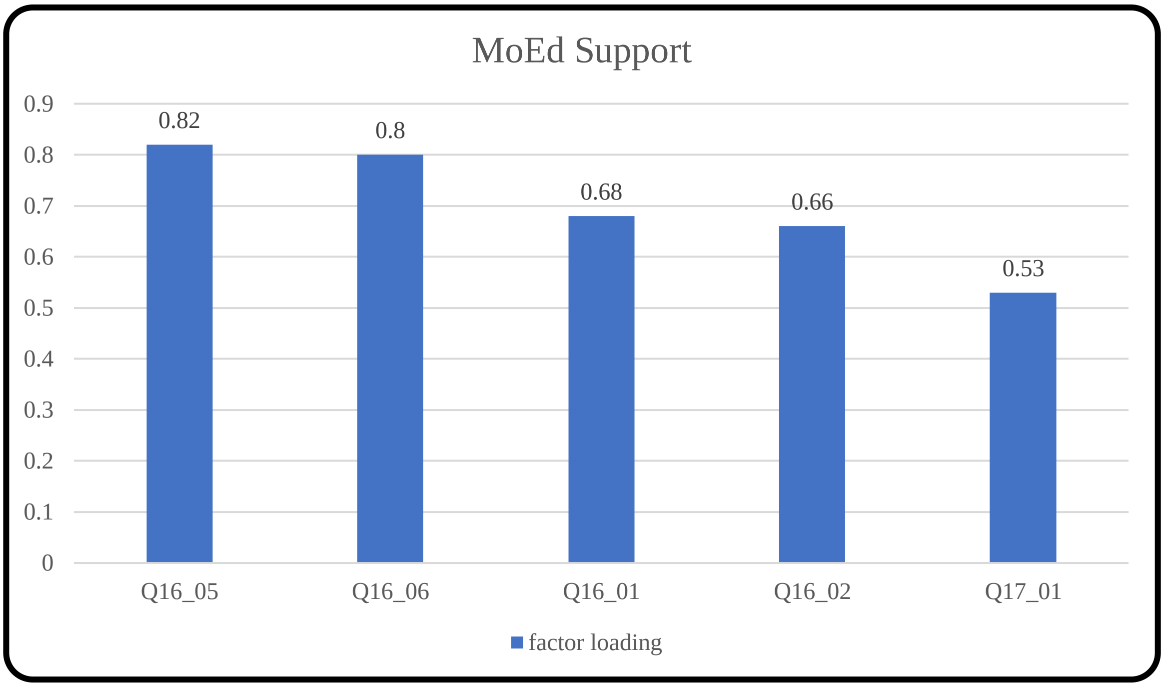

Figure 38. MEdS factor loadings

Table 45. MEdS reliability, mean and standard deviation

Reliability alpha coefficient	**0.89**
Mean Value	3.68
Standard Deviation	1.007

Table 46. Factor 5: MoEd Support

Indicator code	Indicator question
Q16_05	MoEd provides necessary LMS training and workshops
Q16_06	LMS training and workshops have enough information for excellent integration
Q16_01	MoEd provides LMS experts
Q16_02	LMS experts give quick responses with solutions
Q17_01	MoEd supports successful LMS integration

6- Personal Factors

Figure 39 below shows the details of the PF factor extracted and its components with their factor loading values. Table 47 presents the reliability coefficient, mean value and standard deviation, followed by Table 48, which relates each component code to its indicator questions in the questionnaire.

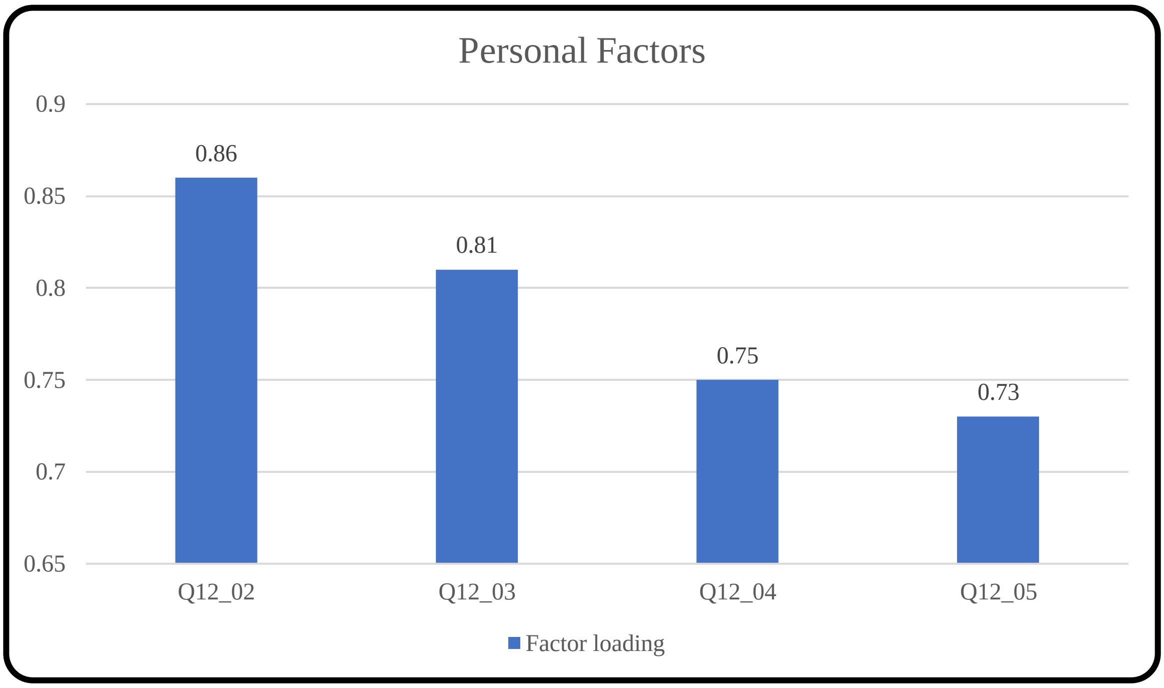

Figure 39. PF factor loadings

Table 47. PF reliability, mean and standard deviation

Reliability alpha coefficient	**0.89**
Mean Value	3.99
Standard Deviation	0.942

Table 48. Factor 6: Personal factors

Indicator code	Indicator question
Q12_02	I am confident in my IT skills
Q12_03	I am confident in my LMS skills
Q12_04	I previously had the skills to use LMS
Q12_05	I gained the experience to use LMS with time

7- MoEd Policies

Figure 40 below shows the details of the MEdP factor extracted and its components with their factor loading values. Table 49 presents the reliability coefficient, mean value and standard deviation, followed by Table 50, which relates each component code to its indicator questions in the questionnaire.

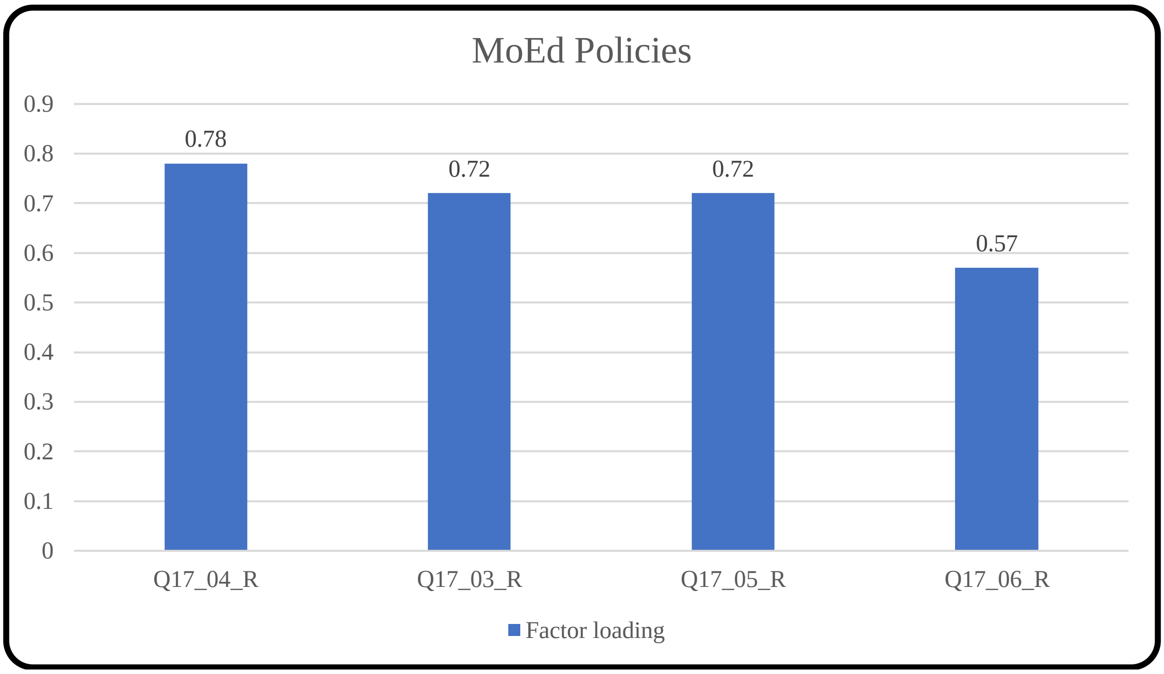

Figure 40. MEdP factor loadings

Table 49. MEdP reliability, mean and standard deviation

Reliability alpha coefficient	**0.79**
Mean Value	2.38
Standard Deviation	1.142

Table 50. Factor 7: MoEd Policies

Indicator code	Indicator question
Q17_04_R	The additional admin work takes too much effort and time
Q17_03_R	Adds to my electronic admin work
Q17_05_R	Distracts me from focusing on the changing curriculum
Q17_06_R	MoEd interest in LMS contradicts its mark value for students

8- IT Lab Classes

Figure 41 below shows the details of the ITL factor extracted and its components with their factor loading values. Table 51 presents the reliability coefficient, mean value and standard deviation, followed by Table 52, which relates each component code to its indicator questions in the questionnaire.

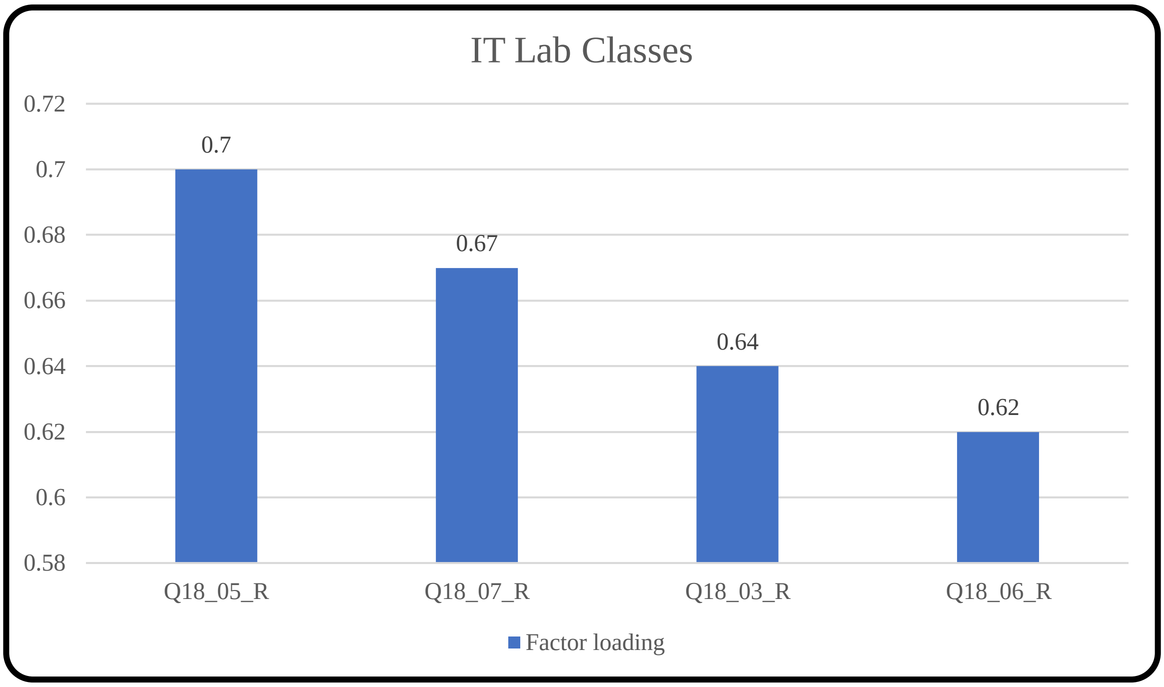

Figure 41. ITL factor loadings

Table 51. ITL reliability, mean and standard deviation

Reliability alpha coefficient	**0.75**
Mean Value	2.64
Standard Deviation	1.134

Table 52. Factor 8: IT lab classes

Indicator code	Indicator question
Q18_05_R	They waste year 12 students' learning time
Q18_07_R	There are too many in an academic year
Q18_03_R	They are used to force the students to use the LMS
Q18_06_R	They waste my teaching time

9- Tablets

Figure 42 below shows the details of the T factor extracted and its components with their factor loading values. Table 53 presents the reliability coefficient, mean value and standard deviation, followed by Table 54, which relates each component code to its indicator questions in the questionnaire.

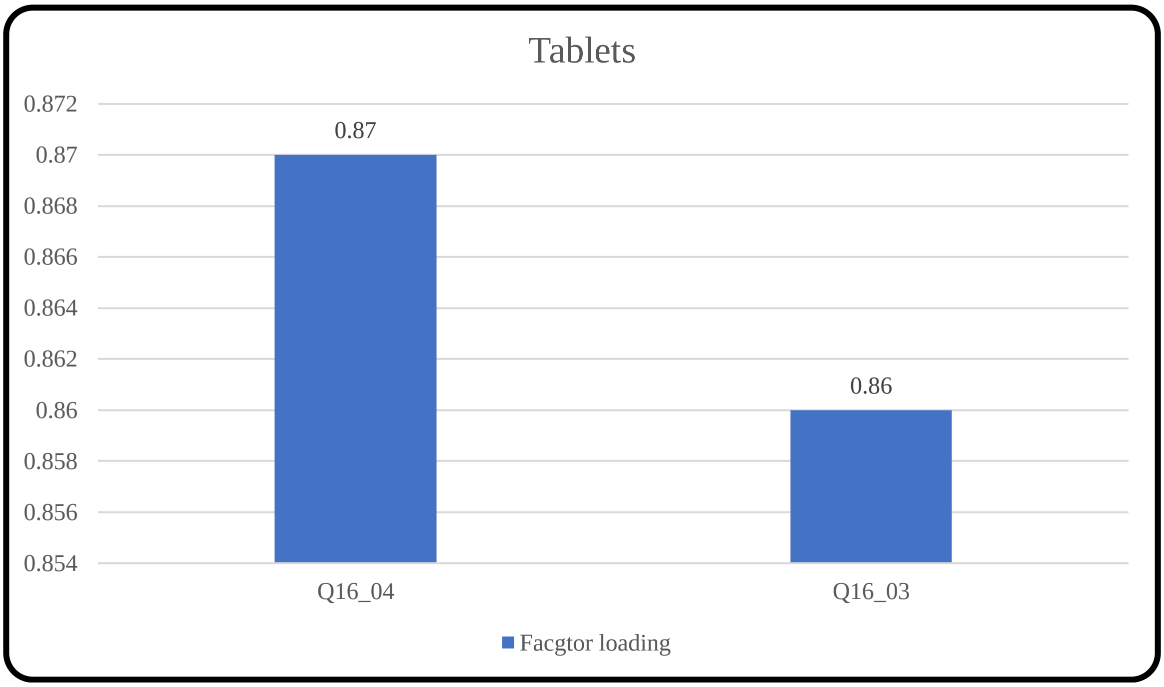

Figure 42. T factor loadings

Table 53. T reliability, mean and standard deviation

Reliability alpha coefficient	**0.89**
Mean Value	3.5
Standard Deviation	1.296

Table 54. Factor 9: Tablets

Indicator code	Indicator question
Q16_04	Students having tablets would increase the benefits of the LMS
Q16_03	MoEd should continue distributing tablet devices to students

With this step, factor analysis was completed. The factor analysis resulted in 11 factors and 55 variables. Factors 10 and 11 were removed to simplify the analysis, as they represented some complications and had reliability scores of less than 0.7 (Abdullah & Maliki, 2017; Moss et al., 1998). A total of 9 factors and 51 variables resulted. The next section will present descriptive statistics for each factor and rank them based on their importance. Importance was gauged based on mean score: the lower the factor's mean score, the more important the factor was considered. The subsequent section contains further analysis of the factors.

5.3.4) Factor Statistics

This section presents key statistics for the most important items in scales extracted from the factor analysis. Table 55 presents the new order of factors based on their mean scores, from lowest to highest.

Table 55. Extracted factors ordered by mean scores

#	Factor	Mean
1	MoEd Policies (MEdP)	2.38
2	Students and Parents (SP)	2.53
3	IT Lab Class (ITL)	2.64
4	LMS System (LMSS)	2.95
5	Tablets (T)	3.5
6	MoEd Support (MEdS)	3.68
7	LMS Functions (LMSF)	3.9
8	Personal Factors (PF)	3.99
9	School Administration (SA)	4.22

For simplicity of presentation, the items 'agree' and 'strongly agree' were combined under the term 'agree'. The same was done for 'disagree' and 'strongly disagree', which were combined under the term 'disagree'.

1- MoEd Policies (MEdP)

Participants were asked to evaluate the influence of MoEd's policies on their LMS practice. Table 56 highlights item codes along with their mean scores and standard deviations in the MEdP factor and indicates the direction of the factor's effect on teachers' LMS integration.

Table 56. MEdP statistics results

MEdP codes	Mean	Std. Deviation
MEdP1 The additional admin tasks take too much effort and time	2.28	1.115
MEdP2 Adds to my (participant) electronic admin work	2.49	1.168
MEdP3 It prevents me (participant) from focusing on the changing curriculum	2.46	1.125
MEdP4 MoEd interest in LMS contradicts its mark value for students	2.28	1.161
Overall	**2.38**	**1.142**

The overall mean score of the MEdP factor was 2.38 with a standard deviation of 1.142. This indicates that teachers in Qatar's secondary schools believed that the MoEd's policies were hindering teachers' successful LMS integration. Figure 43 below shows a further description of the results.

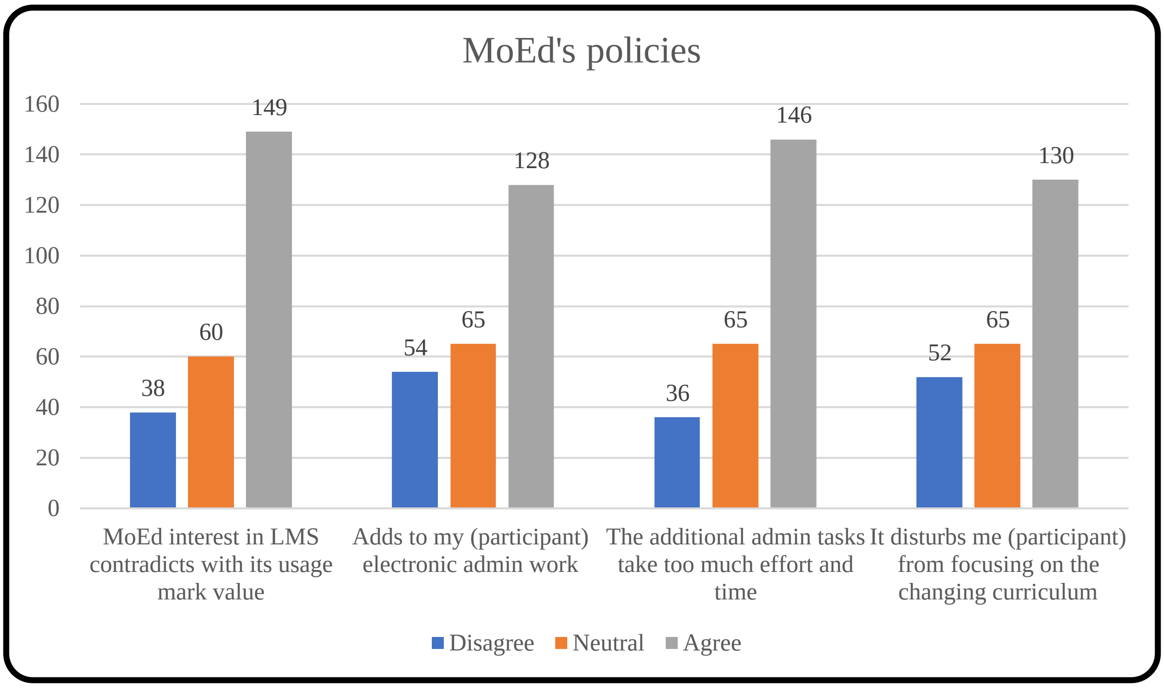

Figure 43. MoEd policy-related scores

As shown in Figure 43, the majority of the participants believed that the MoEd's policies hindered LMS integration. The item regarding the contradiction with mark value scored the highest total agreement by the participants. This can be related to the amount of additional administrative tasks required from teachers according to MoEd's policies, which was agreed to have a direct negative effect on teachers' practices. It was also agreed by the majority of participants that these policies and administrative tasks prevent teachers from focusing on planning and delivering their changing curriculum. Hence, the results suggest that the MoEd's policies are an important factor affecting teachers' LMS integration.

2- Students and Parents (SP)

This factor includes many important items. These can be categorised under three headings: beliefs and support, students' LMS usage and students' interest and motivation. Participants were required to evaluate the influence of student- and parent-related factors on their LMS teaching practices. Table 57 highlights the 'beliefs and support' item codes and their mean scores and standard deviations in the SP factor and indicates the direction of the factor's effect on teachers' LMS integration.

Table 57. SP statistics results (1)

SP codes	Mean	Std. Deviation
SP01 Students believe the LMS enhances their learning practice	2.28	0.992
SP06 Parents provide support at home for their children to use the LMS	2.32	0.999
SP08 Parents believe the LMS is useful for their children's learning	2.34	1.055
SP09 IT lab classes are important for students' learning	3.13	1.208
Overall	**2.52**	**1.064**

All of the items had low mean scores of less than 2.5, except SP09 at 3.13. The overall mean score was 2.52. This means that SP beliefs and support were believed to be negatively influencing teachers' LMS integration. Figure 44 below shows a further description of the results.

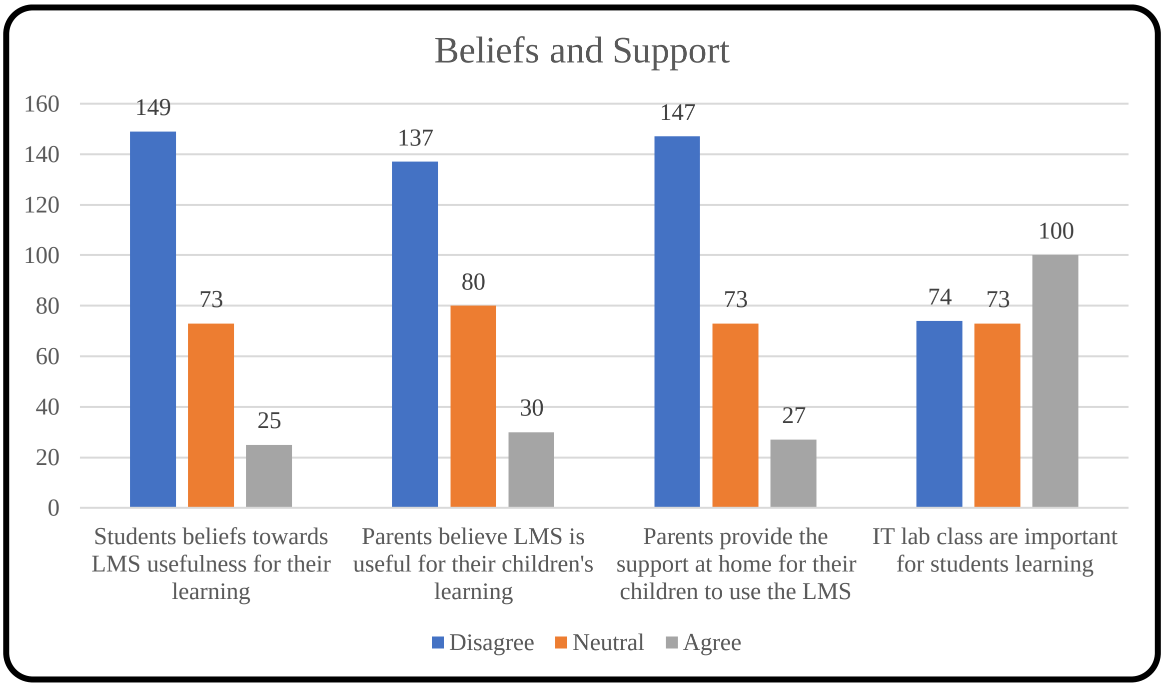

Figure 44. SP 'beliefs and support'-related scores

Students' and parents' beliefs regarding the LMS's usefulness for learning were disagreed with by the majority of the participants: they believed that parents did not think that the LMS was useful for learning. They also felt that this was reflected in a lack of parental support for their children at home when using the LMS. Participants' beliefs about students' and parents' attitudes towards the LMS were mostly negative. However, they showed a little more positivity regarding IT lab classes at school: more participants thought that parents could see the benefits of these specific sessions for their students' learning. Therefore, students' LMS usage at school and how they interacted with it was believed to influence teachers' LMS integration. Table 58 presents students' LMS usage and related items.

Table 58. SP statistics results (2)

SP codes	Mean	Std. Deviation
SP02 Students use the LMS at home	2.24	0.93
SP07 Students use the LMS at school	2.85	0.963
SP11 Students have the skills to use LMS	3.08	1.086
Overall	**2.72**	**0.993**

Table 58 above shows an overall mean score of 2.72 for this group of items, indicating that (SP) students' LMS usage negatively affects teachers' LMS integration. Figure 45 below shows a further description of the results.

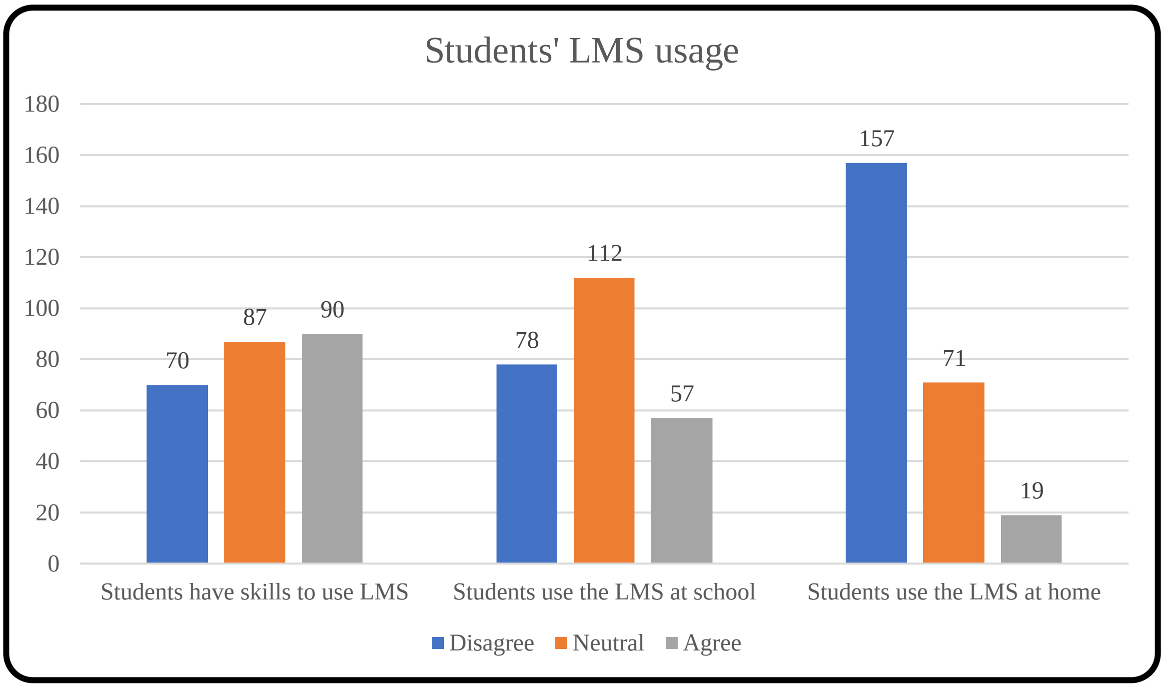

Figure 45. Students' LMS usage-related scores

It can be seen from the results that perception of students' LMS usage differed depending on the location of use. Most of the participants believed that students did not use the LMS at home. However, this perception changed when discussing LMS use at school, where more participants agreed that students made use of the LMS. This suggests that IT lab classes and other factors have helped students to engage and use the LMS more at school than at home. The graph also shows that more respondents agreed than disagreed that students have the appropriate skills to use the LMS, although there was a fairly even split across the three categories (agree, neutral and disagree). The next table presents items related to students' interest and motivation.

Table 59. SP statistics results (3)

SP codes	Mean	Std. Deviation
SP03 Year 10 & 11 students are interested in using the LMS	2.43	1.025
SP04 Students are motivated to use the LMS	2.27	1.06
SP05	1.97	1.045

Year 12 students are interested in using the LMS		
SP10		
IT lab classes motivate students to use the LMS	2.96	1.173
Overall	**2.41**	**1.076**
SP factor overall	**2.53**	**1.049**

The results presented in the table above show a mean score of 2.41 of (SP) students' interest and motivation regarding LMS usage, which indicates that these items were negatively influencing teachers' LMS integration. Combining all of the items in the SP factor, its overall mean score was found to be 2.53. In Figure 46 below, a further description of the results is shown.

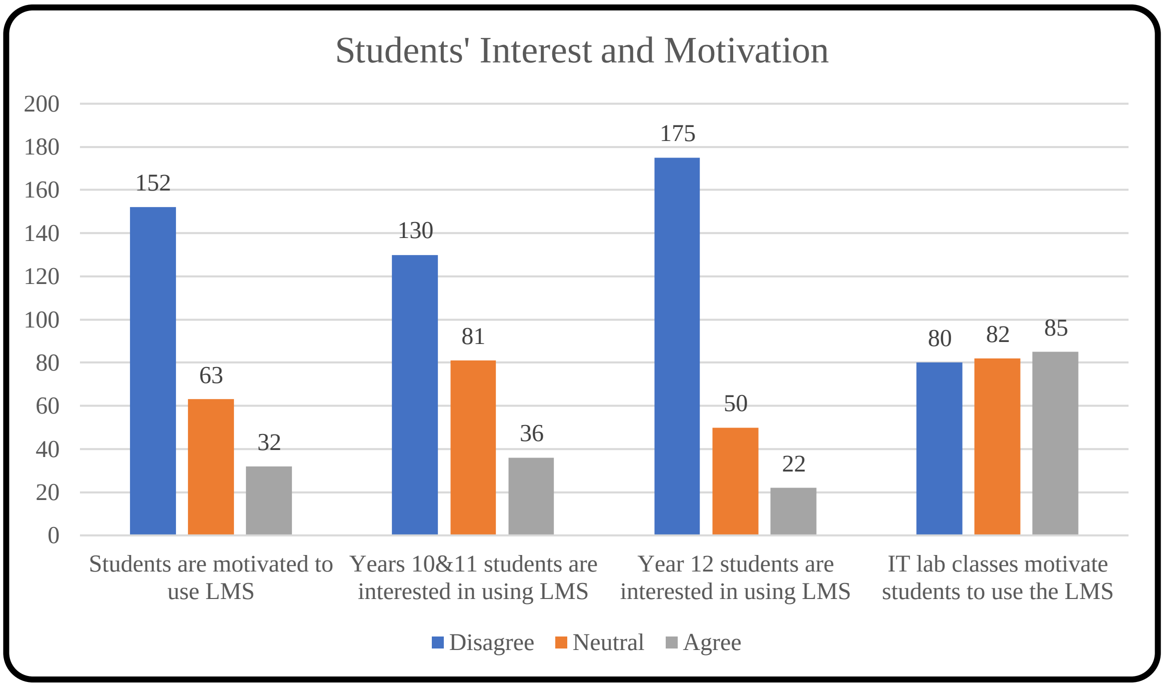

Figure 46. Students' interest and motivation-related scores

Most of the participants believed that students were not motivated to use the LMS, irrespective of their year level. However, Year 12 students were perceived to have the least interest in its use. There was less agreement amongst participants about whether IT lab classes motivate students to use the LMS, with slightly more respondents agreeing that they did achieve this. For this reason, the availability of IT lab classes was not considered to be a major negative influence on students' motivation. Hence, based on those three sub-items, students and parents were found to be an important limiting factor that overall had a negative influence on teacher's LMS integration.

3- IT lab class (ITL)

Participants were asked to evaluate the influence that IT lab classes had on their LMS teaching practice. Table 60 below shows ITL factor item codes and their mean scores and standard deviations and indicates the direction of the factors' effect on teachers' LMS integration.

Table 60. ITL statistics results

ITL codes	Mean	Std. Deviation
ITL1 They waste Year 12 students' learning time	2.36	1.178
ITL2 There are too many in an academic year	3.04	1.083
ITL3 They are used to force the students to use the LMS	2.71	1.198
ITL4 They waste my (participant's) teaching time	2.46	1.077
Overall	**2.64**	**1.134**

The overall mean score was 2.46. This identified ITL as an important factor that was limiting teachers' LMS integration. Figure 47 below shows a further description of the results.

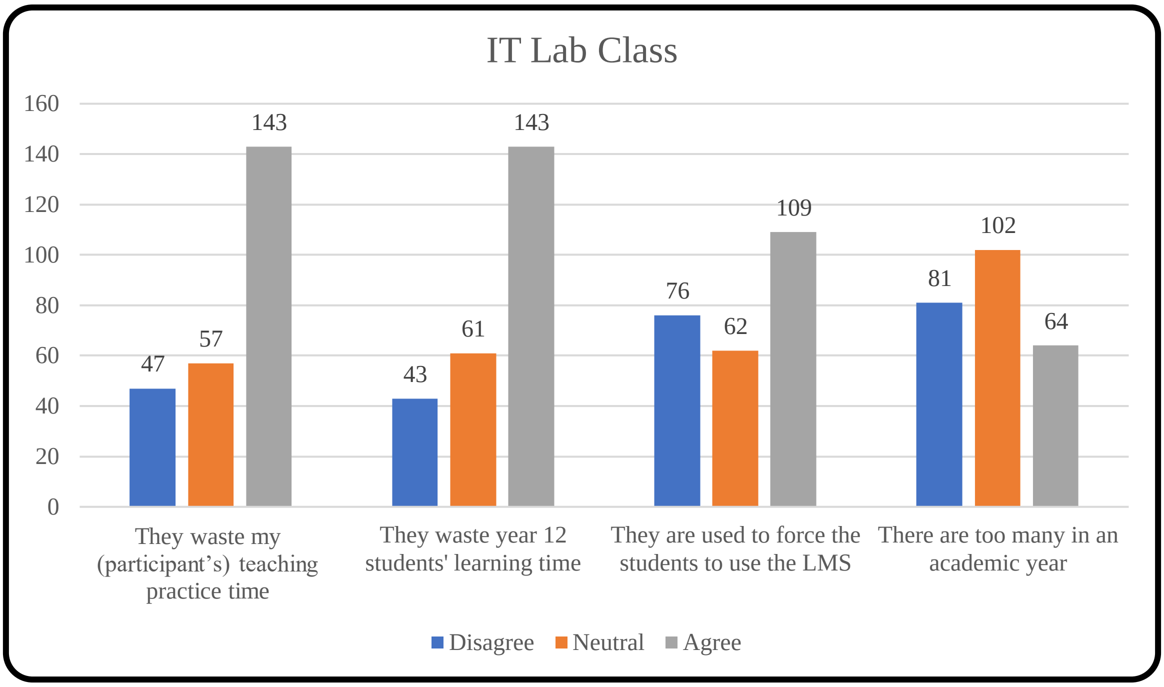

Figure 47. IT lab class-related scores

The results related to IT lab classes presented in Figure 47 indicated that most of the participants felt that IT lab classes were a waste of teaching and learning time. The majority of participants agreed that the IT lab classes were used as a means to force students to use the LMS at school. However, most participants were neutral regarding the frequency of IT lab class occurrence during an academic year: there were neither too many nor too few. This data suggests that IT lab classes were an important factor limiting teachers' LMS integration.

4- LMS system (LMSS)

The LMSS factor contains nine items. These items can be categorised into 'LMS design' and 'LMS usefulness'. The results for the LMSS factor are presented following this categorisation. Participants were asked to evaluate the influence of LMSS-related items on their LMS teaching practice. Table 61 below shows the 'LMS design' item codes and their mean scores and standard deviations and indicates the direction of the effect on teachers' LMS integration.

Table 61. LMSS design statistics results

LMSS design codes	Mean	Std. Deviation
LMSS1 It is educationally designed	3.12	1.07
LMSS3 Its design motivates students and teachers to use it	2.77	1.166
LMSS4 Its design is competitive related to Blackboard	2.91	1.05
LMSS6 Its communication is competitive in relation to WhatsApp	2.46	1.038
Overall	**2.82**	**1.081**

The overall mean score for 'LMS design' was 2.82, demonstrating that LMSS design was negatively influencing teachers' LMS integration. Figure 48 below shows a further description of the results.

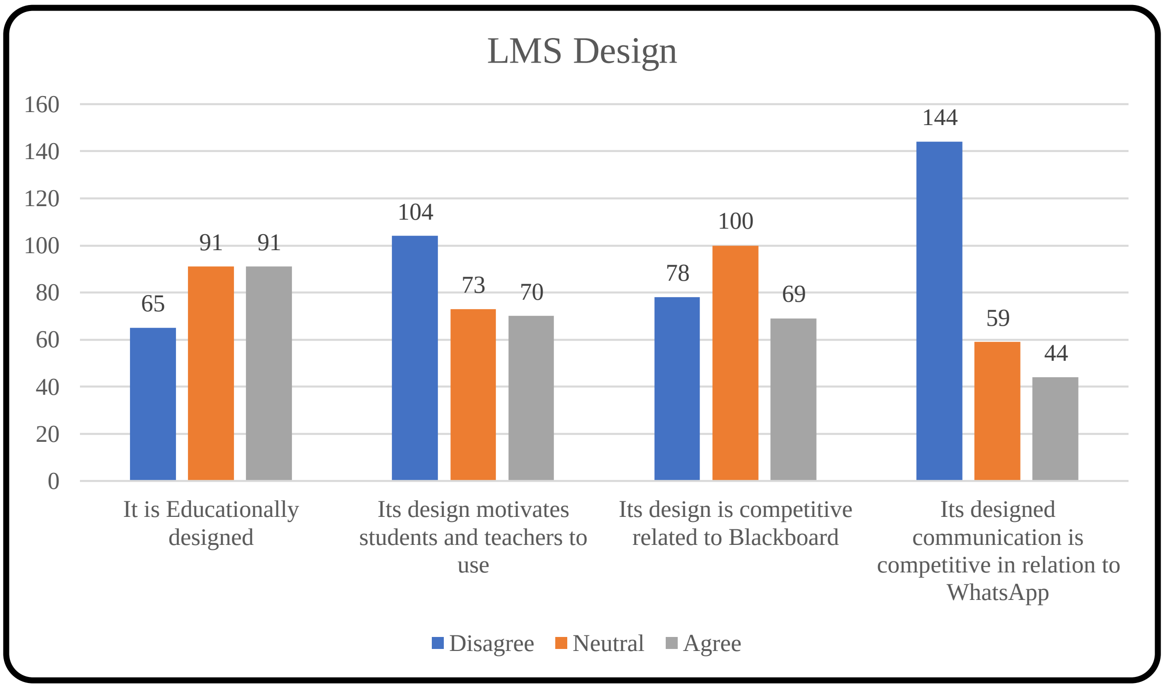

Figure 48. LMS design-related scores

Educationally, the design was seen as acceptable, with the majority of participants agreeing that it was designed in an educationally sound manner or feeling neutral. However, the majority of participants did not believe that the LMS was designed in a way that motivates teachers and students to use it. On the question of competitiveness with similar software, participants were neutral towards the LMS as compared with Blackboard. One of the possible reasons might be due to participants' unfamiliarity with Blackboard. However, when comparing the LMS with WhatsApp, the participants disagreed that the LMS was competitive with WhatsApp. In addition to its design, LMS usefulness-related findings are presented below, completing our understanding of the LMS design and usefulness factor.

Table 62. LMSS usefulness statistics results

LMSS usefulness codes	Mean	Std. Deviation
LMSS2 It is useful for teaching practice	3.15	1.177
LMSS5 It supports student learning	3.16	1.163
LMSS7 It is useful for administration tasks	3.19	1.221
LMSS8 It is reliable to use	2.79	1.145
LMSS9 I (participant) believe that the LMS is useful for my teaching practice	2.96	1.228
Overall	3.05	1.187
LMSS factor overall	**2.95**	**1.140**

Overall, the LMS design and usefulness items had a mean score of 2.95, showing that they were important items that hindered teachers' LMS integration. Hence, LMS design and usefulness was found to be an important factor that negatively affected teachers' LMS integration. The graph below shows further detail regarding the results.

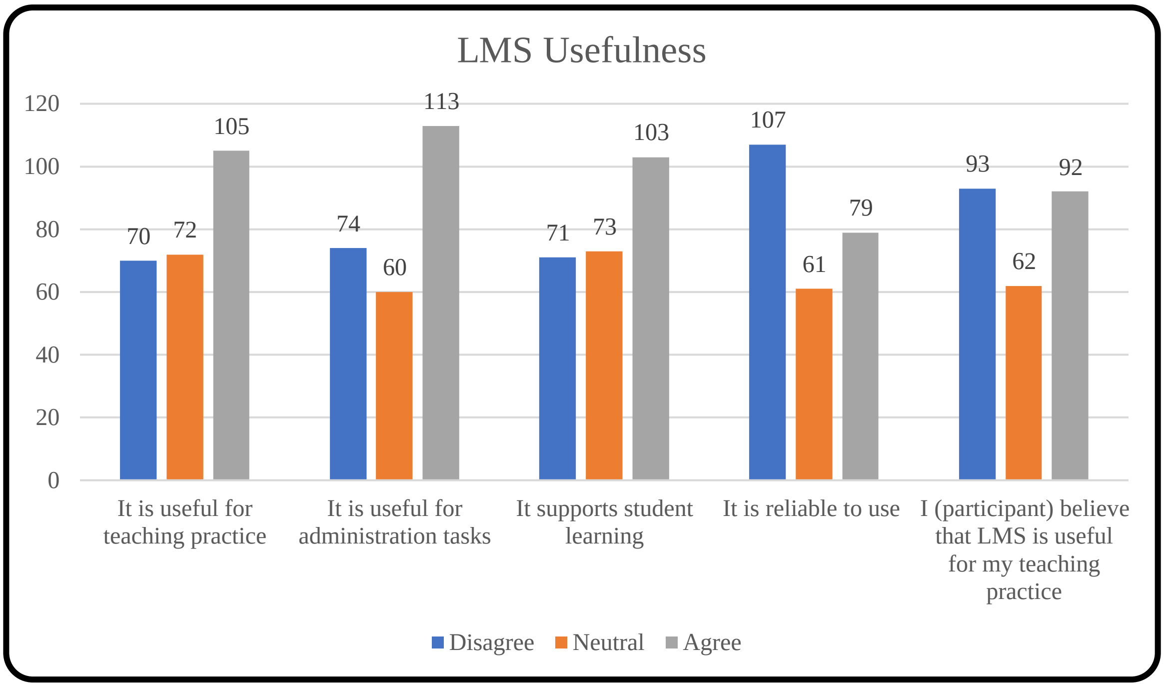

Figure 49. LMS usefulness-related scores

The LMS usefulness-related items had a mean score of 3.05 (see table 62 above). Overall, participants were neutral or agreed slightly with those items. However, the majority of participants believed that the LMS as a system was useful for teaching practice, administrative tasks and in supporting students' learning. Interestingly, this belief was not exactly the same when they reflected on their personal teaching experience in using the LMS. It can be seen in Figure 49 that when comparing the fifth item with the first item, many of the participants disagreed with the statement and expressed their beliefs differently. This indicates that teachers are aware of the LMS's usefulness, but that other factors such as reliability affect their personal experience. The majority of the participants did not believe that the LMS was reliable.

5- Tablets (T)

Participants were asked to evaluate the influence that tablets had on their LMS integration into their teaching practices. The table below shows the relevant item codes and their mean scores and standard deviations for the T factor and indicates the direction of the factor's effect on teachers' LMS integration.

Table 63. T statistics results

T codes	Mean	Std. Deviation
T1 Students having tablets would increase the benefits of the LMS	3.54	1.299
T2 The MoEd should continue distributing tablet devices to students	3.46	1.293
Overall	**3.50**	**1.296**

The T factor was found to positively influence teachers' LMS integration, with an overall mean score of 3.50 and a standard deviation of 1.296. Figure 50 below shows the distribution of responses for this factor.

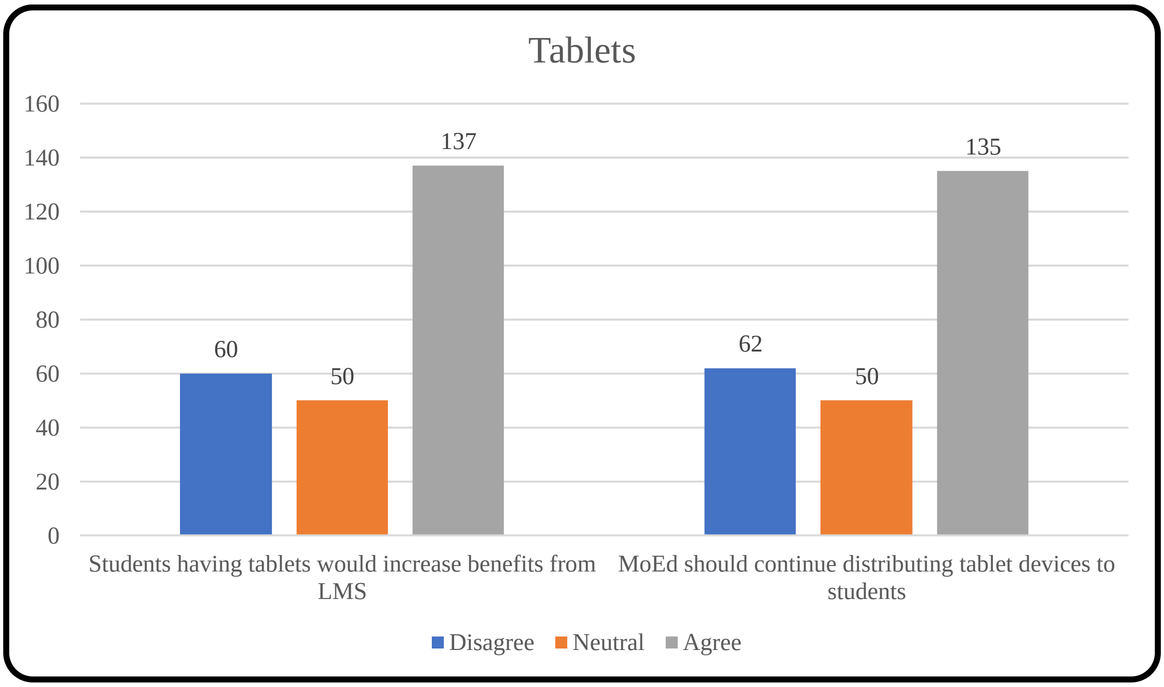

Figure 50. Tablet-related scores

Most of the participants believed that students having access to tablets would increase the benefits they received from the LMS. Similarly, most of the participants agreed that the MoEd should continue to provide students with tablets devices. Hence, having a tablet device would benefit and support LMS integration by teachers, and this factor was found to be supportive.

6- MoEd Support (MEdS)

Participants were asked to evaluate the influence of MoEd support on their LMS teaching practice. Table 64 below shows item codes and their mean scores and standard deviations for the MEdS factor and indicates the direction of the factor's effect on teachers' LMS integration.

Table 64. MEdS statistics results

MEdS codes	Mean	Std. Deviation
MEdS1 MoEd provides necessary LMS training and workshops	3.76	1.035
MEdS2 LMS training and workshops have enough information for excellent integration	3.62	1.056
MEdS3 MoEd provides LMS experts	3.84	0.994
MEdS4 LMS experts respond quickly to issues reported with solutions	3.6	1.002
MEdS5 Supports successful LMS integration	3.57	0.947
Overall	**3.68**	**1.007**

MEdS factor was found to positively influence teachers' LMS integration, with an overall mean score of 3.68 and a standard deviation of 1.007. Figure 51 below shows the distribution of responses relating to this factor.

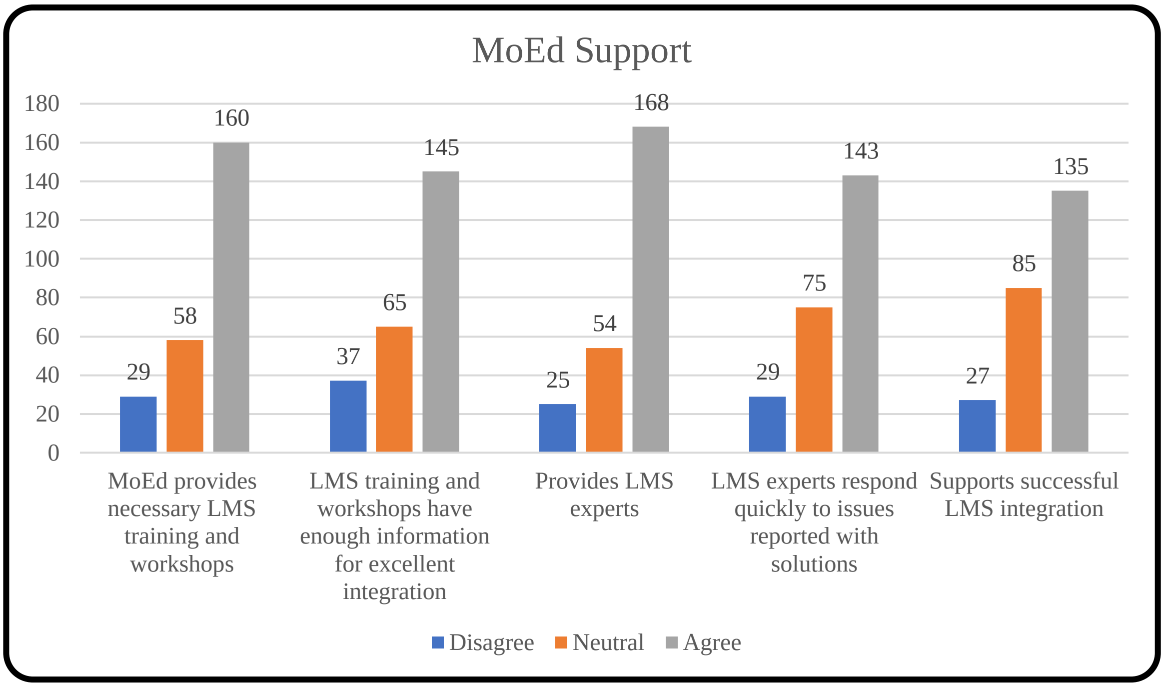

Figure 51. MoEd support-related scores

Most of the participants agreed that the MoEd supports LMS integration. The participants indicated that the MoEd provided the necessary training and workshops for teachers to learn about the LMS and its use. Those training sessions contained enough information for a high level of successful LMS integration. When teachers experienced problems with the system, the MoEd provided an LMS expert team to resolve those issues. Participants agreed that the MoEd's LMS expert team responded quickly with solutions for reported issues. The majority of the participants felt that the MoEd supported successful LMS integration. Hence, MoEd support was found to be a supporting factor in teachers' LMS integration.

7- LMS functions (LMS PEU)

Participants were asked to evaluate the difficulty of the LMS functions they had integrated into their teaching practice. Table 65 below highlights item codes and their mean scores and standard deviations for the LMS PEU factor and indicates the direction of the factor's effect on teachers' LMS integration.

Table 65. LMS PEU statistics results

LMS PEU codes	Mean	Std. Deviation
LMSF1 Online quizzes	2.42	0.669
LMSF2 Uploading materials	2.38	0.704
LMSF3 Auto-correction	2.46	0.83
LMSF4 Creating question bank	2.33	0.783
LMSF5 Sharing lesson plans with colleagues	2.26	0.844
LMSF6 Online homework	2.19	0.87
Overall	**2.34/ 3.9**	**0.783**

The LMS PEU factor was found to positively influence teachers' LMS integration, with an overall 2.34 (equivalent to 3.9 compared to other factors) mean score and a standard deviation of 0.783. Figure 52 shows the distribution of responses within this factor.

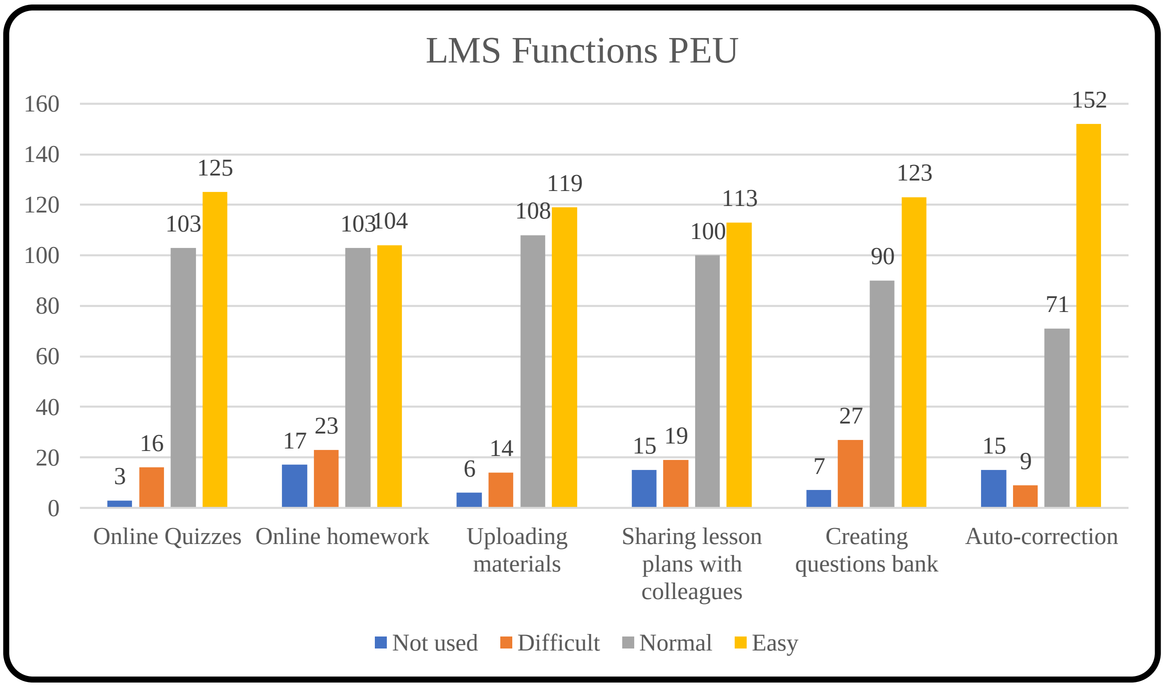

Figure 52. LMS PEU-related scores

Figure 52 above shows the results related to the difficulty of LMS functions used by participants. The majority of LMS functions were found to be easy to use. This indicates that participants do not have issues in learning and using LMS functions. Hence, LMS functions was found to be a supporting factor in teachers' LMS integration.

8- Personal Factors (PF)

Participants were asked to evaluate the influence of personal factors on their integration of the LMS into their teaching practice. Table 66 below shows item codes and their mean scores and standard deviations for the PF factor and indicates the direction of the factor's effect on teachers' LMS integration.

Table 66. PF statistics results

PF codes	Mean	Std. Deviation
PF1 I am confident in my IT skills	4.11	0.897
PF2 I am confident in my LMS skills	4.02	0.93
PF3 I (participant) previously had the skills to use LMS	3.61	1.095
PF4 I (participant) gained experience in using LMS with time	4.21	0.847
Overall	**3.99**	**0.942**

The PF factor was found to positively influence teachers' LMS integration, with an overall mean score of 3.99 and a standard deviation of 0.942. Figure 53 below shows the distribution of responses within this factor.

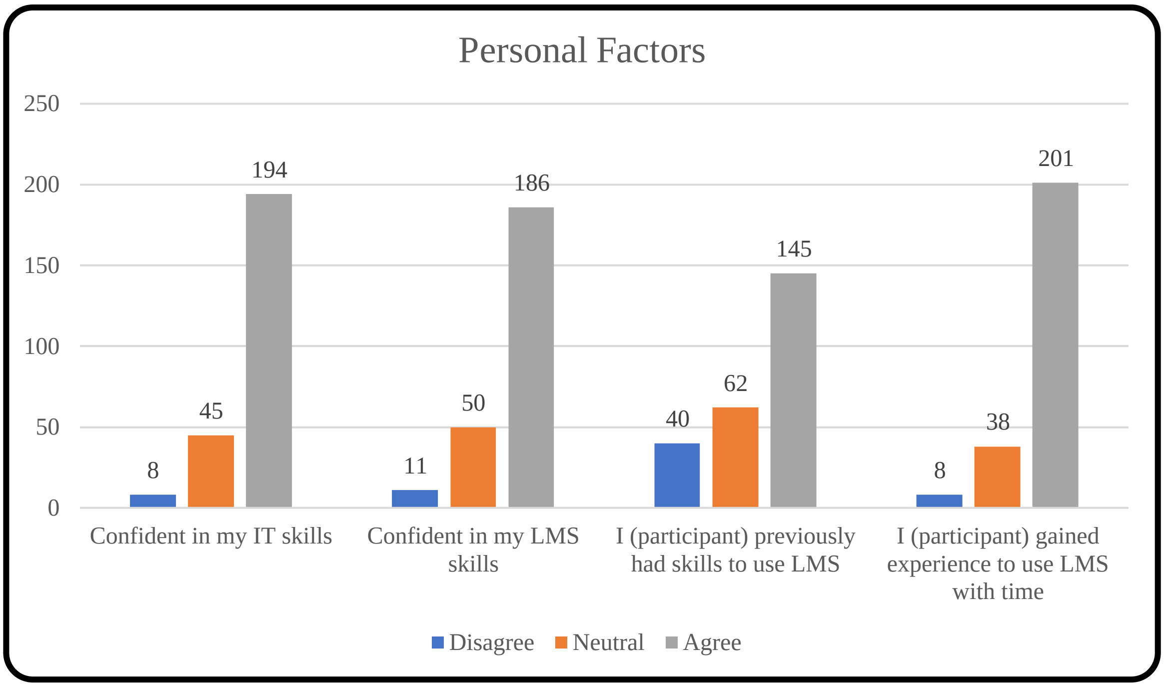

Figure 53. Personal factors-related scores

Most of the participants agreed that personal factors supported their LMS integration. It can be seen in the graph above that with time, teachers gained the experience necessary to use the LMS. When compared to the existence of prior LMS-related skills, which had a lower agreement, it appears that actual usage and experience play more of a role in increasing their skills and confidence in using the LMS. Hence, this factor was found to be supportive of teachers’ LMS integration.

9- School Administration (SA)

Participants were asked to evaluate the influence of the school administration on their integration of the LMS into their teaching practice. Table 67 below shows the item codes and their mean scores and standard deviations for this SA factor and indicates the direction of the factor’s effect on teachers’ LMS integration.

Table 67. SA statistics results

SA codes	Mean	Std. Deviation
SA1 SA manages e-learning classes	4.37	0.801
SA2 SA forces teachers to follow its policies regarding the LMS	4.23	0.9
SA3 School supports LMS usage	4.26	0.838
SA4 SA controls how much of LMS should be integrated	3.98	0.977
SA5 SA provides training for teachers in LMS use	4.24	0.904
SA6 SA supports e-learning classes	4.22	0.837
Overall	**4.22**	**0.876**

The SA factor was found to positively influence teachers' LMS integration, with an overall mean score of 4.22 and a standard deviation of 0.876. Figure 54 below shows the distribution of responses within this factor.

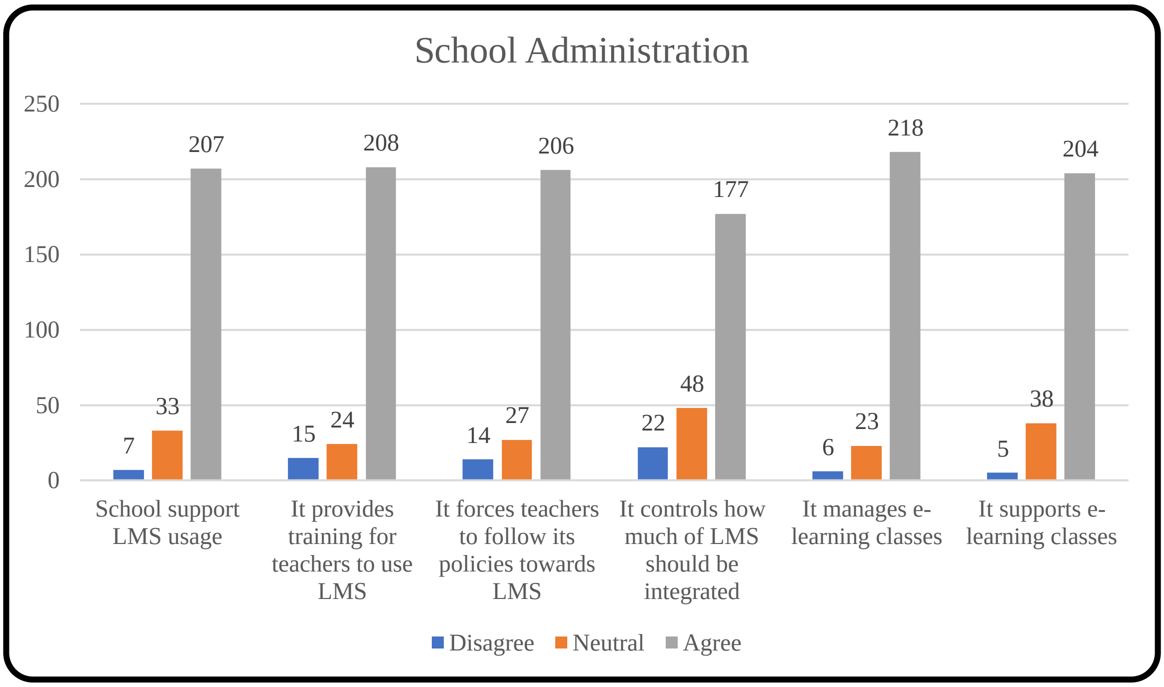

Figure 54. School Administration related scores

The results shown in the graph above indicate that the majority of participants believe that the school administration supported successful LMS integration. Participants agreed that school administration supported them by providing training for teachers and forcing them to follow their LMS policies. The results also showed that participants agreed that the school administration manages e-learning classes (IT lab classes) and provides the support needed for those. Hence, school administration was found to be a supporting factor in teachers' LMS integration.

The following section presents the t-test analyses.

5.3.5) Independent T-Tests:

In a further exploration of the important variables against demographic information, t-tests were used to compare group means and identify any statistically significant differences. The demographic information of interest was years of teaching experience, subjects taught, gender and age.

5.3.5.1) Years of Experience

Participants were split into two groups: less experienced and more experienced teachers. This division separated teachers who had been teaching in Qatar before the introduction of the K-Net from those who came after it. Group One consisted of participants with experience of 0-5 and 6-10 years. Group Two consisted of participants with experience of 11-15 and 16+ years. The less experienced group consisted of 126 participants and the more experienced group consisted of 121 participants. The comparison between these groups resulted in two statistically significant differences: one in MEdP, with $t = 2.543$, and the second in ITL, with $t = 2.157$. In terms of MEdP, less experienced participants had a statistically higher mean (mean = 2.51) than the more experienced (mean = 2.24) with a statistical significance of $p = 0.015$. In ITL, again, less experienced participants had a significantly higher mean than more experienced participants, with a statistical significance of $p = 0.032$. Table 68 below presents further details of the t-test results.

Table 68. Descriptive statistics and t-test results – Less and more experienced teachers

Group Statistics							
Factor	**Exp.**	**N**	**Mean**	**Std. Deviation**	**t**	**df**	**Sig. (p) (2-tailed)**
SP	Less exp.	126	2.56	0.833	0.595	245	0.552
	More exp.	121	2.50	0.794			
LMSS	Less esp.	126	3.03	0.949	1.497	245	0.136
	More exp	121	2.85	0.935			
MEdP	Less exp.	126	2.51	0.868	2.453	245	0.015
	More exp.	121	2.24	0.903			
ITL	Less exp.	126	2.76	0.836	2.157	245	0.032
	More exp.	121	2.52	0.864			

5.3.5.2) Subject Taught

The sample sizes of both subject taught groups were assumed to be of equal variance, as the science subjects group had 121 participants and the other subjects group had 115. When comparing these two groups on the factors of interest, one statistically significant difference was found. This was in the MEdP factor, with a t score of 3.055 at p = 0.003. Science teacher participants were statistically more positive toward the MEdP than teachers of other subjects. Table 69 presents the results of the t-tests.

Table 69. Descriptive statistics and t-test results – Science and Other subjects' teachers

Group Statistics							
Factor	**Subject**	**N**	**Mean**	**Std. Deviation**	**t**	**df**	**Sig. (p) (2-tailed)**
SP	Science	121	2.55	0.808	0.926	234	0.356
	Other	115	2.45	0.813			
LMSS	Science	121	3.03	0.928	1.866	234	0.063
	Other	115	2.80	0.962			
MEdP	Science	121	2.55	0.892	3.055	234	0.003
	Other	115	2.20	0.875			
ITL	Science	121	2.69	0.857	0.874	234	0.383
	Other	115	2.59	0.881			

5.3.5.3) Gender

The male and female participant groups were not of equal sizes: there were 29 male and 216 female participants in the questionnaire. When samples are not equal, equality of variance cannot be assumed. Based on the t-tests, there were no significant differences between male and female participants across any of the important factors identified. Table 70 presents the results of the t-tests.

Table 70. Descriptive statistics and t-test results – Male and female

Group Statistics							
Factor	**Gender**	**N**	**Mean**	**Std. Deviation**	**t**	**df**	**Sig. (p) (2-tailed)**
SP	Male	29	2.56	0.994	0.131	33	0.897
	Female	216	2.53	0.787			
LMSS	Male	29	2.75	0.996	-1.174	35	0.248
	Female	216	2.98	0.933			
MEdP	Male	29	2.48	0.928	0.653	35	0.518
	Female	216	2.36	0.895			
ITL	Male	29	2.57	0.821	-0.499	37	0.261
	Female	216	2.65	0.865			

5.3.5.4) Age

Participants were initially classified into four age groups. However, the statistical comparison was between younger teachers (21 or below) and older teachers (52+) to see if there were any significant differences between the youngest and oldest age groups. The sample of younger teachers consisted of 30 participants and the sample of older participants was 106, hence equality of variance could not be assumed. Surprisingly, there were no statistically significant differences between the two groups in relation to any of the important factors. Table 71 presents the results of the t-tests.

Table 71. Descriptive statistics and t-test results - Younger and older teachers

Group Statistics							
Factor	**Age**	**N**	**Mean**	**Std. Deviation**	**t**	**df**	**Sig. (p) (2-tailed)**
SP	Younger	30	2.51	0.806	-0.022	49	0.982
	Older	106	2.51	0.857			
LMSS	Younger	30	2.87	0.877	0.151	51	0.88
	Older	106	2.84	0.966			
MEdP	Younger	30	2.28	0.923	-0.298	45	0.767
	Older	106	2.34	0.877			
ITL	Younger	30	2.93	0.898	1.948	44	0.058
	Older	106	2.58	0.827			

The above comparisons based on demographic data indicate that most of the groups of teachers have similar opinions about LMS integration, as only three statistically significant differences were found in the 16 comparisons made. None of these differences affected the mean averages. In other words, all of the groups compared retained the overall experience of hindrances and low mean scores. This suggests that regardless of gender, teaching subject, age or experience, these issues exist and need to be resolved if the MoEd is to achieve better LMS integration in the teacher population.

5.3.6) Summary of Phase Two Findings

The Phase Two findings addressed research questions 2 and 3. Research question 2 was *How do these factors affect teachers' teaching and learning practices in relation to Learning Management System integration?* This phase explored 9 factors influencing teachers' integration of the LMS into their teaching and other work practice and determined the direction of their influence. Factors negatively influencing integration were MEdP, SP, ITL and LMSS. Factors positively influencing integration were T, MEdS, LMS PEU, PF and SA.

Research question 3 was *Which factors are most important in teachers' successful integration of the Learning Management System in Qatar secondary schools? Does the importance of these factors differ between different groups? (For example, between male and female teachers, science teachers and teachers of other subjects, younger and older teachers, less experienced and more experienced teachers.)*

The analysis for this question explored four important limiting factors (MEdP, SP, ITL, MEdP and LMSS) that were chosen based on the importance of understanding and resolving them for a more successful LMS integration. Some statistically significant differences were found among different demographic groups, but they did not change the participants' overall negative experience with these factors.

The next section presents a combined analysis of both phases, integrating the qualitative and quantitative results to gain a more complete understanding.

5.4) Combined Analysis

This section integrates the findings of the thematic and statistical analyses above. As explained earlier, Phase Two of the data collection depended on the findings of Phase One, which were used to create the tool and develop appropriate indicators. Hence, there was already considerable integration between the two phases. The organisation of sub-sections is based on the level of importance identified earlier and used in the factor statistics section (5.3.4). Factors will be discussed in the following order: MEdP, SP, ITL, LMSS, T, MEdS, LMSF, PF and SA.

1- **MoEd Policies (MEdP)**

The results of Phase One showed that the MoEd's policies had a potentially strong impact on teachers' LMS integration, and the results of Phase Two showed the direction of this impact. By combining both sets of results, it could be confirmed that the MoEd's policies had negatively affected teachers' LMS integration. Table 72 below shows to which theme in Phase One this factor relates.

Table 72. MEdP and Phase One relationship table

Theme	Item number	Title
1	5.1.2.1	Education system
2	5.1.3.1	No effect
2	5.1.3.3	Major effect

Figure 55 shows the distribution of participants' answers to the questionnaire.

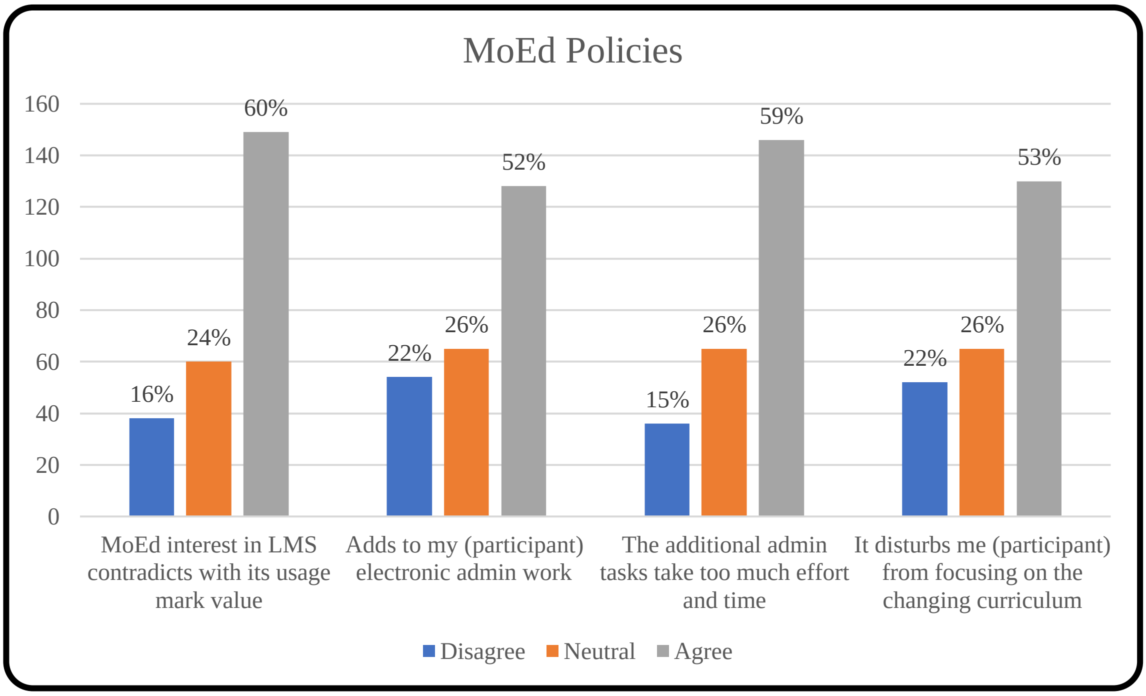

Figure 55. MoEd policies – Score distribution

The MoEd's policies appear to have placed pressure on teachers to use the LMS for administrative tasks far more than teachers were expecting. This is illustrated by participant

05, who stated that ‘They [the MoEd] do not let us benefit from it due to the high workload’. Other participants stated that they have to document everything they do through the LMS. If they fail to do so, this is taken by the MoEd as a lack of LMS usage, which might lead to issues and penalties for teachers. Fifty-nine percent of the participants in Phase Two agreed with this. The majority of Phase Two participants also agreed that the MoEd’s focus on and interest in LMS implementation by teachers and students did not reflect its mark value, with 60% agreement. As participant 05 stated, ‘There is extra work which is not useful [in the LMS], and they ask us to do it, but in the end, it is not worth any marks for students’. This reflected a more management purpose for LMS integration enforced by the MoEd than learning purpose.

2- Students and Parents (SP)

The results in Phase One indicated that students and parents are potential factors affecting teachers’ LMS integration. The results of Phase Two confirmed and further explored this pattern. Exploration of this factor resulted in three categories: beliefs and support, students’ LMS usage and students’ interest and motivation regarding use of the LMS. The Students and Parents factor was found to be negatively affecting teachers’ LMS integration. Table 73 below shows the relationship between the Phase One theme and this factor.

Table 73. SP and Phase One relationship table

Theme	Item number	Title
1	5.1.2.3	Teaching system
2	5.1.3.3	Major effect

Figure 56 presents the distribution of participants’ answers to the relevant survey questions.

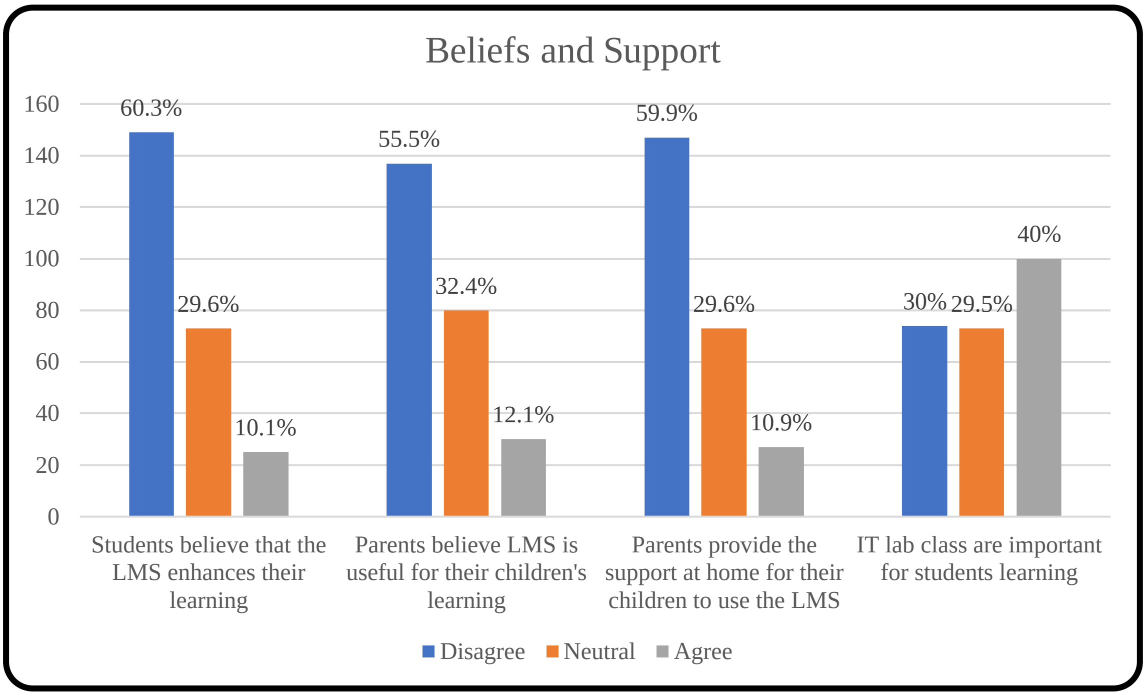

Figure 56. SP ‘beliefs and support’ score percentages

Participants in the study suggested that students and parents did not believe in the benefits of the LMS for enhancing learning. One of the interview participants said, for example, that ‘Parents are not very convinced about [the LMS]’ (P06). Of the participants in Phase Two, 55.5% indicated that parents did not believe in the benefits of the LMS for their children’s learning. Hence, they did not support their children to use the LMS at home. As for students, 60.3% of participants did not think that students believed the LMS benefited their learning. One interview participant stated that ‘Many of the … students don’t have interest [in the LMS]’ (P07). To engage students with the LMS, IT lab classes were often used. Participants in Phase One had a variety of experiences towards IT lab classes: some indicated that it is important for students to engage with the LMS and promote collaborative work, while others disagreed, stating that there was very little engagement with the LMS so they would prefer not to waste their teaching time on IT lab classes. In Phase Two, 40% of the participants agreed that IT lab classes were important for students’ learning.

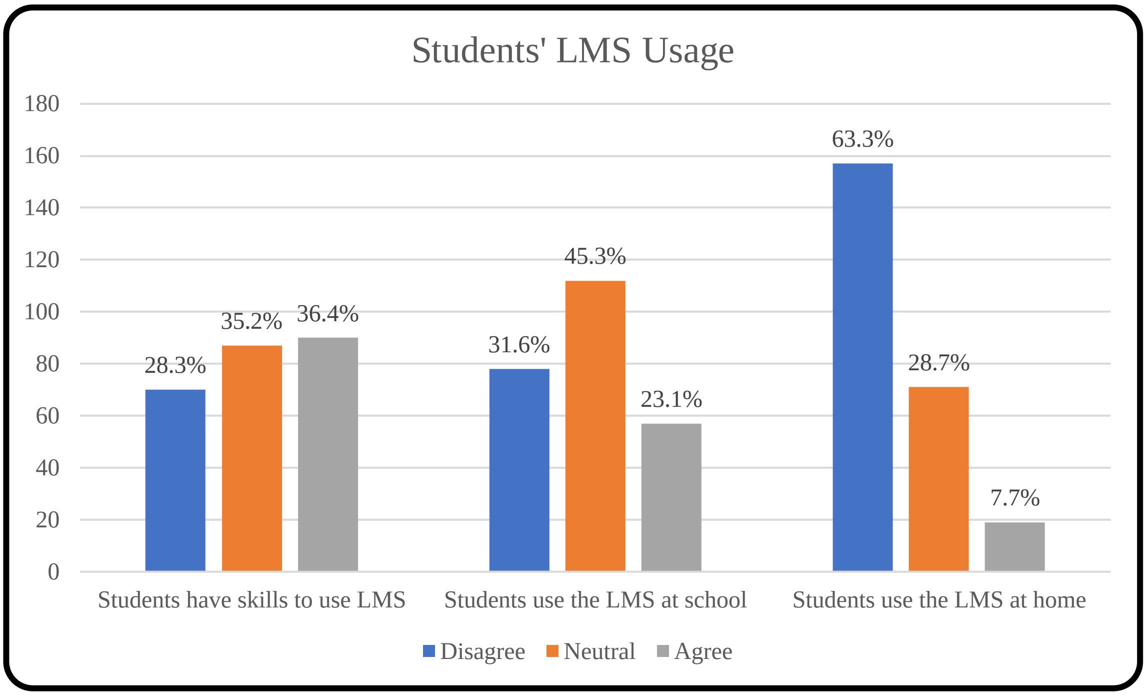

Figure 57. Students' LMS usage score percentages

Continuing with students as a factor, their LMS usage (see Figure 57) in terms of their LMS skills and home versus school usages were found to affect teachers' LMS integration. Participants in Phase One indicated that students are reluctant to use the LMS at home, which was confirmed by 63.3% of the participants in Phase Two. Students' lack of LMS skills, as reported by some of Phase One participants, was not found to be a major issue in Phase Two. On the other hand, students use the LMS at school without issues: 'the student at school honestly says that he doesn't have a problem' (P07). The majority of participants in Phase Two neither agreed nor disagreed on this: 45.3% of them were neutral. The lack of LMS usage by students was seen to be related to their interest and motivation. Figure 58 shows the distribution of survey responses for this factor.

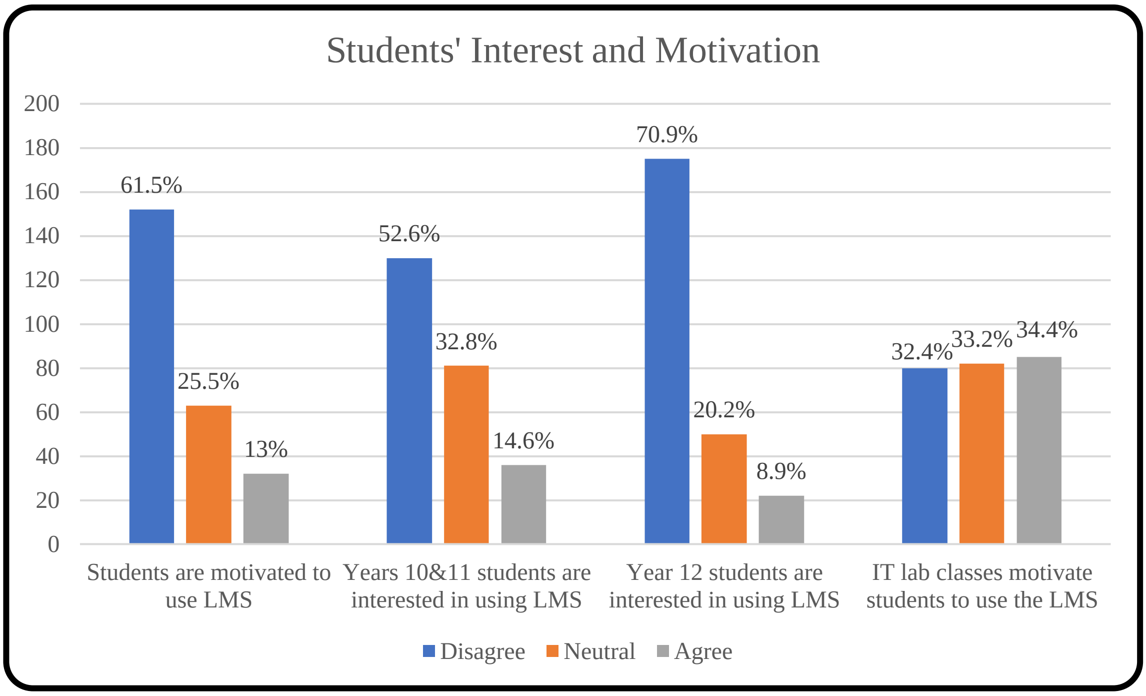

Figure 58. Students' interest and motivation score percentages

Some of the Phase One participants stated that students were not motivated to use the LMS, and participants in Phase Two confirmed this, with 61.5% disagreeing that students are motivated to use it. Participants in Phase One also differentiated between students at different year levels, indicating that students in Years 10 and 11 were more motivated than students in Year 12. The same result was found in Phase Two, where more participants indicated that Year 12 students were not motivated to use the LMS (70.9%) than Year 10 and 11 students (52.6%). Some of the participants in Phase One indicated that IT lab classes motivated their students to use the LMS, however the Phase Two results did not confirm this, with survey responses nearly equally distributed among all choices, with 34.4% agreeing, 33.2% neutral, and 32.4% disagreeing.

3- IT lab class (ITL)

Table 74 below shows the relationship between this factor and Phase One themes.

Table 74. ITL and Phase One relationship table

Theme	Item number	Title
1	5.1.2.3	Teaching system
2	5.1.3.3	Major effect

Figure 59 presents the percentages of Phase Two participants' answers to the survey.

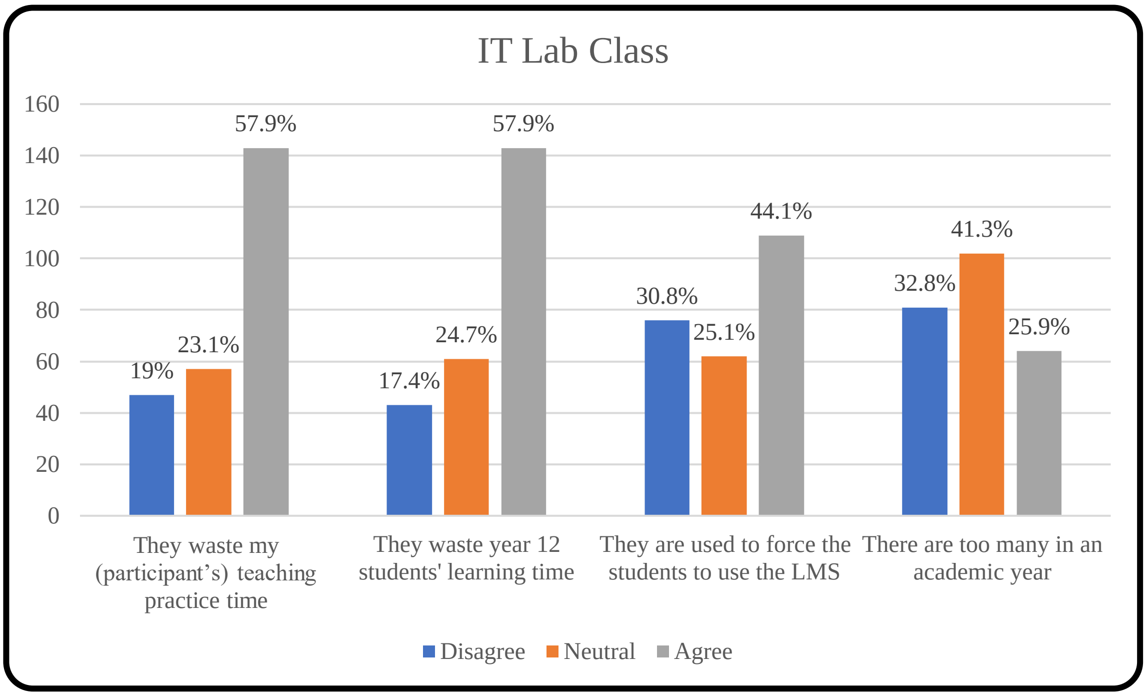

Figure 59. IT Lab class score percentages

Phase One participants had a range of experiences with IT lab classes. In terms of the way in which participants benefited from these classes, some of the participants used them 'to take students to the lab class and force students to go back [to the LMS] and solve equations, things like this' (P03), while others used it to change the traditional classroom learning environment in an attempt to motivate students in a more collaborative environment. Several indicated that it wasted their teaching time, as it disrupted their teaching activities when the school administration assigned the date and time for IT lab classes. Interestingly, the majority of the participants (57.9%) in Phase Two agreed that IT lab classes wasted their teaching time. Participants also said that these classes were wasting Year 12 students' learning time. In terms of the frequency of IT lab classes, most of the participants felt neutral, believing that it was neither too many nor too few (note that participants in Phase One stated that the frequency was twice a year per teacher per class. The greatest number of participants (44.1%) agreed that these classes were used to force students to log into the LMS and use it.

4- LMS System (LMSS)

The findings from Phase One showed that it is important to consider LMS system design and usefulness to successfully integrate LMS into teaching practice. Phase Two findings explored these considerations in more detail and confirmed their importance and effect on teachers' LMS integration. Table 75 below shows the relationships between Phase One themes and this factor.

Table 75. LMSS and Phase One relationship table

Theme	Item number	Title
1	5.1.2.2	Technical system
1	5.1.2.3	Teaching system
2	5.1.3.2	Minor effect

Figure 60 presents the distribution of participants' answers to survey questions related to LMS system design.

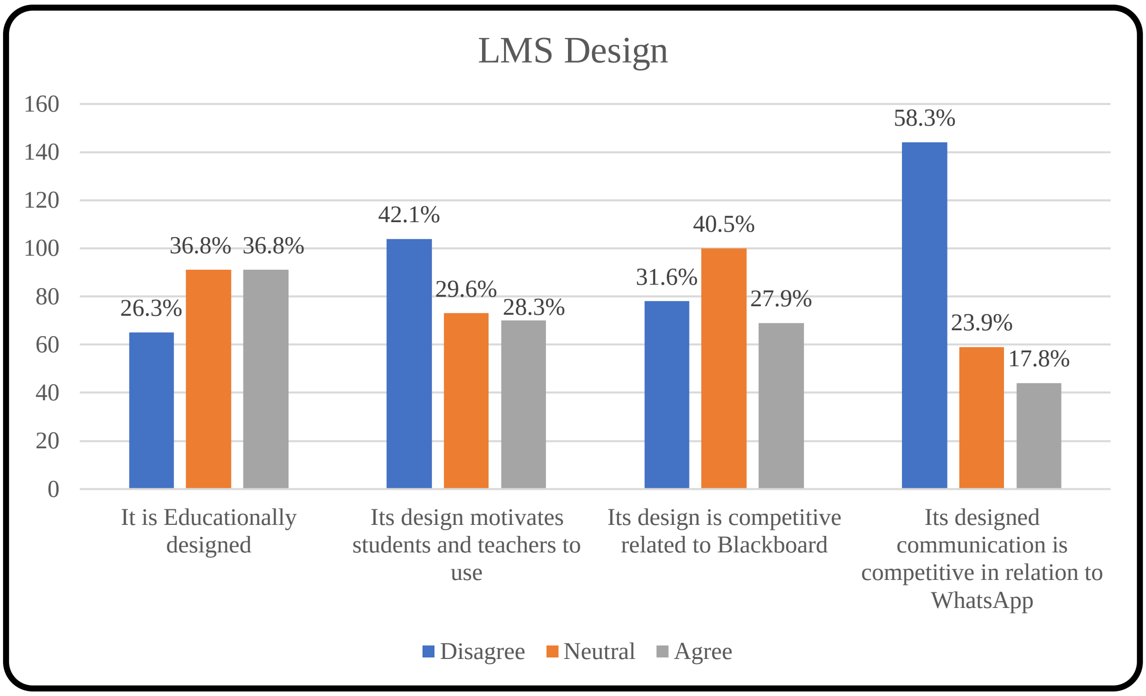

Figure 60. LMS design score percentages

The LMS design had a classic layout: ‘it is a normal page, questions and answers’ (P07). Some of the participants stated that ‘the LMS is static [not user-friendly]’ (P03). Hence it does not motivate and attract the users, an objective mentioned in Phase One: ‘It has to be attractive; this is what we want … it has to be educational’ (P03). Participants in Phase Two tended to agree that the LMS was educationally designed, with only 26.3% of the participants disagreeing. The motivational design element was particularly found to be lacking in the LMS, with the greatest number of participants 42.1%, disagreeing that the design was motivational. To better understand its design, participants in Phase One compared the LMS with similar software, such as Blackboard, in relation to its general layout and design. They also compared it to WhatsApp, specifically discussing online communication and how they preferred to use WhatsApp rather than the LMS. As one of the participants stated: ‘All classes have a WhatsApp group; that competes with us [using the LMS]. When I want to share something … I share it through [WhatsApp]’ (P04). The findings in Phase Two were mostly neutral when LMS design was compared to Blackboard (40.5%), but when compared with WhatsApp the majority of the participants, 58.3%, disagreed that the LMS was at a similar competitive level.

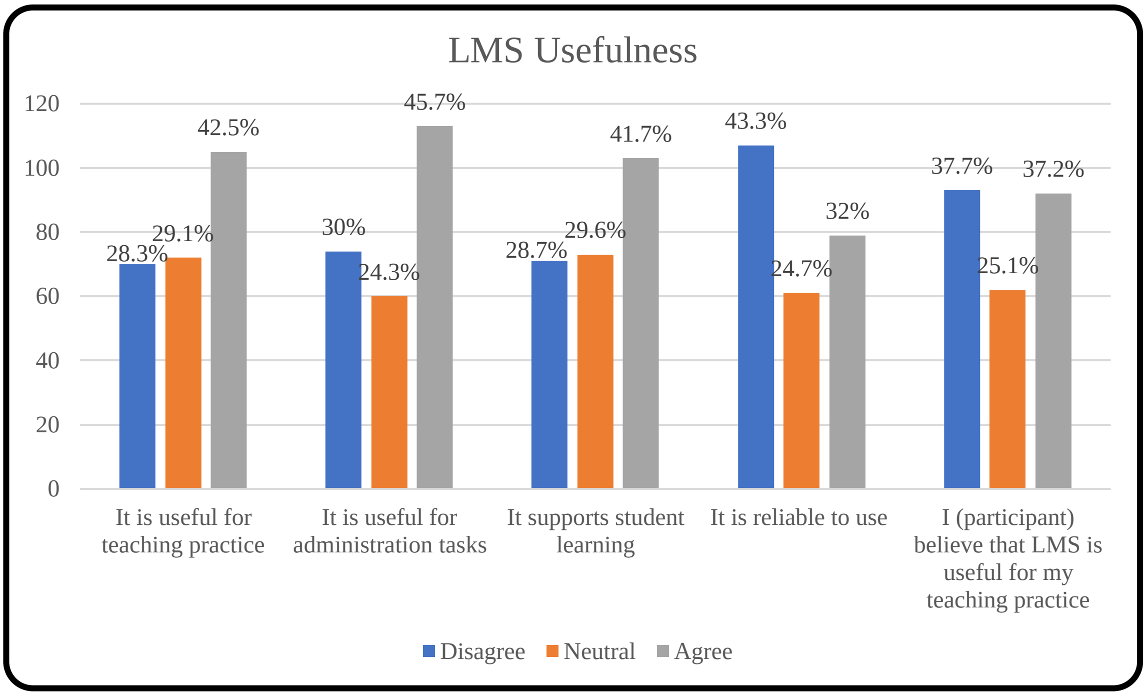

Figure 61. LMS usefulness score percentages

LMS usefulness was found in Phase One to be a potential factor affecting teachers' LMS integration. As one of the participants stated, '[The LMS] is very important … it is not a luxury anymore' (P04). Other participants considered it an excellent learning system. Participants in Phase Two confirmed this, with most of them (42.5%) agreeing that is useful for teaching practice (see Figure 61). They also agreed about its usefulness for students' learning (41.7%), which supported LMS-specific teaching and learning practices. As one of the participants stated, 'You can send [students] materials that are more related to their level' (P09). In addition, 45.7% of the participants agreed that the LMS is useful for administrative tasks.

However, an important element that was found in Phase One to potentially affect the LMS's usefulness was its reliability. One of the interview participants stated that 'they [MoEd] have paid a lot … but I don't know why they didn't succeed? … As soon as a problem occurs twice or three times, I will get bored and leave it [the LMS]' (P05). Participants in Phase Two have confirmed that reliability issues are a problem that affects the LMS's usefulness, with 43.3% having experienced such issues. Phase Two participants were asked specifically about their personal experience with the LMS's usefulness for their teaching practice, and on this question they were nearly equally distributed, with 37.7% disagreeing that it was useful and 37.2% agreeing. Overall, LMS system design and usefulness was confirmed to be an important factor influencing teachers' LMS integration.

5- Tablets (T)

The findings from Phase One indicated that the introduction of tablets into teaching and learning had a major effect on teachers' practice. Phase Two further explored the tablet and its effect on teaching practice, confirming its positive influence. Table 76 below the relationship between this factor and the Phase One theme.

Table 76. T and Phase One relationship table

Theme	Item number	Title
2	5.1.3.3	Major effect

Figure 62 presents the participants' answers to the survey questions relevant to this factor.

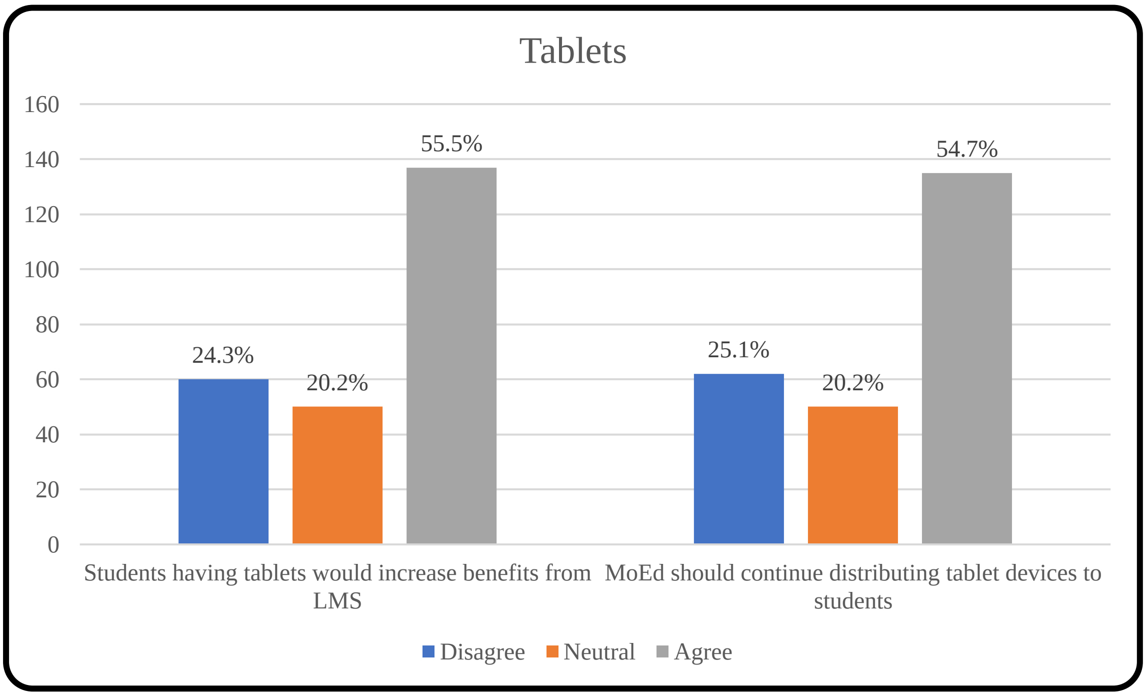

Figure 62. Tablets score percentages

Tablet devices were found in Phase One to be important technological tools that support LMS integration into teaching and learning practices. 'We used to have tablets in the beginning. It was very good, and we used them a lot because they were useful' (P08). Participants recognised the benefits of having tablets available for students' use, in addition to the awareness that the devices could bring to the classroom in terms of distraction. Participants in Phase Two confirmed the importance of having tablet devices for successful LMS integration (55.5% agreement). The majority (54.7%) also agreed that the MoEd should continue distributing tablet devices to students.

6- MoEd Support (MEdS)

The findings from Phase One indicated that the MoEd supported LMS integration. Phase Two further explored MoEd support and its effect on teaching practice, confirming its positive influence. Table 77 below shows the relationships between this factor and Phase One themes.

Table 77. MEdS and Phase One relationship table

Theme	Item number	Title
1	5.1.2.3	Teaching system
1	5.1.2.4	Learning system
2	5.1.3.3	Major effect

Figure 63 presents participants' answers to the survey questions relevant to this factor.

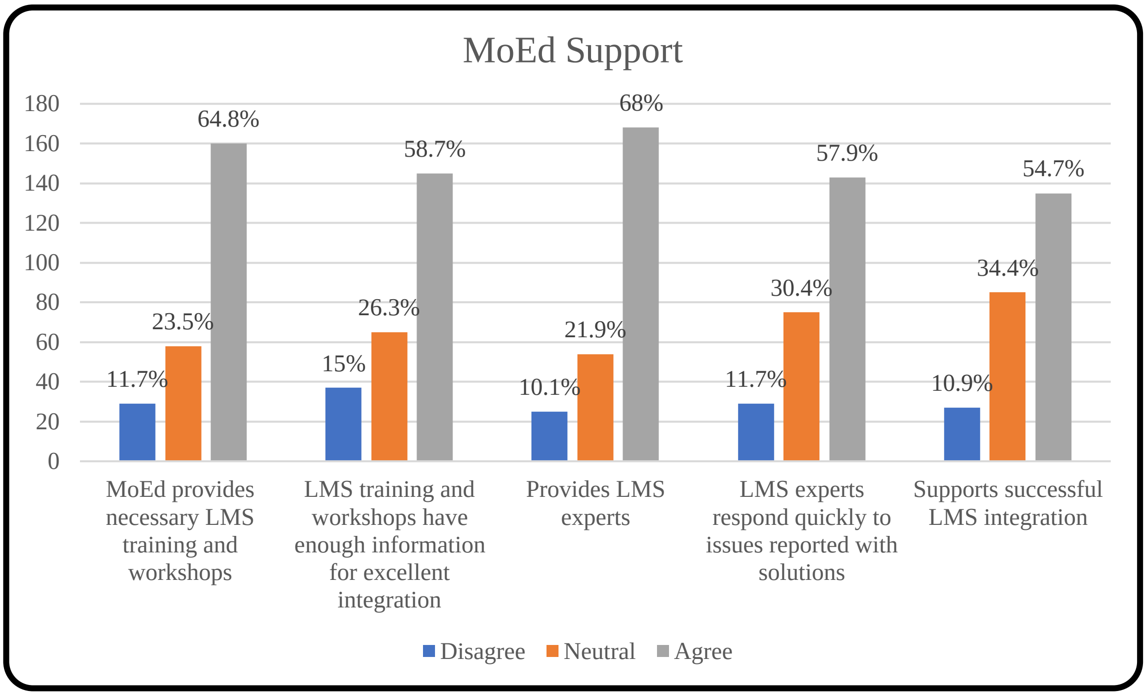

Figure 63. MoEd support score percentages

The results of Phase One indicated that MoEd support was a potential factor affecting teachers' LMS integration. The MoEd has a standard of IT skill that all teachers should reach known as the ICDL (Information Computer Driving Licence). The MoEd also provides specific LMS training for teachers. One of the participants in Phase One stated that 'sometimes the [training] course is open to everyone. Sometimes this is beneficial and sometimes it is less beneficial' (P07). The Phase Two results confirmed that the MoEd provides the necessary training courses (64.8% agreeing). The depth of information and knowledge covered in these training courses was also found to be at the appropriate level for excellent LMS integration (58.7% agreeing). Another Phase One finding was that the MoEd has a support team of LMS experts that can be contacted with any concerns around LMS integration. This finding was confirmed by the majority (68%) of Phase Two participants. The speed of this team's responses with recommendations and solutions were also agreed to be good, (57.9% agreeing). The majority of Phase Two participants agreed that the MoEd provides the necessary support for successful LMS integration (54.7%).

7- **LMS Functions (LMS PEU)**

The findings of Phase One indicated that the functions of the LMS constitute a potential influencing factor in successful LMS integration. Phase Two further explored the LMSF factor and its effect on teaching practice, confirming its positive influence. Table 78 below shows the relationship between the LMSF factor and the Phase One theme.

Table 78. LMSF and Phase One relationship table

Theme	Item number	Title
1	5.1.2.3	Teaching system
2	5.1.3.2	Minor effect

Figure 64 presents participants' answers to the survey questions relevant to this factor.

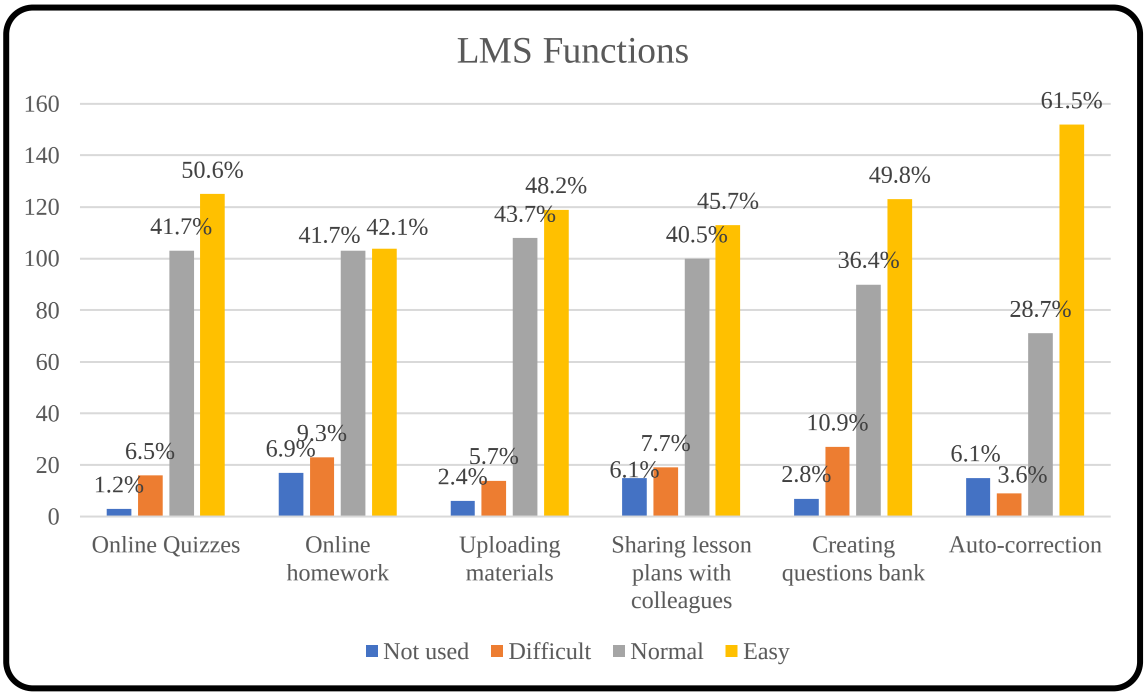

Figure 64. LMS PEU score percentages

LMS functions were found in phase one to have some difficulties that affected the system's ease of use. One of the participants stated that 'I can't upload something [diagrams] like this' (P01), while another participant had a different experience with diagrams, stating that 'before it wasn't possible, [now] everything is OK' (P06). To better understand this factor, participants in Phase Two were asked about the ease of use of most of the LMS functions discussed by participants in Phase One. Overall, the results of Phase Two showed that most participants did not find any of the LMS functions to be difficult to use. The easiest LMS function was auto-correction, with 61.5% indicating that it was easy to use, and the least easy function was online homework, with 42.1.% indicating that it was easy to use. Therefore, in general, the LMS functions were found to be easy to use.

8- Personal Factors (PF)

The findings from Phase One indicated that PF was a potentially influential factor in teachers' successful LMS integration. Phase Two further explored PF and its effect on teaching practice, confirming its positive influence. Table 79 below shows the relationship between the PF factor and Phase One findings.

Table 79. PF and Phase One relationship table

Theme	Item number	Title
1	5.1.2.4	Learning system
Self-efficacy	This was not officially reported as a Phase One theme. High confidence was reported by all of the participants in Phase One, except for one participant who became more confident with time and practice.	

Figure 65 presents the responses of participants to the survey questions relevant to this factor.

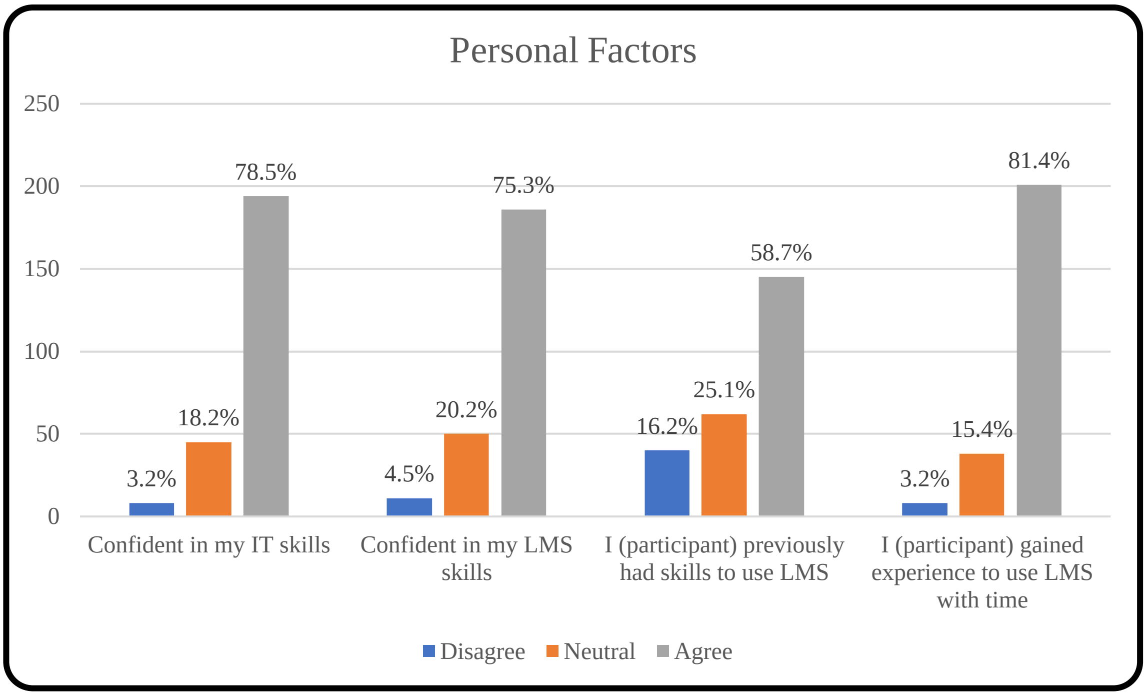

Figure 65. Personal factors score percentages

Personal factors were found in Phase One to be one of the potential factors affecting teachers' LMS integration. Some of the participants in Phase One stated that they had no issues with using computers and other technologies as they had already received their ICDL. Most expressed confidence in their IT and LMS skills. It was also found that with time, teachers gained more experience in using the LMS. In Phase Two, the majority of the participants, 78.5%, were confident in their IT skills, and 75.3% were confident in their LMS skills. The majority of the participants, 58.7%, indicated that they had possessed the skills necessary to use the LMS before LMS integration. In Phase One, one of the participants stated that the only difficulty in using the LMS was due to the many functions that have to be learned and used, but with time, teachers develop their LMS skills and become more experienced. Phase Two findings confirmed this, with 81.4% of the participants agreeing that they had gained experience in LMS use over time.

9- School Administration (SA)

The findings from Phase One indicated that SA is a potentially influential factor in teachers' successful LMS integration. Phase Two findings further explored the SA factor and its effect on teaching practice, confirming its positive influence. Table 80 below shows the relationship between this factor and Phase One themes.

Table 80. SA and Phase One relationship table

Theme	Item number	Title
1	5.1.2.3	Teaching system
1	5.1.2.4	Learning system
2	5.1.3.3	Major effect

Figure 66 presents participants' answers to the survey questions relevant to this factor.

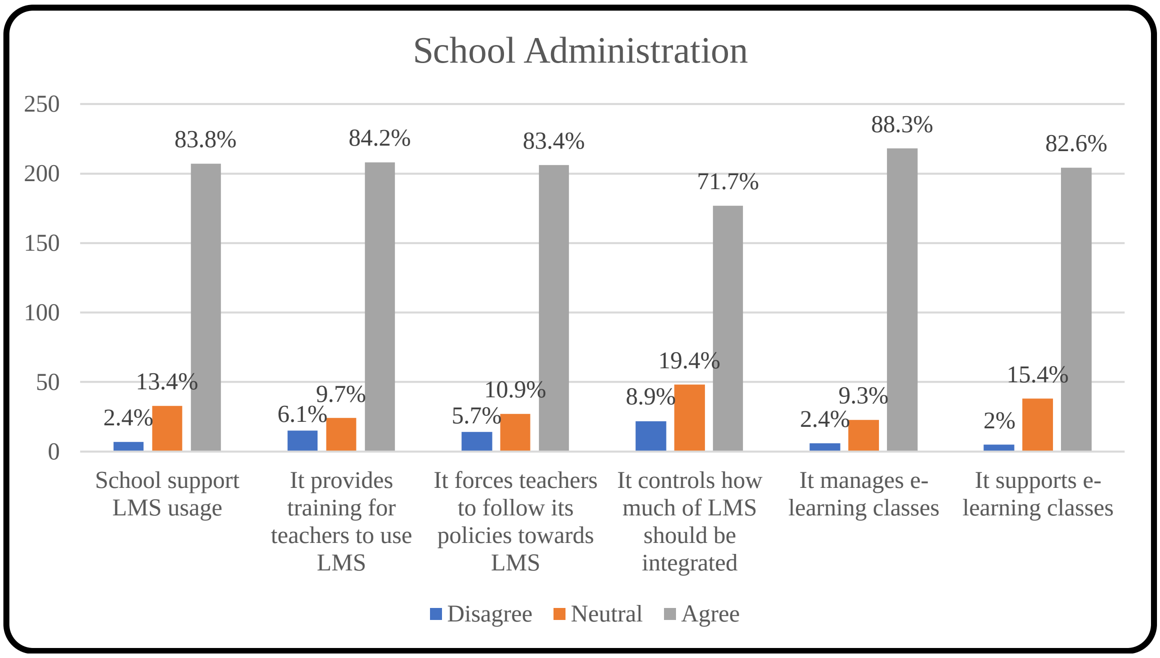

Figure 66. School administration score percentages

The school administration was found in Phase One to be one of the factors potentially influencing teachers' LMS integration. Phase Two findings confirmed this, with 83.8% of respondents agreeing that their school administration supported LMS integration. The school administration was also found to force teachers to follow school policies regarding LMS integration (83.4%). In addition, 71.7% of the participants agreed that the school administration controlled how much the LMS should be used. It was also confirmed in Phase Two that school administrations provide in-house training for teachers on LMS use.

It was found in Phase One that the school administration controls and manages IT lab classes. As some of the participants indicated, the school administration decides when teachers will have IT lab classes and for which class. The findings of Phase Two confirmed this pattern, with 88.3% of respondents agreeing.

5.5) Summary

This chapter has presented the analysis of both phases of the research, starting with a thematic analysis of the qualitative interview data collected. Two themes emerged from the Phase One data that were then used to develop the indicators used to create the data collection tool for the second phase. Following this, the analysis of data collected during the second phase was presented. Data were filtered and cleansed, removing incomplete responses and responses with missing data. Factor analysis was then employed, resulting in the identification of nine factors representing the 61 original variables. The descriptive statistics of mean and standard deviation scores were also reported and important limiting factors were identified based on the descriptive statistical analysis. T-tests were then used to compare different demographic groups on several important factors. Finally, the findings of both phases were combined in an overview section. The following chapter discusses the findings in relation to the literature and identifies unique insights that have arisen from this study.

Chapter 6 – Discussion

6.1) Introduction

This study has examined how a range of factors influence teachers' LMS integration practices in secondary stage schools in Qatar, contributing to the broader field of teacher behaviour and specifically teachers' integration of e-learning systems. This chapter will discuss the most important findings relating to research questions 2 and 3. For a discussion of research question 1, please see section 5.2.4.

Research question 2 was formulated as follows: *How do these factors affect teachers' teaching and learning practices in relation to Learning Management System integration?* The answer to this question was determined based on a combination of the findings of both phases, as described in the previous chapter. Briefly, a total of nine factors were identified and categorised as either limiting or supporting factors. The limiting factors were MoEd policies (MEdP), students and parents (SP), IT lab classes (ITL) and LMS design and usefulness (LMSS). Supporting factors were tablets (T), MoEd support (MEdS), LMS functions (LMS PEU), personal factors (PF) and school administration (SA).

Research question 3 was formulated as follows: *Which factors are most important in teachers' successful integration of the Learning Management System in Qatar secondary schools?* Research question 3 contained several sub-questions that focused on the influence of participants' demographic information on the important factors identified. Those demographic features were *years of experience, subjects taught, gender and age*. The important factors explored in relation to these demographic features were the factors that had been previously identified as limiting. To complete the picture of factors affecting teachers' LMS integration, the supporting factors identified are also discussed.

A new LMS framework was created and is presented at the end of this chapter. This is designed to help us understand the complexity of the interactional loop of factors influencing teachers' LMS integration. The original theoretical and methodological contributions of this research to knowledge are presented after the discussion section.

6.2) Limiting Factors

The following four factors were found to be limiting (negatively influencing) teachers' successful LMS integration: MoEd policies, students and parents, IT lab classes and LMS design and usefulness. The following sections will discuss these findings in relation to the existing literature.

6.2.1) MoEd Policies

It was found in this study that MoEd policies were one of the factors hindering teachers' integration of the LMS into their teaching. The purpose of the MoEd's LMS policy is to explain and guide how and when the LMS should be used by stakeholders (teachers, students, school administrations, MoEd's LMS-related staff and parents); in other words, the laws and regulations governing LMS usage (Oxford, 2020; Viennet & Pont, 2017). Government policy has been recognised in the literature as an important guide and supporting factor in successful technology integration (Bianchi et al., 2020; Livingstone, 2012; Williamson et al., 2019). If there were no policies, the purposes and methods of technology integration would be unclear to teachers and other stakeholders. In his research into student teachers' learning and perceptions when using tablet applications for teaching, Browne (2015) found that participants required the school administration to develop policies and guidelines to encourage and support teachers' use of such technologies.

However, in this study it was found that the MoEd's policies, instead of motivating teachers to increase their LMS integration into their teaching, demotivated teachers by imposing additional, burdensome administrative tasks. These tasks included archiving their own LMS usage records and preparing two versions of lesson plans, one in hard copy and another as a soft electronic copy to be uploaded to the LMS. In addition, teachers in this study complained that they were required to use too many LMS functions, some of which (such as sharing lesson plans with students) were not judged to be beneficial to students' learning. As the participants in this study explained, teachers' lesson plans are not structured in a way that helps students to understand and learn from them. Instead, they are used as the name suggests, as a plan for delivering the lesson to the students that includes goals, sub-goals, strategies to be used and further notes depending on the specific subject and topic. The additional tasks consumed teachers' time and required extra effort, which overloaded teachers and hindered their integration of the LMS into teaching practice.

This finding about policies overloading teachers with more administrative tasks is consistent with other literature, such as the study of Awang et al. (2011) on knowledge management in a Malaysian smart schools project (see section 2.7.2). These researchers found that teachers teaching in smart schools and using knowledge management had a higher workload than teachers in normal schools due to the implementation of new knowledge management policies, which demanded effort and time. While the aim of having such policies is to support and encourage the integration of technology into teaching, administering bodies should be careful that the additional policies do not overload teachers.

In contrast to the findings of this research, Chen (2008) explored the relationship between teachers' pedagogical beliefs and their technology integration in Taiwan and found that education policies encouraged teachers to integrate technologies into their instructional practice. This difference could be due to different technologies used, as some technologies are more complex than others (for example, the LMS is more complex than a data projector), or due to technology evolution since 2008. Similarly, Muralidharan et al. (2019) conducted research on the impact of a personalised technology-aided after-school instruction programme in India and found that having good technological policies and sound implementation improves pedagogy.

Another recent study that found a positive influence of policies on technology integration but with a different targeted sample was that of Bianchi et al. (2020). This study, conducted in China, found that over time policy positively influenced students' achievements. These researchers noted that after ten years of exposure to technological policies, students are staying at school for longer periods compared to students who had not been exposed to technological policies. Therefore, policies have mostly been found to positively influence technology integration, however this study has found the opposite. In Qatar, policies appear to have been an issue since at least 2011 (Nasser et al., 2011). At the time, these issues were believed to be related to the infancy of the LMS project; however, this study shows that they continue to exist even after the project has matured. The long-term nature of this problem was also found by Awang et al. (2011): these teachers had started using knowledge management in 1997 and the policy issues in terms of overloading teachers were still ongoing.

One of the unique aspects of this research was the MoEd's specific interest in LMS integration. This was found to be confusing and vague to some of the participants. Integrating such learning management systems can be done for managerial purposes, educational purposes or both. From the participants' point of view, some were expecting it to be more oriented towards educational purposes. Others questioned the MoEd's actual purpose in LMS integration, as they felt it was not educationally oriented. This led teachers to have doubts and potential misconceptions regarding the MoEd's interest in LMS integration.

This probable misconception could be due to a lack of clarity in the educational technology integration vision shared by the MoEd with other stakeholders. The influence of a technology integration vision is supported by Blackwell et al. (2014), who researched factors influencing digital technology in the USA. They found that having a strong school technology vision influences teachers' confidence and promotes technology usage. Ahmad and Hamad (2020) recommended that more teachers utilise technology to better implement the school's pedagogical vision. Building a positive relationship between the school's technology vision and teachers' attitudes towards LMS usage would promote successful LMS integration.

However, in this study and in Qatar specifically, the extent of each school's technology vision seemed to be clear to teachers and supported by the school administration (discussed later within the chapter), but the MoEd's technology vision was less clear. Participants stated that they were overloaded with compulsory administrative tasks through the LMS, which consumed their time and distracted their focus from covering the curriculum. For example, they mentioned the mandatory minimum LMS usage policy, whereby teachers are required to upload at least one online homework task and a quiz uploaded through the LMS every week. The task, however, was not mandatory for students to complete. This inconsistency added to teachers' doubts about the MoEd's interest in LMS integration, and some participants raised it as an issue and queried the lack of mandatory online tests. Participants also compared the policy requirements to the marks awarded for tasks completed by the students using the LMS. They noted that there were very few marks allocated for the completion of online tasks.

This inconsistency between MoEd policy and allotted marks was noted by 60.3% of the survey participants. The discrepancy might be due to MoEd's policymakers not having included enough experienced, practising teachers, parents and administrators in the development of their technology integration policies and vision. This inclusion of other stakeholders has been suggested in much of the technology-related educational policymaking literature (e.g., Hadad et al., 2020; del Carmen Ramírez-Rueda et al., 2021; Viennet & Pont, 2017; Zagami et al., 2018), Another explanation for the disjunction could be the usage of policies imported from another country with different individual and organisational cultures and visions, and thus ill-adapted to the Qatari systems and culture.

Indeed, the literature suggests that country-specific policies may need to be in place (Abdel-Maksoud et al., 2018; Abdul Hamid et al., 2020). For example, in China, there are some differences in conditions between schools in large, developed cities and schools in rural areas (Bianchi et al., 2020), hence there are different considerations in creating and implementing technology integration policies in these areas. Tarhini et al. (2015) made a similar finding when they examined the impact of social, organisational and individual factors on educational technology acceptance among British and Lebanese university students. They found statistically significant differences between the two groups of students in terms of perceived ease of use, social norms, perceived quality of work life, facilitating conditions, computer self-efficacy and actual usage. Hence, they suggested that individual, social and organisational factors should be considered before importing an external policy, as those factors were found to be important in explaining students' behavioural attitudes towards e-learning.

Thus, the MoEd's policies form a critical factor that influences teachers' LMS integration. The literature discussed above supports the explanation of Taylor and Todd (1995) in their theoretical model of DTPB about the influence of subjective norms on both intentions and technology usage. The MoEd's policies have the potential to influence both pedagogical and performative LMS integration by teachers. The existing policies were found to primarily encourage performative LMS usage. This underscores the importance of sharing a clearer

MoEd vision regarding LMS integration with stakeholders, especially with teachers, as teachers are often the first ones blamed if LMS integration is not successful. This recommendation may help to resolve some of the ongoing issues related to LMS policies.

6.2.2) Students and Parents

Students and parents were found to be a significant factor influencing teachers' LMS integration. This factor was found to limit teachers' integration of LMS into their practice, with most of the participants agreeing that students and parents hindered their LMS integration. This hindrance is discussed in relation to sub-factors related to students and parents individually, starting with parents.

6.2.2.1) Parents

The social contribution of parents to their children's development and technology integration has been shown to be a significant factor in the successful integration of LMS by teachers (del Carmen Ramírez-Rueda et al., 2021; Ertmer et al., 2001; Keengwe et al., 2014; Zhu et al., 2018). Their influence is discussed according to the following categorisation: beliefs, support and involvement in the educational practices.

6.2.2.1.1) Parents' Beliefs

Parents' beliefs about the LMS's usefulness for their children's learning had a hindering influence on teachers' practice. In agreement with this finding, Chien et al. (2014) examined science teachers' beliefs regarding technology-based assessment in Taiwan and found that parents' beliefs are a constraining factor in regard to teachers' use of technology-based assessment in schools. Most of the participants in this study believed that parents did not see the usefulness of the LMS's for their children. They reported that parents believed the LMS wasted their children's time and had the potential to expose them to inappropriate internet content. Similar concerns were found in Zhu et al.'s (2018) research, which focused on parents' and students' attitudes regarding tablet integration at schools in China: those parents' concerns about tablet usage were mostly associated with video game addiction and distraction from learning. Hence, some parents might not allow their children to access a computer at home, or may have a control such as a time limit for children's computer usage; other parents might not be able to afford to buy a computer for their children to use at home due to financial problems. Different parenting support decisions could be related to the literature, for example to the work on parenting style (see section 3.2.1). The following section discusses parents' support in more detail.

6.2.2.1.2) Parents' Support

Parents were found to support their children's learning both objectively and subjectively. Their objective support was related to the provision of technological devices and their subjective support was related to their beliefs towards LMS and their parenting style. The provision of technological devices such as computers at home was found to be important to allow students to benefit more from the LMS. Being unable to provide those technological devices imposes some difficulties on students in completing their online homework. In their research on technology integration assisting teachers in controlling the classroom and how this impacted students' achievement, Ahmad and Hamad (2020) interviewed teachers and found that students who do not have access to a computer at home had difficulties with learning.

The unavailability of technological devices at home may be caused by local or national issues. Local issues are related to parents' financial situation: parents with sufficient resources can afford to buy technological devices and related tools for their children to continue learning at home, while parents with fewer resources cannot afford to buy the same tools. On a national level, this is also related to the degree of development of a country and the average income per capita of the country or a specific area in the country. For example, Ashrafi et al. (2020) indicated that rural areas and small towns with modest infrastructure may have limited internet access as their main barrier in benefiting from the LMS. Bond (2019), who conducted research in a rural South Australian government school focusing on flipped learning*, found that 15 of the 16 parents who participated indicated that the availability of internet and a technological device at home would allow their children to access online learning. Therefore, other factors such as culture, economic resources and country development influence how parents support their children's learning. It cannot be taken for granted that all parents are able to provide the necessary requirements for their children to engage with online learning at home.

Even in Qatar, one of the top countries in the world in terms of GDP per capita, there are some families with financial difficulties that cannot provide basic learning tools for their children. There are specific known institutions that support such families with the provision of basic tools for learning, such as Qatar Charity (Qatar-Charity, 2021). Additionally, and more specifically during the COVID-19 pandemic, all government schools in Qatar transformed their teaching practice into a fully online learning environment, which has disadvantaged low-income families that cannot afford internet access and appropriate technological devices and tools for learning. The MoEd in Qatar provided all of the students in this situation with an internet modem and an appropriate technological device to access online learning (MoEd, 2020). Therefore, parents' financial issues as a cause for parents' lack of support in providing the necessary technological tools for their children's LMS integration at home can be assumed to be resolved in Qatar.

* A flipped learning approach aims to free some of the classroom teaching time to allow for more activities and collaborative learning by requesting that students complete work at home that used to be traditionally taught in class, such as the teacher's explanation (Bond, 2019).

However, the reasons for parents' lack of support for LMS integration at home have not been fully resolved. Qatari parents' lack of subjective support has existed since the beginning of the LMS project in Qatar. Nasser et al. (2011) found, in their K-net research with students at the preparatory stage in Qatar schools, that parents' lack of belief in the LMS's usefulness for their children affected its usage by other stakeholders (teachers and students). This study found that not only was students' LMS integration affected by parents' lack of belief in the LMS's usefulness, teachers' LMS integration was also affected. The continuous influence that these stakeholders' beliefs have on each other is very important to consider when implementing an LMS.

6.2.2.1.3) Parents' Involvement

The involvement of parents in educational practice was found to be useful for teachers' LMS integration and students' learning. Some of the participants in this research wished that parents were more engaged with their children's learning and wanted parents to critique their practices more, stating that this would influence them to do better. Hadad et al. (2020) examined why parents resisted the educational use of smartphones at schools and found that the school administration needed to involve parents more. Parents' involvement was also investigated by Tsuei and Hsu (2019), who focused on parents' acceptance of participation in the integration of technology into children's instruction. They found that parents who had positive beliefs about technology integration and communicated more with teachers were more supportive of their children's technological integration and learning.

A community of practice is a good example of strong parental involvement. The inclusion of parents in communities of practice, as discussed earlier in relation to the MoEd's policies, would allow a better explanation of the importance and benefits of LMS integration to parents, which in turn would help to improve their beliefs about the LMS's usefulness and increase their support for LMS integration. Zagami et al. (2018) examined challenges concerning design, implementation and evaluation of national policies and recommended that parents and other stakeholders be included in communities of policymaking to create more thoughtful digital educational policies. The involvement of parents in educational communities of practice has been shown to be beneficial (Bond, 2019). Parents who were involved in a community of practice called a 'governing council' were aware of the school administration's approach and plan in technology integration and were found to be more supportive of the idea (Bond, 2019).

Hence, subjective norms among parents were found to be a factor that influenced teachers' LMS integration. This finding relates to the subjective norm factor in the DTPB framework (Taylor & Todd, 1995), which is applicable in addressing the complexity of the educational field, especially in relation to parents. It also underscores the importance of parental support in constructivist learning approaches. If parents guide their children at home in collaboration with teachers at school, students are more in control of their learning through LMS both in and out of the school. The involvement of parents in communities of practice would help teachers' pedagogical LMS integration.

6.2.2.2) Students

The influence of students on teachers' LMS integration has been found to be important (Abdul Hamid et al., 2020; Adzharuddin & Ling, 2013; Dündar & Akçayır, 2014; Klobas & McGill, 2010; Liu et al., 2010; Nasser et al., 2011). Students' influence is discussed according to the following categories: students' beliefs, students' LMS usage, students' interest and motivation, and students and IT lab classes.

6.2.2.2.1) Students' Beliefs

Students' beliefs about the usefulness of the LMS for their learning had a hindering role towards teachers' integration of the LMS into their practice, with participants indicating that many of the students did not believe that the LMS enhanced their learning. The importance of students' beliefs for teachers' successful LMS integration is supported in the literature. For example, Adzharuddin and Ling (2013) reviewed literature related to students' experiences in higher education with using the LMS. They recognised that students' beliefs about the LMS's usefulness are important to understand for better LMS implementation. In addition, Dündar and Akçayır (2014) studied 9th-grade students' attitudes and opinions about implementing tablet PCs in school in Ankara, Turkey, and found that student participants' positive attitudes towards integrating tablet PCs in school were mainly due to their beliefs about the technology's usefulness. Similar results were also found in more recent research (Ashrafi et al., 2020; Ozkan et al., 2020; Yuen et al., 2019). This study confirms those findings and adds to them based on teachers' perspectives and experiences.

Teacher participants in this study reported that students believed the use of LMS for learning was a waste of their time. This is likely to be related to the low mark value allotted to LMS quizzes and homework completed by students. In addition to this, the examination format for students remains pen and paper and is not related to the LMS. Further discussion of findings regarding student LMS usage, interest and motivation to use the LMS appear in the following sections.

6.2.2.2.2) LMS Usage by Students

In this study, most of the participants indicated that students who do not use the LMS at home engage with it more at school. This is most likely due to the availability of teachers at school and their support for and encouragement of students' LMS use, in addition to the availability of IT lab classes, in which teachers take students to the computer laboratory and run an e-learning session using computers in which they access the LMS. Each student logs into the LMS and starts interacting with the materials online based on the lesson planned, reflecting a student-centred constructivist approach. Ozkan et al. (2020) explored predictors of students' LMS acceptance in a postsecondary vocational school and found that the support provided by instructors to students in terms of explaining what LMS is and how to use it, as well as providing them with the opportunity to use it, was very important in encouraging the students to accept the LMS. In Qatar, Nasser et al. (2011) found that students complained that teachers provided little support for their LMS integration. The reason for this difference could be due to the infancy of the LMS project in Qatar at the time of the study, which might have introduced new challenges and difficulties for teachers when integrating the LMS.

It was found in this study that some teachers did not want to waste their teaching time on teaching students the skills to use the LMS. This was especially the case for students at secondary level, who are expected to be more familiar with the LMS. The importance of teaching students about the system and how to benefit most from it was recognised by the participants, who recommended that this be taught to students at earlier stages, especially in elementary schools. This would make students more flexible and knowledgeable about the LMS and would equip them with the expected skills and experience before they progress to secondary school.

Participants' point of view in relation to teaching students the skills to use the LMS was different to what has been recommended in the literature. Abdul Hamid et al. (2020) explored factors that influenced students' acceptance of LMS, highlighting the importance of involving teachers in supporting students to learn about the integrated system at the beginning of the semester. This was similarly recommended by Yuen et al. (2019). One of the explanations is that stakeholders (policymakers, school administration, students and parents) expect teachers to be able to do everything and be responsible for all aspects of LMS integration.

Furthermore, in relation to this research context, secondary students are expected to be at the age of taking responsibility for their learning. If a student lacks skills or is unaware of certain LMS functions, he or she is expected to be proactive and seek advice from their peers or teachers as needed. This teaching environment supports a constructivist approach, as it focuses on guiding the students to take control of their own learning process.

6.2.2.2.3) Students' Interest and Motivation

In general, the teachers in this study did not respond favourably regarding students' interest in using the LMS. A very large proportion of the participants, 70.9%, indicated that Year 12 students were not interested in using the LMS, while 52.6% of the participants indicated that Year 10 and 11 students were not interested in using the LMS. This difference between Year 12 students and Years 10 and 11 students was most likely due to the marks allotted for LMS use by students. Year 10 and 11 students are marked for using the LMS via online homework and quizzes, while Year 12 students' LMS usage does not count for any marks. The lack of interest by students in Years 10 and 11 can be explained by the very low percentage of marks awarded for its use. Participants indicated that in a full academic year, LMS-based work is worth only 0.3 marks out of 100. To the best of the author's knowledge, this was not previously a finding in any of the LMS-related literature. It could be due to the uniqueness of the context of the LMS integration: participants reported that students receive the marks if they submit the online homework, while not necessarily having answered all of the questions correctly, and for the online quizzes, they count only the best five out of ten quizzes taken online and in-class using pen and paper. All of those practice supports LMS performative usages rather than pedagogical. Nasser et al. (2011) recommended that rewards be offered to teachers and students based on their LMS integration, but to date this has not materialised. Students' interest in using LMS has also been found to be directly influenced by system design factors (Abdul Hamid et al., 2020). This is similar to what affected teachers' interest in this study, as discussed later in the chapter.

Participants in this study reported that their students were not motivated to use the LMS. Unmotivated students demotivate teachers, hence teachers tend to use the LMS less frequently. These teachers were disappointed that students did not interact with online homework and quizzes. This finding is the reverse of what was found in the literature, where teachers' use of technology in itself was a motivational factor in students' technology usage and their learning (del Carmen Ramírez-Rueda et al., 2021; Ottenbreit-Leftwich et al. 2010). This difference in findings could be due to the type and version of technology used or the context in which it was integrated, or simply because students got bored with the LMS. Erkan's (2019) research on the impact of technology on student-teacher communication and interaction, in which he focused on how to improve students' learning, found that students could get bored with a technology. He found that simple technological changes, such as installing sound insulation, increased students' motivation to use technology. Therefore, a change in the design of the LMS and its layout could have a motivational impact on students. That in return would motivate teachers to engage in more pedagogical LMS use. As a result, a theoretical loop of influence could be drawn between number of marks awarded, LMS performative use and LMS pedagogical use (see figure 67 below).

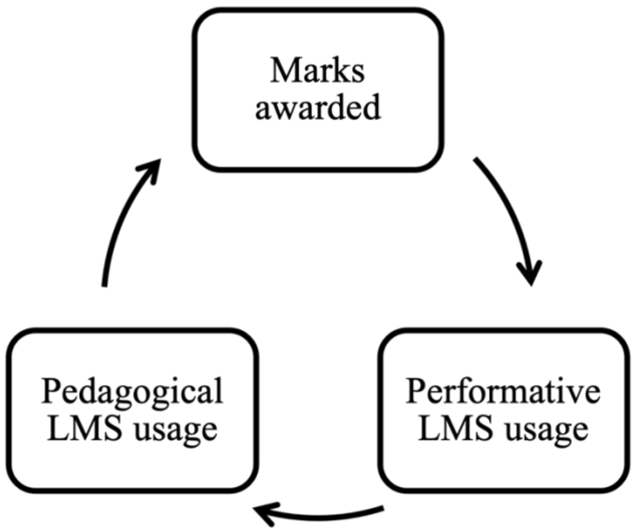

Figure 67. Marks awarded, performative and pedagogical LMS usages loop of influence

Due to marks awarded for students LMS usages, they are expected to engage more with the system mostly performatively such as doing their online homework and quizzes. This engagement would motivate teachers and promote pedagogical LMS usages which strengthen importance of having more marks awarded for LMS usages. As for policy makers (MoEd), increasing number of marks awarded for students LMS usage would increase system usages in both ways performatively and pedagogically, which would achieve a more successful LMS integration by stakeholders, hence benefiting the educational system. In addition, parents could also support LMS integration more when they see the active engagement of their children with the LMS and its influence on their learning.

6.2.2.2.4) IT Lab Classes and Students

The last sub-factor in this factor is the IT lab classes. Participants were nearly equally distributed when asked whether the IT lab classes motivated students to use the LMS. This could be due to the different ways in which teachers benefit from these classes. It was found that some teachers use them to revise previously taught material, while others introduce new topics and yet others continue with previous topics but with new knowledge and strategies. Other reasons could be also related to the availability of teacher support in class and with the LMS and the low marks awarded for students' LMS use.

Many participants did report that the IT lab classes were useful for students' learning due to the opportunities they provide for collaborative work with the LMS and the change in class environment, which also encourages students' learning. This finding is supported by the literature. For example, in her research on African American high school students' perspectives on culturally relevant mathematics pedagogy in the USA, Hubert (2013) found that the learning environment affected students' learning. Her student participants tended to be more interested and comfortable learning in home-like environments, and reported that the use of technologies enhanced their learning of mathematics. A more recent study by

Bianchi et al. (2020) examined the effect of computer-assisted learning (CAL) on students' long-term development in China. They found that the availability of computer rooms helped students to engage with their teachers via computer and to benefit from the use of interactive quizzes and exercises based on the CAL lectures. They also stated that computer rooms could benefit teaching and learning experiences in STEM (science, technology, engineering and mathematics) subjects in addition to literary subjects. The teachers interviewed in this study used IT lab classes to engage students with the LMS and also had access to a virtual physics lab (PhET). Through PhET, students were able to virtually test and calculate different aspects and variables related to physics laws. Therefore, IT lab classes could be beneficial not only in fostering the use of the LMS, but also in using pedagogical strategies and different resources for student learning.

Subjective norms relating to students are an important factor influencing teachers' LMS integration. The participants in this study indicated that if students were motivated to engage with the LMS, they in turn would be motivated to better integrate the LMS pedagogically. Students are critical in LMS integration according to constructivist approaches, as they are expected to be in control of their own learning.

6.2.3) IT Lab Classes

The IT lab class was one of the specific initiatives that influenced LMS integration. It was introduced to support teachers' and students' LMS integration. However, in this study, these classes were found to be limiting to teachers' practice. Most of the participants believed that these classes wasted their teaching time. One of the possible reasons for this was how participants used the lab classes. Many of them used it to force students to use the LMS so that they could record in their files that there had been some interaction with the LMS. Students' and teachers' LMS skills could also have affected how IT lab classes were utilised. This is supported in the literature, for example by Smarkola (2008), who found that to benefit from sessions in computer classrooms students must be trained beforehand. She also found that some of her participants showed naivety about their IT skill competence, and that many participants had a limited understanding of how technology could be integrated.

Another limitation on the benefits of the IT lab classes was participants' beliefs about IT lab class usefulness in relation to their teaching time and to Year 12 students' learning time. The IT lab class schedule was arranged by the school administration, who assigned two IT lab classes per teacher per class in an academic year. Even though the frequency of classes was not high, most of the participants did not have extra time to spare for an IT lab class. Teachers are expected by the MoEd to teach a very full curriculum, and they find difficulties in covering all subjects during the academic year due to the limited number of classes. This means that when they are forced to do an IT lab class, some of them find it distracting and overly time-consuming. This contrasts with the context of Ozkan et al. (2020), in which students and teachers were not assigned specific times to use computer labs during official teaching time, so students stayed at school after they had finished all their classes to be able to use the LMS. This consumed more time and effort. This confirms that IT lab classes cannot simply be added to teachers' teaching schedules, even though they have been found to be supportive in teachers' pedagogical LMS use and in constructivist approaches to teaching. It is clear that careful consideration is needed before a decision is made.

This issue is consistent with the conflict discussed earlier in relation to the MoEd policies factor: the MoEd's purpose in LMS integration was not clearly shared with stakeholders. Teachers in this study recognised that IT lab classes were useful for students' learning (6.2.2.2.4) but at the same time they found them a waste of their teaching time. The IT lab class could be either utilised performatively or pedagogically. Hence, IT lab class was found as an important behavioural control factor that influences teachers' LMS integration. It confirms and explains the importance of behavioural control factors included in DTPB.

6.2.4) LMS Design & Usefulness

The LMSS factor was found to be hindering teachers' teaching practice. Two main sub-factors defined this factor: the design of the LMS and the usefulness of the LMS. This factor needs careful consideration as it has both negative and positive experiences.

6.2.4.1) LMS Design

The LMS design was found to be hindering teachers' practice. The design of the LMS was measured in terms of its educational aspects, motivational layout, and competitiveness with similar software. The LMS educational design was found to be relatively supportive to teachers' teaching, as they could customise materials to a specific student or a group of students. In addition, they could provide feedback on students' work through the LMS. In accordance with this, Abdel-Maksoud's (2018) research on the Acadox LMS and the relationship between students' satisfaction and their perceptions of its ease of use and usefulness in Egypt and KSA universities found that the system design had a positive influence on users' acceptance. She recommended that systems be designed in a user-friendly way that requires a minimum of physical and mental effort on the part of the users. Yildirim et al. (2014) compared several LMSs used by teachers, administrators and technology coordinators in a small suburban school district in the United States in a search for the ideal personalised integrated educational system. They could not find the ideal system as each system had limitations. Their participants indicated that the LMS should have as many features as possible and be well-designed to enable customisation (Yildirim et al., 2014). Customisation was a design feature of the LMS in this research; however, participants still considered the design to be hindering their pedagogical LMS integration, as they were more likely to use it performatively.

One of the critiques of the LMS in this study was that it was not educationally designed: the system should interact with the student according to a constructivist learning approach. For example, if there was an online test and a student was answering this test, he or she did not receive immediate feedback on their answers. In addition, the student would not know what questions they had answered incorrectly and what the correct answers were and why. Instead, there should be immediate feedback to the students and further guidance on how to get the correct answer.

This comment is supported in the literature by Cigdem and Ozturk (2016). In their research on factors affecting student's attitudes regarding the use of the LMS in Turkish post-secondary vocational schools, they comment that interactivity in the LMS enables students 'to explore and play with the course materials' (p. 280). Abdul Hamid et al. (2020) found that the LMS used needed some improvements in terms of interactional design. Therefore, educational design is a continuous process that requires periodic updates, as does the system's layout.

The layout of the LMS was found to be demotivating for teachers and students. The LMS page had a normal, classical layout that did not stimulate internal interest in teachers and students. Only one layout was available for all users (teachers and students across all school stages). Student motivation is stimulated differently in different age groups, as indicated for example by Ginsburg and Opper (1979), who identified four stages of intellectual growth in children (see sections 3.3.2 and 6.6.1.1). Montrieux et al. (2015) conducted qualitative exploratory research investigating teachers' and students' perceptions of the impact of tablet devices in Belgium and recommended that online materials be designed at an appropriate level for the students' class stage and be related to the subject taught. Visual attractiveness and navigation are essential in an LMS design. Ashrafi et al. (2020) found that the use of inappropriate background colours and layout for the LMS can be distracting and could create difficulties for users when reading, texting or trying to find hyperlinks connecting to other materials and pages.

Overall, in the literature, the design of LMSs has been found to attract students and engage them more in learning (Abdul Hamid et al., 2020; Ashrafi et al., 2020; Chen, 2008; Livingstone, 2012; Ozkan et al., 2020). To attract students and engage them with the LMS, the system should be competitive with similar software. In this study, the LMS was found to be lacking in this respect.

The LMS's lack of competitiveness with similar software was found to be a limiting factor. Teachers used other software more frequently than the LMS to communicate with their students. This was found to be due to better accessibility. The teachers who participated in this research indicated that they have a WhatsApp group for each class they teach. Nearly all students in secondary school have a smartphone with WhatsApp installed, as mentioned by one of the participants. Teachers tend to communicate and share educational materials, as well as strengthening their relationships socially, via WhatsApp. As a result, teachers become more present in their students' lives, which helps to keep students connected to the school. Therefore, WhatsApp was regarded as more appropriate for educational use than the LMS in terms of communication and sharing materials. Based on this finding, one recommendation might be to have WhatsApp as the communication portal linked with the LMS. Teachers can then benefit from both platforms. However, careful consideration is necessary, as one possible risk could be misuse of WhatsApp by students: students may, instead of communicating with their teachers and peers during their learning time, be distracted by communicating with their friends. Facebook, which also has communication features, was explored by Wang et al. (2012) as a possible learning management system for teacher education in Singapore. They found that it has the potential to be used as an LMS because of its features enabling communication and sharing multimedia. However, certain limitations were found, such as its double-edged use, whereby learners can easily log into Facebook and communicate with their friends rather than teachers and peers.

Having an excellent LMS design does not guarantee its usefulness for teaching, learning and management. The next section discusses the LMS's usefulness and related findings in more detail.

6.2.4.2) LMS Usefulness

The LMS's usefulness was measured in three ways: in teaching, in supporting student learning and for administrative tasks. It was found that the LMS was relatively useful for teaching 'in general' and as an advanced technology that could enhance learning. Teachers using the LMS are provided with many different options to plan lessons, to design strategies and to share their lesson plans with their colleagues. Based on the interviews, it was found that participants do not oppose the idea of new technologies being integrated into education, especially in this information age. The integration of technologies is not considered a luxury anymore, but a necessity, a sentiment corroborated by Al-Busaidi and Al-Shihi (2010). Balážovič and Karolčík (2016; see section 2.7.2) found the Claroline LMS useful for teaching and learning when they surveyed pupils' opinions and experiences on their system usage during the 2011/2012 academic year. Abdel-Maksoud (2018) and Abdul Hamid et al. (2020) made similar findings. Therefore, LMS was found to be useful for teachers' teaching practice.

The LMS was found to be cognitively supportive of student learning. For example, teachers uploaded different materials to the LMS and students could access those materials online anytime and from anywhere. Additionally, and taking a more constructivist approach, students can send their questions to teachers after school hours and repeatedly go through the online tasks when appropriate, among other beneficial uses that reflect students' control over their learning. These functions support students' learning outside of school. The LMS was found to be useful for students who lacked confidence in talking in front of others and preferred to text their questions to teachers directly or through discussion boards. Other authors have also found that technology particularly benefits less confident children (Taladriz, 2019; Yaniawati et al., 2020).

Using the LMS for administrative tasks was also found to be useful, which reflects a performative LMS usage by teachers. Teachers can use the LMS to share lesson plans with their colleagues and supervisors at school and the MoEd outside the school. They can also generate student performance reports and communicate with other teachers or staff working in the educational organisation using the internal networking features, in addition to other features that were not included in the scope of this research. This finding has been widely corroborated in the literature (Abdel-Maksoud, 2018; Ashrafi et al., 2020; Asiri et al., 2012; Awang et al., 2011; De Smet et al., 2012; Oliveira et al., 2016; Venter et al., 2012).

Several teachers reported negative experiences in using the LMS when asked specifically to evaluate their own teaching experiences. Most of the participants indicated that the LMS was not useful for their teaching practice. This seems to contradict the previous findings. The reason behind this difference is the day-to-day issues they experienced. It was found that there were certain technical issues, such as slow internet or loss of internet connection, in addition to the unavailability of technological devices for LMS integration. The recurrence of such technical issues limited their LMS integration. As one of the participants stated, they are not machines, they are humans with feelings, and they can get irritated and demotivated about using the LMS when such issues continue occurring. These problems affect their planned LMS-based constructivist activities and strategies. This explains why teachers believed (in general) that the LMS as an idea and a necessary technological tool was critical for teaching and learning practices, especially in the information age, but had some practical complaints that needed to be resolved for better future LMS integration. Many authors have recommended giving more consideration to factors in teachers' environment for successful LMS integration (Ashrafi et al., 2020; Bond & Bedenlier, 2019; Chen, 2008).

The use of the LMS by teachers in the study included both performative and pedagogical uses. For example, one of the teachers put the LMS to pedagogical use in keeping one of his bright students interested in more knowledge about the subject through customised materials, which were uploaded in the LMS for the student to access. This student had a great hunger for learning: he would finish reading and learning the lesson ahead of time in class, so when the teacher started teaching other students about the topic, this student would get bored and might start interrupting the lesson with questions. Therefore, the teacher came up with this LMS-based solution. This example reflected the influence of more than one factor, as teacher self-efficacy, LMS skills, LMS PEU and LMS design all played a role in facilitating this pedagogical approach. Supporting factors are discussed later in the chapter.

In summary, the LMS design and usefulness factor was found to be critical and needs careful consideration. The discussion has shown that technical factors influence teachers' LMS integration, which affirms the importance of attitude as per the DTPB with a further decomposition of components to include the design factor. LMS design and usefulness support both performative and pedagogical practices, and the reoccurrence of technical issues demotivate teachers when attempting LMS integration.

In consideration of all factors and how they affected teachers' LMS integration, it was found that teachers themselves also affect other factors. Therefore, a loop of influence can be drawn based on the relationships between all stakeholders and related attitude and behavioural control factors. Further discussion of the differences between participant demographic groups in relation to those factors is presented in the next section.

6.3) Demographic Comparisons Regarding Limiting Factors

One of the characteristics of this research was the diversity of participants in terms of their demographic information. The four limiting factors identified previously – MoEd policies, students and parents, IT lab class and LMS design and usefulness – are further discussed in this section in relation to the differences between demographic groups identified in the sub-question of research question three. Demographic groups are discussed in the following order: years of experience, subjects taught, gender and age.

6.3.1) Years of Experience

Teachers' number of years of teaching experience was found in the literature to positively influence teachers' LMS integration: teachers who have been engaged with the LMS are typically better users. Experienced teachers are also typically more aware of issues related to technology and policies (Abubakar et al., 2018; De Smet et al., 2012). This study found two statistically significant differences in teachers' experiences in relation to two of the important factors, MEdP and ITL.

Less experienced teachers were slightly more positive towards those factors than more experienced teachers. This difference appears to be mostly related to the continued burdens more experienced teachers had endured because of MoEd policies. In relation to ITL, there are two possible reasons for the differences found. The first is that more experienced teachers may be more comfortable with their current teaching strategies and plans in their regular classroom, rather than in IT lab classes. The second is their belief that IT lab classes wasted their teaching time. However, the differences found between the more and less experienced groups were not sufficient to change teachers' overall evaluations. In other words, both less and more experienced teachers agreed that MEdP and ITL were limiting factors.

6.3.2) Subject Taught

During the preparatory focus of this research, the MoEd made it clear that its preference was to focus on STEM (Science, Technology, Engineering and Mathematics) subjects, which represented the science subjects Mathematics, Biology, Physics, Chemistry and Computing. Hence, those STEM subjects were compared with a group of ‘other subjects’ (Arabic Language, Islamic Studies, English Language, Social Science).

Only one statistically significant difference was found between these subject groups, in the MEdP factor. A possible reason for this is that the MoEd’s interest in STEM subjects led the LMS design to be more supportive of STEM subjects than other subjects. For example, this could be related to why the LMS did not support auto-correction for open-ended questions and had limited functionality for using different question types. To the author’s knowledge, there is no similar research comparing science teachers’ and other subject teachers’ usage of the LMS and relating this to governmental educational policies. As with years of experience, the difference found between the groups of subjects taught did not change teachers’ evaluation of MEdP as a limiting factor.

6.3.3) Gender

Considerable literature has found that gender differences have a significant influence on users’ LMS integration, however the direction of influence has not been consistent. Some studies found that women were more likely to use technology than men (Abazi-Bexheti et al., 2018; Anderson & Maninger, 2007), while others found that men used technology more than women (Liaw & Huwang, 2011; Lim et al., 2020; Hermans et al., 2008). Abubakar et al. (2018) and Dündar and Akçayır (2014) found no gender differences, however both of those studies focused on students. In this study, which focused on teachers, it was found that there were no significant differences between male and female teachers.

The differences between most of the literature findings and this research finding might be that the use of the LMS in Qatar was compulsory. Another reason could be that in Qatar, male and female teachers have similar training programmes, LMS support and LMS infrastructure at schools.

6.3.4) Age

Age has been found in the literature to have a significant influence on users' technology integration: the older the user is, the more resistant to technology he or she may be (del Carmen Ramírez-Rueda et al., 2021; Gibbs et al., 2009). In complex systems such as the LMS, teachers' age has been found to have a significant effect on how they perceive the severity of LMS errors (Abubakar et al., 2018). However, in this study, no significant differences were found between younger and older teachers in relation to the limiting factors. One probable explanation for this difference is that all teachers in Qatar have taken mandatory LMS training sessions, in addition to the requirement from the MoEd to have an ICDL (International Computer Driving License) to be hired to work as a teacher.

In summary, these four comparisons have indicated that most of the groups of teachers had similar experiences and practices: only three differences were found out of the 16 comparisons made. These differences did not affect the direction of the relationship; in other words, all of the groups compared showed similar overall experiences of hindrances and low mean scores. This suggests that regardless of the experience, subject taught, gender or age, those issues exist and need to be resolved if a better educational LMS integration is sought by the MoEd.

In the next section, the supporting factors are discussed to complete the picture of factors influencing teachers' LMS integration. A newly created LMS framework is also presented.

6.4) Supporting Factors

The following factors were found to support (positively influence) teachers' successful LMS integration into their teaching practices: tablets, MoEd support, LMS functions, personal factors and school administration. The following sections will discuss these findings in relation to other literature.

6.4.1) Tablets

Tablet devices were found to be supportive in teachers' usage of the LMS. Participants reported that when students had tablet devices in class, teachers used the LMS more in their teaching. This was evident from the example of HP Classroom mentioned by some of the participants. The MoEd (SEC at that time) had initially planned to provide each student with a tablet device (see section 6.2.2.1), but the plan was not completed due to technical issues such as battery life, maintenance costs and inappropriate use by students causing device damage. The benefits of tablet devices have been supported in the literature by researchers such as Erkan (2019) and Dündar and Akçayır (2014), who found that tablets were useful and engaging when used by students.

Participants in this study believed that the MoEd should continue to provide students with tablet devices, as it would benefit students and teachers not only at school but also at home, supporting constructivist learning (see section 6.2.2.1). Consistent with this finding, Montrieux et al. (2015) found that teachers' perceptions of tablets influenced their teaching practice. Their participants appreciated the benefits that tablets introduced to learning. When tablets were provided by the SEC to students in Qatar, they were not able to make the excuse that they did not have computers or technological devices connected to the LMS at home.

The provision of tablets could have increased some students' interest in classes, promoting student-centred approaches. However, some participants reported the opposite, feeling that tablets disturbed their teaching and distracted students' attention from classes. This could explain the findings of Ahmad and Hamad (2020), that teachers preferred the use of smart interactive boards to laptops and tablets. Therefore, students having tablets may not always be beneficial, because students can misuse these devices and disturb classes. They may play noisy sounds or use the devices to access online games and non-educational websites that distracted them from the class content. This finding is consistent with that of Montrieux et al. (2015), who found that some teachers feared losing control over the classroom due to the presence of tablets in the classroom. Hence, the benefits and drawbacks of tablet devices should be carefully considered (Zhu et al., 2018).

6.4.2) MoEd Support

MoEd support was found to be a supporting factor influencing LMS integration by teachers. This finding was expected, as the MoEd introduced the LMS to schools in Qatar. However, the extent of their support was considerable. The MoEd invested in building high-quality infrastructure for the LMS. This kind of support is a good example of what has been recommended in the literature. For example, Browne (2015) found that for successful technology integration to occur in education programmes, certain conditions must be met, one of which is that sufficient funds need to be available to secure software, hardware and technical support. Zagami et al. (2018) had similar recommendations.

The MoEd provided a large number of essential training sessions and workshops, in addition to having a dedicated team of LMS experts to support users and to continuously update the system with new functionalities and resolve reported issues. Other research has also found benefits of training and technology-specific workshops being provided to teachers prior to their integration of technology (del Carmen Ramírez-Rueda et al., 2021; Zhu et al., 2018). Therefore, MoEd support was confirmed as a control behaviour factor that positively influenced teachers' LMS integration.

6.4.3) LMS Functions

LMS functions are the fingers and thumbs of the system; they are the tools used in the practice of teaching. The functions reported by participants were evaluated in terms of ease of use (LMS PEU), and it was found that all of the functions were easy to use. Some of the participants indicated that using the LMS in the beginning could be difficult, not because the system is difficult to use but rather because of the many functions a teacher needs to learn about. Ease of use is one of the two components of attitude in the TAM (Davis, 1989), defined as the degree to which the user believes that the technology is easy to use, and its importance as an indicator of usage has been widely reported in the literature (Aljaloud, 2019; Bagozzi, 2007; Chien et al., 2014; Erkan, 2019; Lai, 2017; McCoy et al., 2005; Ozkan et al., 2020; Teo & Noyes, 2008; Teo, Luan & Sing, 2008; Tsuei & Hsu, 2019; Zhu et al., 2018). It was found in the literature that users who believe that the integrated technology is easy to use and useful tend to have positive attitudes towards the technology (Abdel-Maksoud, 2018; Abdul Hamid et al., 2020; Ashrafi et al., 2020; Dündar & Akçayır, 2014). There were a few complaints about the difficulty of creating questions using Greek symbols by some of the participants. This issue seemed to limit the variety of questions that teachers could create in the LMS. However, it was also found that this particular issue was resolved by the MoEd's LMS support team. Hence, the LMS PEU factor helps to explain the importance of attitude and its influence on teachers' LMS integration.

6.4.4) Personal Factors

Personally controllable factors such as ICT skills, LMS skills, experiences and self-efficacy were all found to be factors supporting teachers' integration of the LMS into their work. Most of the participants in this research were teachers who were experienced in using computers and different kinds of software. Because they had attended the training and workshops delivered by the MoEd and school administrations, teachers were prepared with the specific skills for LMS use. In the early years of LMS integration in Qatar, Nasser et al. (2011) found that a lack of IT and LMS knowledge in teachers was a barrier to students' LMS usage. This change is consistent with previous findings that teachers' level of IT and LMS knowledge affects their level of integration (Adzharuddin & Ling, 2013; Li et al., 2018).

Participants in this study reported that with time teachers became more experienced with LMS functions. This finding is consistent with other studies, such as that of Klobas and McGill (2010), who found that teachers' level of experience with the LMS had a direct influence on their total time using it, a finding confirmed by Vongkulluksn et al. (2018).

Self-efficacy was a supporting factor influencing participants' LMS integration. This finding is consistent with the work published by Aljaloud et al. (2019). Similarly, Erkan (2019) found that teachers were quicker to accept the integration of technology into their teaching practices than students when they had higher self-efficacy. In conclusion, personal factors were found to support teachers' pedagogical LMS integration, as presented in the LMS design and usefulness factor example.

6.4.5) School Administration

The school administration was found to be a supporting factor in teachers' LMS usage. This indicates that teachers approved of the work of the school administration towards successful LMS integration. This finding was reflected in how school administrations supported policies imposed by the MoEd for LMS integration and did not add extra burdens that would disturb teachers' teaching. In addition, they provided in-house LMS training for new teachers. The school administrations also managed IT lab classes by scheduling a few classes for each subject throughout the academic year. School support has previously been found to positively influence teachers' integration of the LMS and other technology (Smarkola, 2008; Vongkulluksn et al., 2018)

There was one issue found relating to the school administrations: when they scheduled IT lab classes, they sometimes allocated inappropriate dates to teachers, interrupting their teaching schedules and subject coverage. Chien et al. (2014) found that school administrations were a barrier to teachers' use of technology, which is opposed to the findings of this study. This could be due to the compulsory usage of the LMS imposed by the MoEd in Qatar, which forces school administrations to support its integration and usage. Overall, school administrations help to confirm the importance of subjective norm factors in influencing teachers' LMS integration.

This study focused on teachers and their LMS integration. To summarise all of the limiting and supporting factors explored, the following novel LMS framework was created, aiming to simplify the presentation of the complexity of such relationships.

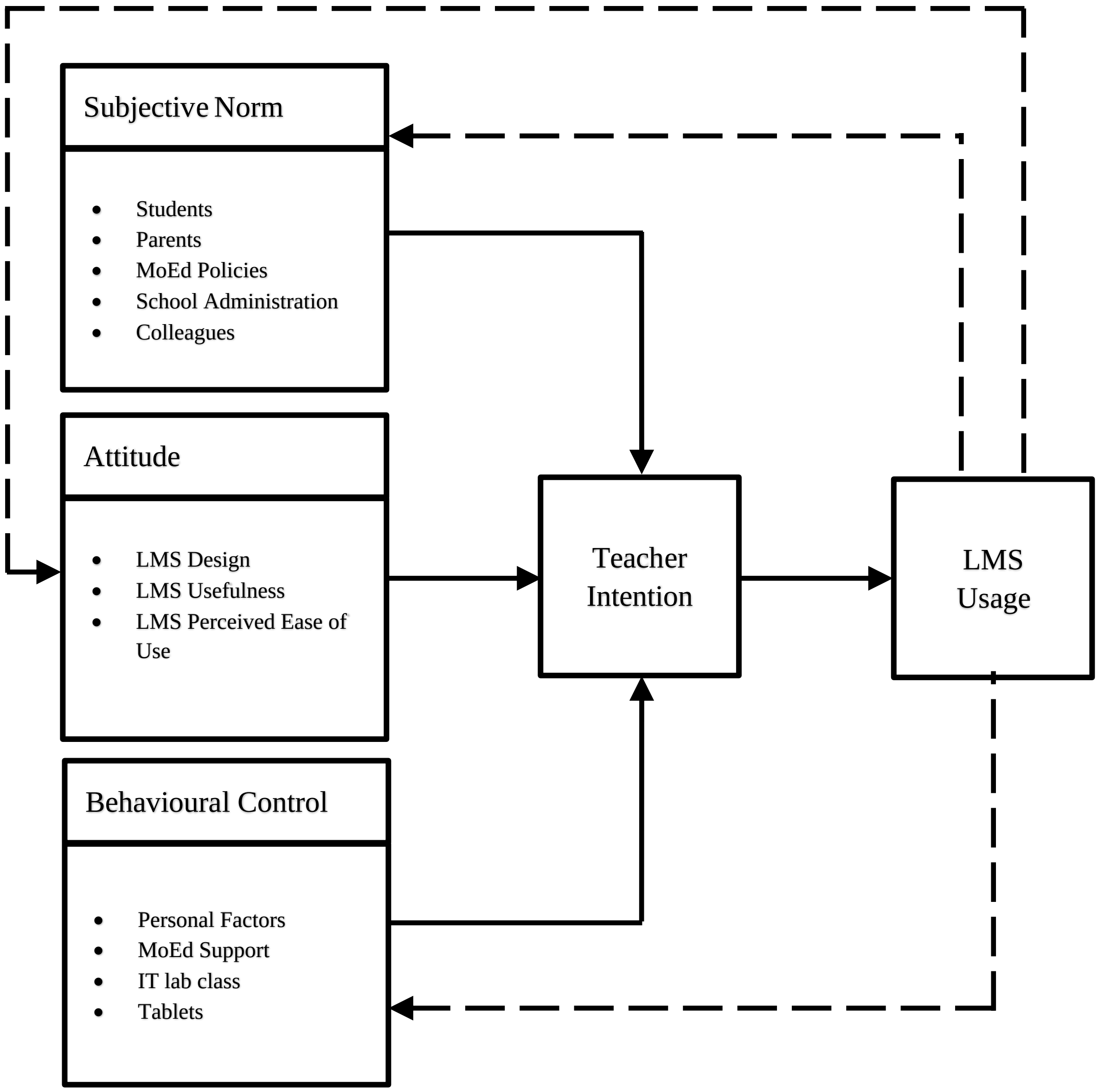

Figure 68. Qatar's LMS framework

The framework shows that three main categories of factors influence teachers' intention to use the LMS. The first category is subjective norm factors, which encompass students, parents, MoEd policies, school administration and colleagues. The second category is attitude factors, which is decomposed into LMS design, usefulness and LMS PEU. The third category is behavioural control factors, which are MoEd support, personal factors, IT lab classes and tablets. The originality in this framework when compared to DTPB and others lies in the decomposed components and the reciprocal influence of usage on subjective norm, attitude and behavioural control factors, recognising the continuous loop of influence and complexity.

6.5) Discussion Summary

This chapter so far has related the important findings of this study to the literature, highlighting unique and novel findings. A discussion of demographic comparisons confirmed that regardless of participants' demographic characteristics, all agreed that the limiting factors identified were hindering teachers' LMS integration. Based on the combination of limiting and supporting factors, a new LMS framework was created that presents factors influencing teachers' LMS integration in terms of a loop of interactions. This framework helps in understanding teachers' behaviour when using the LMS. The next section focuses on this study's theoretical and methodological contributions to knowledge.

6.6) Research Contribution

This study has contributed empirical data in filling the previously identified research gaps (see section 3.7). This research also offers numerous further contributions to theory and methodology. Theoretical contributions were presented in terms of relating LMS integration to learning theories, conceptualising new factors and redefining and confirming other factors. The main methodological contribution was in creating and validating a new instrument for data collection.

6.6.1) Theoretical Contributions

This section presents the theoretical contributions to knowledge made by this research, categorised into four areas: contribution to learning theories, creation of a new LMS framework, contribution to teachers' beliefs and behaviour and context uniqueness.

6.6.1.1) Contribution to Learning Theories

These new findings regarding LMS use by teachers in Qatar contribute to our understanding of learning theories. The LMS in this research integrated the three learning theories reviewed in Chapter 3: behaviourism, cognitivism and constructivism. Behaviourism defines learning as an acquisition of new behaviour or modification of existing behaviour due to a stimulus (Ouadoud et al., 2018). An example of this is when teachers used online quizzes; these introduced questions that stimulated students to answer them. However, teachers indicated that this approach was neither educational nor interactive, as students could not learn from this type of interaction with knowledge: they could only know if their answer was correct or incorrect. This led teachers to upload materials for their students, which reflected a cognitive learning approach.

Cognitivism defines learning as an internal mental phenomenon that results from what others do and say (Ertmer & Newby, 2013; Hoic-Bozic et al., 2009), and the focus is on how learners ‘perceive, interpret, store and memorize information’ (Hoic-Bozic et al., 2009, p. 20). In a cognitivist approach, learning involves three important processes. First the learner acquires knowledge through an external source, then the learner recognises and stores this knowledge in memory structures, and finally the learner processes this knowledge to understand and solve problems (Ashworth et al., 2004; Chisanu et al., 2012; Ouadoud et al., 2018; Schunk, 2012). This study found that teachers who uploaded useful learning materials to the LMS for students to interact with and learn from were not engaged with by the students. This finding indicates that there are other factors limiting students’ learning and LMS engagement that are not included in a cognitivist learning approach.

Constructivism has been a very common approach in literature examining the use of technologies because of its support of student-centred approaches (Amineh & Asl, 2015; Levin & Wadmany, 2006; Ouadoud et al. 2018). In a constructivist approach, students are actively involved in constructing their own knowledge internally (Chen, 2008; Cobb & Bowers, 1999; Teo, Chai et al., 2008). Similarly, in this study teachers designed materials and created online quizzes and homework to encourage students to engage with the LMS, aiming to apply more student-centred approaches. However, teachers reported that students rarely engaged with those kinds of learning activities, leading them to rely more on traditional means of teaching. Even if an LMS was designed and implemented using constructivist, student-centred approaches, this does not guarantee that students will actively engage with it and construct their own knowledge. There could be barriers that affect students' engagement, such as a lack of interest or motivation, as found in this study. If students do not believe in the benefits of using the LMS, they will not trouble themselves to use it. A relevant finding in this study relates to the negligible number of marks awarded for LMS usage.

Another reason for students' disregard of the LMS could be that they are used to traditional means of teaching and learning, and they are not ready to change that when they reach secondary school. This implies a rigidity of their beliefs about learning, which are discussed in the literature as core beliefs (Ertmer & Ottenbreit-Leftwich, 2010; Pajares, 1992). Core beliefs are more difficult to change even when they are challenged with scientifically proven findings. Those findings add to the understanding of how sociocultural and internal beliefs affect students' construction of knowledge.

In addition, this research contributes to Vygotsky's sociocultural theory, in that it emphasises the importance of context in association with learning for students to construct knowledge (Duncan, 1995; Karpov & Haywood, 1998; Matusov & Hayes, 2000). This was found, for example, in teachers' reports that students are more motivated to use the LMS at school than at home. Sociocultural interaction at school promotes learning among students and this promotes teachers' LMS integration. In this study, the availability of IT lab classes assisted this process.

This leads to the exploration of parents as a factor in students' learning at home. In support of Vygotsky's sociocultural theory, parents can support their children's learning at home by providing a similar environment to that of their school, and can act as a guide to their children's learning in a constructivist student-centred approach. It cannot be taken for granted that this type of parent support will exist in every home. Two main factors were identified that could limit this support: parents' beliefs about the usefulness of the LMS for their children's learning and their economic resources.

The biological maturation element in Piaget's theory of cognitive development (Beunen et al., 2006; Geary, 1995; McLeod, 2018) was similarly highlighted in this research in relation to student motivation for LMS interaction, which in turn influences teachers' LMS integration. The intelligence of children develops with their biological growth. Primary school students are largely in the concrete operational stage (7 years old to 11) and do not perceive knowledge similarly to secondary stage students (11+ years old). Students at 11 years old and over have improved thinking and reasoning capabilities (Ginsburg & Opper, 1979; McLeod, 2018). Teachers in this research indicated that the LMS design did not consider the age of students as users. The LMS has a classic, static system design that is simple and does not motivate students or attract them to use it.

A further contribution to understanding student and teacher behaviour was the influence of the mark value of LMS use. The more marks a task is worth, the more it is expected to be completed by users. Behaviourist learning theory suggests that student behaviour can be controlled by controlling a task's worth in marks and deadline for submission. Based on this, it is possible that increasing the mark value of LMS tasks will lead to improved engagement from students.

This exploration of factors influencing teachers' LMS interaction has contributed to our general understanding of human behaviour in relation to both the integration of technology in general and our specific understanding of the integration of an LMS into teaching practice.

This explorative research contributes to our understanding of the complexity of the relationships among the factors that influence such integration.

6.6.1.2) Creation of LMS Theoretical Framework

The findings of this research support the categorisation used in the DTPB framework and add detailed empirical data relating to the sub-elements of subjective norms, attitudes and behavioural control, leading to the creation of a new LMS theoretical framework. This new framework contains these categories as potential determinants of teachers' intention to use the LMS in their practice. A further decomposition of these categories yielded MoEd policies, parents and students as additional subjective norm sub-elements. LMS design was added to usefulness and ease of use in the attitude category. IT lab classes, personal factors, MoEd support, and tablets were added to the behavioural control category. Teachers' LMS usage was found to influence the three categories identified, which created a loop of influence. Therefore, there is a continuity of influence between those factors.

To summarise the important factors and their contributions:

1- MoEd policies are very important, as they have the ability to motivate or demotivate teachers' LMS integration. Their contribution can be divided into two categories: contribution to management practices (performative) and contribution to teaching and learning (pedagogical) practices. It was found that MoEd policies increased teachers' burdens by imposing additional management requirements that negatively affected teachers' teaching and learning practices. This increase in workload was found to create doubt among teachers about the MoEd's purpose in introducing the LMS. For better implementation, the MoEd should clarify its LMS integration vision with teachers and other stakeholders.

2- Students' and parents' beliefs about LMS usefulness have a direct impact on teachers' LMS integration. As a rule of thumb, the more students and parents are engaged with the system, the more teachers are also expected to be pedagogically engaged with the system. Parenting style can help in understanding parents' level of support for their children's LMS integration at home. Students are very important in successful LMS integration by teachers. One motivation for students' LMS integration may be the mark worth awarded for using the LMS.

3- IT lab classes are a new initiative that has been confirmed in this research as important to consider when integrating the LMS. Findings related to this factor bring new experiences and empirical data in relation to the use of computer classrooms for LMS integration.

4- LMS design and usefulness were found to contribute to teachers' performative and pedagogical LMS integration. The LMS's layout, design and functions can motivate teachers and students to use the system if they are pitched at the appropriate level. Teachers expected the LMS to be educationally designed and visually attractive. Technical issues and their recurrence demotivate teachers and lead to less LMS integration.

5- The other factors identified in the framework were found to support teachers' LMS integration. The findings related to those factors bring in empirical evidence on their importance and influence in this usage context.

6.6.1.3) Contribution Regarding Teachers' Beliefs and Behaviour

This research contributed to our understanding of teacher's beliefs about the LMS and their effect on teachers' behaviour. It was found that most of the teachers believed the LMS was a useful educational technology. They also believed that technology use is no longer a luxury; it is a necessity. However, this belief was not exactly reflected in their behaviour in practice. They indicated that the LMS was not useful for their personal practice. Teachers believed that the inclusion of parents in children's learning and use of the LMS would benefit their integration of the LMS (del Carmen Ramírez-Rueda et al., 2021; Zhu et al., 2018).

However, teachers' communication through the LMS with parents in this research was found to be very limited. This difference in beliefs and practice has been discussed in the literature (Ahmad & Hamad 2019; Bianchi et al., 2020; Chien et al., 2014; Hadad et al., 2020) as being due to external factors such as parents' beliefs and the usefulness and ease of use of the technology. The findings of this study contribute to our empirical understanding of the complexity of teachers' beliefs regarding technology and their LMS practice.

6.6.1.4) Context Uniqueness

Qatar is an under-studied developing country with the relatively rare characteristic of LMS integration at a country-wide level. This study contributes empirical data about LMS integration in secondary stage schools, focusing on teachers. It utilised mixed methods to explore factors influencing teachers' LMS practice. Qatar also includes a segregated school system in which male teachers and students are separated from female teachers and students. This segregation allows for a cross-gender comparison in the field of LMS integration at the level of different school cultures. Examining Qatar as the country of focus allows us to look closely at a context in which education financing is not a significant issue, discerning how non-financial factors help us to understand teachers' LMS integration. The diversity of participants' backgrounds in terms of subjects taught also brings in new empirical data and facilitates new comparisons.

6.6.2) Methodological Contribution

This research included a survey tool that was created based on the interview data analysis in Phase One. The survey was tested, validated and used for data collection, hence, it could be easily adapted to other school stages such as elementary and preparatory. The individual items included in the survey could also be useful for research in other similar contexts.

6.7) Chapter Summary

This chapter has discussed the results of both phases of the research and related the findings to the appropriate literature. It also outlined a novel LMS framework based on the study's findings and highlighted the original contribution of the research to theoretical and methodological knowledge. The next chapter will present the research conclusion, limitations, practical recommendations and suggestions for future research.

Chapter 7 – Conclusion

7.1) Introduction

This chapter concludes the research presentation by restating the research aims, questions and methodologies used to answer research questions, highlighting the main findings and addressing the research questions. Following this, the limitations of the study are discussed and some recommendations are provided for better LMS integration in practice. Finally, directions are recommended for future research in the field of LMS integration and technology in education.

7.2) Summary of the Research Conducted

This study explored factors that influenced teachers' LMS integration into their teaching practice. It identified a number of influential factors that were divided into three categories, as illustrated in the new LMS framework created (Figure 70): subjective norms, attitudes and perceived behavioural control. The study utilised mixed methods, beginning with qualitative semi-structured interviews to collect narrative data that provided an in-depth understanding of teachers' experiences with the LMS and helped to explore the potential factors influencing their LMS practices. Using thematic analysis and coding, 49 indicators were developed and used for the creation of a quantitative online survey. The results of the survey led to the identification of important factors, which were categorised as limiting or supporting teachers' LMS integration based on their mean scores. The most important factors were the limiting factors, which were MoEd policies, students and parents, IT lab classes and LMS design and usefulness.

Overall, the LMS was found to be generally useful as a supportive technological tool for teachers' practice and students' learning. The LMS was used for teaching and learning practices and for administrative tasks. Those two LMS usage purposes have demonstrated a pull between performative and pedagogical drivers for the implementation and integration of the LMS. Teachers' generally positive perspective on the LMS was limited by four key factors. The first and most limiting factor was MoEd policies.

The MoEd introduced the LMS project and insisted on its integration across all government schools. They created LMS policies that were expected to guide users toward successful LMS integration. LMS integration was compulsory for all teachers in Qatar, with teachers who failed to use it seeing their performance appraisals affected. The MoEd's LMS policies, instead of guiding teachers toward successful LMS integration were found to hinder the integration process. Teachers complained about the amount of extra administrative work that was required when using the LMS. Those administrative tasks overloaded teachers and demanded considerable time and effort. Hence, teachers began to wonder whether the LMS project was indeed intended to improve pedagogical practice or if it actually had a more performative and administrative purpose.

Students and parents were the second limiting factor. This factor was a combination of two factors: students and parents. Parents were found to negatively influence teachers' LMS integration due to their lack of belief in the usefulness of LMS and their lack of support for their children's learning at home. Parents' beliefs and support cannot be taken for granted, and the involvement of parents in communities of practice would help schools to clarify the reasons for LMS integration and seek more parental support at home. It would also benefit teachers to understand more about parents and their expectations for their children's learning.

Students were found to be negatively influencing teachers' LMS integration in three ways: their negative beliefs about the LMS's usefulness, their lack of motivation and interest, and their interaction with IT lab classes. The most probable reason for students' lack of interest was the low number of marks allotted to LMS-based work by the MoEd. This was found to be very little for Year 10 and 11 students and zero for Year 12 students. Therefore, students are using it in a rather performative way.

IT lab classes were the third limiting factor. Many of the participants were not very happy about IT lab classes, as they believed them to waste teaching time. However, there were also some examples of how teachers had benefited from IT lab classes. These teachers used them pedagogically as a change of teaching environment that would motivate students to learn in a more collaborative and student-centred way, supporting constructivist learning theories. Other teachers simply used the IT lab classes as a means to force students to use the LMS performatively, supporting behavioural learning theories. Those examples describe the tension between teachers' performative and pedagogical LMS functions usages.

LMS design and usefulness was the fourth and final limiting factor identified. This factor was divided into LMS design and LMS usefulness. LMS design negatively influenced teachers' LMS integration due to its static and classical non-interactive nature. Ideally, the LMS should be designed so that students can interact with online materials and construct their knowledge, facilitating a student-centred teaching approach. The inclusion of experienced teachers in the design team would be beneficial in constructing a more engaging and pedagogically sound LMS. One important consideration when designing the LMS is to think about the layouts that best suit students of different ages.

Teachers in this study believed that the LMS was useful for teaching and learning practices in general. However, when they were asked about their own practices, they were less positive due to the technical issues and limited student engagement with the system. These problems demotivated them to increase their LMS use.

Five main supporting factors were also identified. Tablet availability increases students' interaction with the LMS in and outside of school, which in return increases teachers' LMS integration. The MoEd provided a range of support structures, including technical support, infrastructure, training and system development. The LMS was found to be easy to use, with the only real difficulties experienced when the system was used by a teacher for the first time. Over time, teachers become more experienced and better LMS users. Personal factors relating to individual teachers, such as self-efficacy, IT skills and LMS skills, positively influenced their LMS integration. In addition, school administrations were encouraging and supportive of teachers' LMS integration.

The statistical comparisons made in this study between demographic groups of participants in terms of the limiting factors (MoEd policies, students and parents, IT lab classes and LMS design and usefulness) did not result in any effective differences that could have changed the evaluation of the factor from being limiting to supporting or vice versa. Participants across all of the demographic backgrounds investigated agreed about the direction of the influence of each factor on teachers' LMS integration.

In summary, teachers' LMS integration is affected by many complex, interrelated factors. In this study, more emphasis was placed on the normative factors most hindering LMS integration: MoEd policies and students and parents. This reflected the importance of those factors in successful LMS integration. An LMS cannot be successful at school if it is not supported by students and parents outside of the school context.

7.3) Limitations

This study had several limitations. The methodology selected was a mixed methods design. Mixed methods are challenging to implement in a thesis, as they require more time and effort in terms of theoretical background, data collection and data analysis. There is also the possibility that the researcher will gather too much data and get lost in it. I resolved this issue by separating the data collected into different files. The sequential methods design choice was helpful because data collection and analysis needed to be finalised for Phase One before the Phase Two data collection could begin.

Another limitation was the number and scope of the interviews conducted. The qualitative phase of the study included only a small number of male physics teachers. It would have been improved with more interviews, and interviews with teachers of more diverse subjects, to capture a wider range of teacher perspectives.

Several limitations were faced in relation to the tool created for survey data collection. A gender question was missed by mistake, even though it was written in the draft copy. When I created the tool online, I forgot to add it, and did not realise this until I had started the data analysis. This issue was resolved by combining two questions, as explained in Chapter 5. Another issue was not including a condition for mandatory question completion to move to the next page of the questionnaire. This led to many instances of missing data in the completed survey. Some respondents had only missed selecting one answer, however their responses were removed from the analysis.

In terms of sampling for the questionnaire, there was a limitation in obtaining a list of potential participants' emails. When I visited the MoEd's research manager for the first time, she agreed to share the list with me before I had reached the second phase. On my second visit, the research manager had been replaced by another person, and the new manager did not agree to share the list. However, this was resolved with the use of cluster sampling, whereby emails were sent to the school administration e-mails that had been provided by the new research manager. In addition, the number of responses collected was lower than expected, so it would have been better if a reminder e-mail had been sent in addition to calling each school.

A final limitation was the lack of previous educational research in Qatar, more generally on technology integration at schools and especially on LMS integration, which leaves many questions still unanswered and gaps still unfilled.

7.4) Recommendations

The findings of this research suggest some recommendations and implications. Being financially strong and investing heavily in new technological systems to be implemented in the schools does not guarantee successful integration. There also needs to be an understanding of other factors that comes from work on the ground (in this case in secondary schools) rather than relying on superficial knowledge to plan and execute a strategy.

Policymakers need to clarify whether the goal of implementation is administrative, educational or both. It is also desirable to communicate clearly about the goals of implementation with all stakeholders, especially parents. It would be beneficial to hold training sessions on-site or online for parents to learn about the LMS, including them in communities of practice dedicated to supporting their children's online learning.

It also recommended that there be a focus on the important LMS functions, functions that support teachers' practice and promote students' learning, and leave other functions as optional. It also recommended that MoEd policymakers make a plan to gradually shift some tasks from being paper based to being purely electronic. This was mentioned repeatedly by participants in relation to lesson planning.

Mark worth for students' LMS use appears to be an important reason for students' and teachers' lack of motivation to engage with the LMS. Hence, it is recommended that policymakers increase the number of marks allotted to the LMS-based tasks completed by students.

7.5) Future Research

In future research, it would be beneficial to interview a more diverse range of teachers in terms of gender and subject area. Based on the findings of this study, a specific qualitative examination of the effect that policy has on LMS integration would provide a deeper understanding that could result in improved policymaking. Different methods of data collection, such as adding observations and real-time data capturing how often teachers and students log into the LMS, would increase the reliability of the research findings. It would also be interesting to examine LMS integration at other year levels. In addition, research involving different stakeholders (parents, students, school administration and the MoEd) on the LMS would enrich the field with empirical information.

During the course of this research, the global COVID-19 pandemic affected education systems all over the world. Many countries had to stop teaching, while others continued via online channels. In Qatar, there was a shift to fully online teaching through the LMS, in addition to using Microsoft Teams for video conferences to replace classes taught in person. It would be very interesting to collect data about LMS usage patterns and attitudes after this extended period of elevated LMS use and compare the results with pre-pandemic studies.

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Appendices

Appendix A:

This appendix has two sections, the first section (A.1) includes interview questions related to phase one in this research. The second section (A.2) includes questions related to phase two questionnaire.

Al-Busaidi and Al-Shihi (2010) figure (3) Proposed Instructor's LMS Acceptance Model details

- Instructor factors:
    - Self-efficacy
    - Attitude toward LMS
    - Experience
    - Teaching style
    - Personal innovativeness
- Organisation factors
    - Motivators
    - Technology alignment
    - Organisation support
    - Technical support
    - Training
- Technology factors
    - System quality
    - Information quality
    - Service quality

A.1: Phase one

Test Interviews

Before conducting the actual interviews, a list of test questions was created based on the literature (detailed below, section 4.5.1.1.6). This list was updated twice before finalising the third version for the test interviews. The latest reviewed and agreed questions with the supervision team were chosen for the interview protocol to keep the flow in sequence with the research questions and allowing some extra questions to be included based on the conversation.

The Ministry of Education (MoEd) in Qatar was contacted and a meeting was held with the Head of Research and Development, the aim and methodology of the research was discussed, and a written support paper and verbal consent was obtained to conduct the research in Qatar.

Three teachers (repeated p.87, fits better there) were willing to participate in the test interviews after contacting their school principal. The interviews were held within the school meeting room over two days. On the first day, one interview was held, and on the second day two interviews (4-5th of July 2017).

Convenient sampling was used for the test interviews, one specific secondary stage school was contacted to conduct those interviews with their physics teachers. The participants were given the choice to participate or withdraw at any time.

A prior phone call with the school administration was conducted to agree on a date, time and venue for the author to visit the school and conduct the interviews. Three interviews were conducted in a two-day period at the same school with three different physics teachers. The interviews were audio recorded.

On average the interviews lasted about an hour and they were audio recorded. All participants were given the opportunity to choose the preferred language for the interview and all chose to have it in Arabic. Participants were given the choice to participate or not and withdraw at any time from the interview without giving a reason.

4.5.1.1.1) Interview Questions

The questions were constructed based on the research questions and refined using the literature and particularly behavioural theoretical frameworks detailed in chapter 3 (see page XX).

The interview questions focused on understanding participants' experiences of using the LMS, the e-library and e-content. (For both full Arabic and English language questions, please see appendix A.1)

1- *Teaching practice/ style:*
   a. *How would you describe your teaching style? / how would you describe your teaching practice?*
   b. *How would e-learning affect your teaching style/ practice?*

2- *Beliefs about the components: (Likert Scale)*
   a. *e-library:*
   b. *e-Content:*
   c. *LMS:*

3- *The specific usage of e-learning components:*
   a. *How would you describe your usage of e-library?*
   b. *How often do you use it?*
   c. *How would you describe your usage of e-content?*
   d. *How often do you use it?*
   e. *How would you describe your usage of LMS?*
   f. *How often do you use it?*
   g. *What factors might stand in your way of utilising them?*

4- *Combining beliefs and practices:*
   a. *How would you describe your practices reflecting your beliefs in utilising e-learning components?*
   b. *How would it be utilised in a better way?*

Based on the participants feedback the question list was edited and refined to reach a better version which is more and relevant to participants' experiences. (See further explanation in the next section.)

Refining questions

The test interviews highlighted that none of the participants knew what the e-library and e-content were. Hence, those terms were dropped from the questions. A further search through literature was conducted to identify factors that may potentially affect the integration of the

LMS. Likert scale questions were also removed (see questions list below). They were thought to provide useful information to capture for the analysis, but not in this phase. Participants were distracted from the conversation when moving to Likert scale questions and then back to open-ended questions, hence, it was decided to include this type of question the second phase of data collection. The new division of questions was changed based on participants' LMS experience (before and after) focusing on three main parts: lesson planning; in-class teaching practice; and after class practice. The aim of this new division was to let participants express their experiences from two different teaching periods and environments. This might reflect changes that occurred in their teaching practices and let them relate how are they teaching now compared to how they were before. In addition, some of the main related factors affecting LMS integration mentioned in the literature were added and divided into two categories, internal and external factors. The following are some of the questions (version 5) in English. (For both full Arabic and English language questions and all other versions please see appendix A.1)

1- *Teaching Practices' Routine:*
    a. *How would you plan for your lessons?*
    b. *How would you interact with the curriculum (learning/ revision) in planning and for delivery in classroom?*
    c. *How can you describe your technology integration in your teaching routine?*
    d. *what do you think about the potential of technology supporting/ reforming teaching and learning?*
2- *LMS:*
    a. *What do you know about LMS? How can you explain it?*
    b. *How would you describe your LMS experience?*
    (when, why, and how you use it)
    c. *How satisfied are you with using LMS?*
    d. *Internal factors:*
        i. *Beliefs*
        ii. *Other*

e. External factors:

i. Ministry of Education's policy

ii. Resources (school facilities, internet connections, computers … etc.)

iii. Parents

iv. Students

f. How would you describe the necessity of LMS integration?

3- How did LMS impact your teaching routine?

Version 1 of interview question

Introductory questions:
- How are you doing today?
- How is school this year?
- Are you enjoying it?

  - A transitional statement which prepares for the next theme –

Some broad questions about theme 1 (Teacher's practices):
- How is teaching nowadays?
- How is your teaching going?
- How are students interacting with your classes?

More specific questions, covering sub-themes 1.1, 1.2:
- Express your teaching practices in a classroom?
- Would you describe your teaching practices?
- How do you plan your lessons?
- What do you think about knowledge-centric and learner-centric approaches?
- In terms of these two approaches, how would you reflect your teaching practices?

  - A transitional statement which prepares for the next theme –

Some broad questions about theme 2 (e-learning):
- Heard about e-learning?
- What do you think about it?
- How would you describe it?
- How can it be utilised?
- What do you know about Qatar's e-learning project?
- How was your experience?

  - A transitional statement which prepares for the next theme –

Some broad questions about theme 3 (Teacher's beliefs):
- What do you think about using e-learning in teaching in learning?
- How do you feel about it?
- What motivates you?

More specific questions, covering sub-themes 3.1, 3.2, 3.3:
- How do you feel about the usefulness of e-learning project?
- How would you describe their ease of use?
- How would you express other peers or superiors' influence on you, in using e-learning?
- How would you react?
- How do you find the facilities and conditions for e-learning project?

  - A transitional statement which prepares for the next theme –

Some questions about theme 4 (Barriers):

- What could stand in the way of implementing e-learning?
- How was your experience in using e-learning?

Closure questions:

- What would you wish to find in the future?
- Would you stat any other ideas or experiences not discussed earlier?
- Any last comments?
  – A big Thank you for your precious time and wonderful discussion, if you would like to hear from me later about the project please email me on Saoud.a.jamali@northumbria.ac.uk –

Version 2 of interview questions (English)

5- Teaching practice/ style:
   a. How would you describe your teaching style? / how would you describe your teaching practice?
   b. How would e-learning affect your teaching style/ practice?
6- Beliefs about the components:
   a. E-library:
      i. How would you describe its usefulness?
      ii. How would you describe its ease of use?
      iii. How would you describe other peers' influence?
      iv. How would you describe the school readiness and facilities?
      v. How would you describe the need of use?
   b. E-content:
      i. How would you describe its usefulness?
      ii. How would you describe its ease of use?
      iii. How would you describe other peers' influence?
      iv. How would you describe the school readiness and facilities?
      v. How would you describe the need of use?
   c. LMS:
      i. How would you describe its usefulness?
      ii. How would you describe its ease of use?
      iii. How would you describe other peers' influence?
      iv. How would you describe the school readiness and facilities?
      v. How would you describe the need of use?
7- The specific usage of e-learning components:
   a. How would you describe your usage of e-library?
   b. How often do you use it?
   c. How would you describe your usage of e-content?
   d. How often do you use it?
   e. How would you describe your usage of LMS?
   f. How often do you use it?
   g. What factors might stand in your way of utilising them?
8- Combining beliefs and practices:
   a. How would you describe your practices reflecting your beliefs in utilising e-learning components?
   b. How would it be utilised in a better way?

Version 2 of interview questions (Arabic)

أسئلة المقابلة

1- أسلوب التعليم، طريقته:
   a. كيف بإمكانك شرح طريقة وأسلوب تعليمك داخل الفصل؟
   b. كيف يمكن للتعليم الالكتروني أن يؤثر على طريقة وأسلوب تعليمك داخل الفصل؟
2- المعتقدات حول عناصر التعليم الالكتروني:
   a. المكتبة الالكترونية:
      i. ما هو تعليقك على مدى فاعليته وفائدته؟
      ii. كيف ترى سهولة استخدامه؟
      iii. كيف ممكن آن تعلق على مدى تأثير الاخرين (مدير، زميل، غيره) عليك؟
      iv. كيف ترى مدى جاهزية المدرسة من الناحية التقنية والخدمية؟
      v. ما رأيك في الحاجة لاستخدام هذا العنصر؟
   b. المحتوى الالكتروني:
      i. ما هو تعليقك على مدى فاعليته وفائدته؟
      ii. كيف ترى سهولة استخدامه
      iii. كيف ممكن آن تعلق على مدى تأثير الاخرين (مدير، زميل، غيره) عليك؟
      iv. كيف ترى مدى جاهزية المدرسة من الناحية التقنية والخدمية؟
      v. ما رأيك في الحاجة لاستخدام هذا العنصر؟
   c. LMS:
      i. ما هو تعليقك على مدى فاعليته وفائدته؟
      ii. كيف ترى سهولة استخدامه؟
      iii. كيف ممكن آن تعلق على مدى تأثير الاخرين (مدير، زميل، غيره) عليك؟
      iv. كيف ترى مدى جاهزية المدرسة من الناحية التقنية والخدمية؟
      v. ما رأيك في الحاجة لاستخدام هذا العنصر؟
3- الاستخدام العملي الدقيق لعناصر التعليم الالكتروني:
   a. كيف ممكن ان تعبر عن استخدامك الشخصي للمكتبة الالكترونية؟
   b. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟
   c. كيف ممكن ات تعبر عن استخدامك الشخصي للمحتوى الالكتروني؟
   d. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟
   e. كيف ممكن ان تعبر عن استخدامك الشخصي للLMS ؟
   f. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟
   g. ماهي العوامل التي قد تواجهها وتمنعك من حسن استخدام هذه العناصر؟
4- الدمج بين المعتقدات وأسلوب التدريس:
   a. كيف بإمكانك شرح طريقة التدريس وترجمتها لاعتقاداتك حول استخدام عناصر التعليم الالكتروني؟
   b. كيف بالإمكان استخدامها بطريقة أمثل؟

Test interview questions – version 3 (English)

1- Teaching practice/ style:
    a. How would you describe your teaching style? / how would you describe your teaching practice?
    b. How would e-learning affect your teaching style/ practice?
2- Beliefs about the components:

e-library:
Please rate each of the following items from 1 to 5 as one is lowest and five as highest:

Item	**1**	**2**	**3**	**4**	**5**
Usefulness					
Ease of use					
Peer influence					
School facilities					
Need of use					

e-Content:
Please rate each of the following items from 1 to 5 as one is lowest and five as highest:

Item	**1**	**2**	**3**	**4**	**5**
Usefulness					
Ease of use					
Peer influence					
School facilities					
Need of use					

LMS:
Please rate each of the following items from 1 to 5 as one is lowest and five as highest:

Item	**1**	**2**	**3**	**4**	**5**
Usefulness					
Ease of use					
Peer influence					
School facilities					
Need of use					

3- The specific usage of e-learning components:

a. How would you describe your usage of e-library?

b. How often do you use it?

Item	Once a year	Twice a year	3-6 times a year	6-10 times a year	More than 10 times a year
Frequency usage of e-library					

c. Is it enough?

d. How would you describe your usage of e-content?

e. How often do you use it?

Item	Once a year	Twice a year	3-6 times a year	6-10 times a year	More than 10 times a year
Frequency usage of e-Content					

f. Is it enough?

g. How would you describe your usage of LMS?

h. How often do you use it?

Item	Once a year	Twice a year	3-6 times a year	6-10 times a year	More than 10 times a year
Frequency usage of LMS					

i. Is it enough?

j. What factors might stand in your way of utilising them?

4- Combining beliefs and practices:

a. How would you describe your practices reflecting your beliefs in utilising e-learning components?

b. How would it be utilised in a better way?

Test interview questions – version 3 (Arabic)

أسئلة المقابلة

1- أسلوب التعليم، طريقته:
  a. كيف بإمكانك شرح طريقة وأسلوب تعليمك داخل الفصل؟
  b. كيف يمكن للتعليم الالكتروني أن يؤثر على طريقة وأسلوب تعليمك داخل الفصل؟
2- المعتقدات حول عناصر التعليم الالكتروني:

المكتبة الالكترونية:

قم بتقييم ما يلي من ١ الى ٥ حيث أن واحد هو الأقل وخمسة هو الأعلى:

العنصر	**١**	**٢**	**٣**	**٤**	**٥**
مدى فاعليته وفائدته					
سهولة استخدامه					
مدى تأثير الاخرين (مدير، زميل، غيره) عليك					
مدى جاهزية المدرسة من الناحية التقنية والخدمية					
الحاجة لاستخدام هذا العنصر					

المحتوى الالكتروني:

قم بتقييم ما يلي من ١ الى ٥ حيث أن واحد هو الأقل وخمسة هو الأعلى:

العنصر	**١**	**٢**	**٣**	**٤**	**٥**
مدى فاعليته وفائدته					
سهولة استخدامه					
مدى تأثير الاخرين (مدير، زميل، غيره) عليك					
مدى جاهزية المدرسة من الناحية التقنية والخدمية					
الحاجة لاستخدام هذا العنصر					

LMS:

قم بتقييم ما يلي من ١ الى ٥ حيث أن واحد هو الأقل وخمسة هو الأعلى:

العنصر	**١**	**٢**	**٣**	**٤**	**٥**
مدى فاعليته وفائدته					
سهولة استخدامه					
مدى تأثير الاخرين (مدير، زميل، غيره) عليك					
مدى جاهزية المدرسة من الناحية التقنية والخدمية					
الحاجة لاستخدام هذا العنصر					

a. المكتبة الالكترونية:
  i. ما هو تعليقك على مدى فاعليته وفائدته؟
  ii. كيف ترى سهولة استخدامه؟
  iii. كيف ممكن آن تعلق على مدى تأثير الاخرين (مدير، زميل، غيره) عليك؟
  iv. كيف ترى مدى جاهزية المدرسة من الناحية التقنية والخدمية؟
  v. ما رأيك في الحاجة لاستخدام هذا العنصر؟
b. المحتوى الالكتروني:
  i. ما هو تعليقك على مدى فاعليته وفائدته؟
  ii. كيف ترى سهولة استخدامه
  iii. كيف ممكن آن تعلق على مدى تأثير الاخرين (مدير، زميل، غيره) عليك؟
  iv. كيف ترى مدى جاهزية المدرسة من الناحية التقنية والخدمية؟
  v. ما رأيك في الحاجة لاستخدام هذا العنصر؟
c. LMS:
  i. ما هو تعليقك على مدى فاعليته وفائدته؟
  ii. كيف ترى سهولة استخدامه؟
  iii. كيف ممكن آن تعلق على مدى تأثير الاخرين (مدير، زميل، غيره) عليك؟
  iv. كيف ترى مدى جاهزية المدرسة من الناحية التقنية والخدمية؟
  v. ما رأيك في الحاجة لاستخدام هذا العنصر؟

3- الاستخدام العملي الدقيق لعناصر التعليم الالكتروني:

a. كيف ممكن ان تعبر عن استخدامك الشخصي للمكتبة الالكترونية؟

b. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟

العنصر	مرة واحدة فقط	مرتين	٣ إلى ٦ مرات	٦ إلى ١٠ مرات	أكثر من ١٠ مرات
كم عدد المرات التي تستخدمها					

c. هل هذا يكفي؟

d. كيف ممكن ات تعبر عن استخدامك الشخصي للمحتوى الالكتروني؟

e. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟

العنصر	مرة واحدة فقط	مرتين	٣ إلى ٦ مرات	٦ إلى ١٠ مرات	أكثر من ١٠ مرات
كم عدد المرات التي تستخدمها					

f. هل هذا يكفي؟

g. كيف ممكن ان تعبر عن استخدامك الشخصي للـ LMS؟

h. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟

العنصر	مرة واحدة فقط	مرتين	٣ إلى ٦ مرات	٦ إلى ١٠ مرات	أكثر من ١٠ مرات
عدد المرات التي تستخدمها					

i. هل هذا يكفي؟

j. ماهي العوامل التي قد تواجهها وتمنعك من حسن استخدام هذه العناصر؟

4- الدمج بين المعتقدات وأسلوب التدريس:

a. كيف بإمكانك شرح طريقة التدريس وترجمتها لاعتقاداتك حول استخدام عناصر التعليم الالكتروني؟

b. كيف بالإمكان استخدامها بطريقة أمثل؟

Version 4 of interview questions (English)

1- Teaching practice/ style:
   a. How would you describe your teaching style? / how would you describe your teaching practice?
   b. How would e-learning affect your teaching style/ practice?
2- Beliefs about the components:

LMS:
Please rate each of the following items from 1 to 5 as one is lowest and five as highest:

Item	**1**	**2**	**3**	**4**	**5**
Usefulness					
Ease of use					
Peer influence					
School facilities					
Need of use					

3- The specific usage of e-learning components:
   a. How would you describe your usage of LMS?
   b. How often do you use it?

Item	Once a year	Twice a year	3-6 times a year	6-10 times a year	More than 10 times a year
Frequency usage of LMS					

   c. Is it enough?

   d. What factors might stand in your way of utilising them?

4- Combining beliefs and practices:
   a. How would you describe your practices reflecting your beliefs in utilising e-learning components?
   b. How would it be utilised in a better way?

Version 4 of interview questions (Arabic)

أسئلة المقابلة

1- أسلوب التعليم، طريقته:
  a. كيف بإمكانك شرح طريقة وأسلوب تعليمك داخل الفصل؟
  b. كيف يمكن للتعليم الالكتروني أن يؤثر على طريقة وأسلوب تعليمك داخل الفصل؟
2- المعتقدات حول عناصر التعليم الالكتروني:

LMS:

قم بتقييم ما يلي من ١ الى ٥ حيث أن واحد هو الأقل وخمسة هو الأعلى:

العنصر	١	٢	٣	٤	٥
مدى فاعليته وفائدته					
سهولة استخدامه					
مدى تأثير الاخرين (مدير، زميل، غيره) عليك					
مدى جاهزية المدرسة من الناحية التقنية والخدمية					
الحاجة لاستخدام هذا العنصر					

3- الاستخدام العملي الدقيق لعناصر التعليم الالكتروني:

  a. كيف ممكن ان تعبر عن استخدامك الشخصي للـ LMS؟
  b. كم ما مدى استخدامك الكمي؟ كم مرة تستخدمه؟

العنصر	مرة واحدة فقط	مرتين	٣ إلى ٦ مرات	٦ إلى ١٠ مرات	أكثر من ١٠ مرات
كم عدد المرات التي تستخدمها					

  c. هل هذا يكفي؟
  d. ماهي العوامل التي قد تواجهها وتمنعك من حسن استخدام هذه العناصر؟

4- الدمج بين المعتقدات وأسلوب التدريس:
  a. كيف بإمكانك شرح طريقة التدريس وترجمتها لاعتقاداتك حول استخدام عناصر التعليم الالكتروني؟
  b. كيف بالإمكان استخدامها بطريقة أمثل؟

Version 5 – Final interview questions (English)

1- Teaching Practices' Routine:

a. How would you plan for your lessons?

b. How would you interact with the curriculum (learning/ revision) in planning and for delivery in classroom?

c. How do you manage your classroom?

d. What is your teaching practice/ pedagogy?

e. How would you describe students' assessment?

f. How would you describe home works, tests and quizzes?

g. How can you describe your technology integration in your teaching routine?

h. How would you classify your teaching practice, more of lecturing or constructivist approach?

i. what do you think about the potential of technology supporting/ reforming teaching and learning?

2- LMS:

a. What do you know about LMS? How can you explain it?

b. How often do you use it?

c. How would you describe your LMS experience?
(when, why, and how you use it)

d. How satisfied are you with using LMS?

e. What is your ideal situation in using LMS?

f. What factors affects your ideal situation?

g. Internal factors:
    i. Beliefs
    ii. Experience
    iii. Self-efficacy
    iv. IT skills
    v. Other

h. External factors:
    i. Ministry of Education's policy
    ii. School's Policy
    iii. Training
    iv. Resources (school facilities, internet connections, computers … etc.)
    v. Curriculum
    vi. Technological support
    vii. School management
    viii. Parents
    ix. Time
    x. Students

i. What would you suggest improving LMS integration?

j. How would you describe the necessity of LMS integration?

3- How did LMS impact your teaching routine?

Version 5 – Final interview questions (Arabic)

أسئلة المقابلة

1 - روتين التعليم:

a. كيف تحضر للدروس؟

b. كيف تتعامل مع المنهج (التعلم او المراجعة) للتحضير للدروس؟

c. كيف تدير الفصل الدراسي؟

d. ما هي الأساليب التي تستخدمها في تعليمك داخل الفصل؟

e. كيف يتم تقييم الطلاب؟

f. أخبرني أكثر عن الواجبات والاختبارات والتطبيقات؟

g. عبر عن استخدامك للتكنلوجيا ضمن روتينك التعليمي؟

h. كيف تصنف أسلوب تعليمك, مائل أكثر لأسلوب المحاضرات ام التعليم البنائي؟

i. ما قناعتك بمدى إمكانية التكنولوجيا في دعم او تحويل التعليم والتعلم؟

2 - LMS

a. ماذا تعرف عن الـ LMS؟

b. كم مرة تستخدم الـ LMS؟

c. عبر لي عن طريقة استخدامك للـ LMS وكيف كانت تجربتك؟
(متى، كيف ولماذا تستخدمه)

d. ما مدى رضاك حول استخدامك للـ LMS؟

e. ماهي الوضع الأمثل لاستخدام الـ LMS؟

f. ماهي العوائق التي تصعب من تحقيق الوضع الأمثل؟

g. عوائق داخلية:

i. قناعات شخصية

ii. قناعات تكنلوجية

iii. الخبرة

iv. الكفاءة الذاتية

v. مهارات تكنلوجيا المعلومات

vi. غيرهم

h. عوائق خارجية:

i. قوانين وضوابط الوزارة

ii. قوانين وضوابط المدرسة

iii. الدورات التعليمية والتدريبية

iv. الموارد (الانترنت، الاجهزة الالكترونية، مرفقات المدرسة ... غيرهم)

v. المنهج

vi. الدعم التقني والفني

vii. ادارة المدرسة

viii. أولياء الامور/ الوالدين

ix. الوقت

x. غيرهم

i. ماذا تقترح لتحسين وتطوير استخدام الـ LM؟

j. كيف تعبر عن أهمية استخدام الـ LMS؟

3 - كيف أثر الـ LMS على روتينك التعليمي؟

Interviews demographic page:

Faculty of Health & Life Sciences

Demographic information sheet

Research Title:

Please fill in the following:

Name	
Date of Birth	
Nationality	
School Name	
Years of Experience	
Teaching Stages	
Degree	

Question Guide

Participant (   )

Date   /   /

A.2: Codes (Strong vs issues and barriers)

Interview: 02

Strong attributes	Issues and barriers
2- Teaching strategies 3- Mixing teaching approaches 4- Beliefs towards technology 5- Experience 6- IT lab class 7- Satisfaction (Yrs. 10, 11)	14) Marks worth (quizzes, Yr. 12) 15) Motivating students (Yr. 12) 16) Marks worth (HW Yr. 12) 17) Student 18) Parent 19) Ease of use 20) In-class use of LMS (Yr. 12) 21) Satisfaction (Yr. 12) not useful

Interview: 03

Strong attributes	Issues and barriers
8- Technology usage 9- Teaching strategies 10- Mixing teaching approaches 11- Beliefs towards technology 12- IT lab class 13- LMS "class" effect on teaching 14- MoEd 15- Good Idea, difficult to implement = not successful 16- IT skills 17- Training 18- Self-efficacy	22) LMS system 23) System design 24) Policy (MoEd compulsory student usage of LMS) 25) LMS satisfaction 26) Marks Worth 27) System functionality 28) Motivating student 29) Student 30) IT lab class 31) Time and Workload 32) Parents 33) LMS is not useful to students

Interview: 04

Strong attributes	Issues and barriers
19- Technology usage 20- Online materials 21- Online resources 22- Mixing teaching strategies 23- Beliefs towards Technology 24- Belief towards "LMS idea" 25- System functionality 26- Self-efficacy 27- Experience 28- School context 29- IT skills 30- School admin 31- Training 32- LMS effect on teaching 33- Technical support 34- LMS system (compulsory usage)	34) Marks worth on HM 35) Administration (MoEd admin) 36) Student 37) Policy (printing!) 38) System functionality 39) System design 40) Parents 41) Internet connection 42) Motivating students 43) Ease of use 44) Time and workload 45) Policy (planning for full implementation gradually in stages)

Interview: 05

Strong attributes	Issues and barriers
35- Technology usage 36- LMS satisfaction 37- Communication 38- Experience 39- IT skills 40- Self-efficacy 41- Technical support	46) MoEd LMS support team 47) Policy (workload), documentation 48) Time and workload 49) Marks worth 50) Better implementation 51) Infrastructure 52) Internet connection 53) Teachers' motivation 54) Cultural shock 55) Training 56) Ease of use 57) System functionality 58) doing minimum work on LMS 59) parents 60) students 61) system design 62) motivating students 63) LMS effect on Teaching (put more pressure)

Interview: 06

Strong attributes	Issues and barriers
42- Technology usage 43- MoEd support (technologies available) 44- Online resources 45- Mixing teaching approaches 46- Beliefs towards technology 47- LMS importance 48- IT lab class 49- Beliefs towards LMS 50- IT skills 51- Training 52- Self-efficacy 53- Experience 54- Searching skill 55- System functionality 56- Internet connection 57- School admin 58- Technical support 59- System design 60- LMS satisfaction 61- LMS effect on teaching	64) LMS system 65) Parent 66) Curriculum (size) 67) Student (IT/ LMS skills) 68) Time and Workload 69) Policy 70) Marks worth 71) LMS at home 72) Policy (execution plan) 73) Motivating student

Interview: 07

Strong attributes	Issues and barriers
62- Technology usage 63- Online resources 64- Communication (through LMS) 65- IT class lab 66- School admin 67- LMS satisfaction 68- Time and workload 69- LMS functionality 70- Experience 71- Technical support 72- Training 73- Self-efficacy 74- IT skills 75- Student engagement (at school) 76- LMS effect on teaching	74) Parents 75) LMS at home 76) Students 77) Marks worth 78) Student engagement (at home) 79) Motivating students 80) Policy (execution plan) 81) Student (LMS skills) 82) Time and workload (at first years) 83) Training (class size)

Interview: 08

Strong attributes	Issues and barriers
77- technology usage 78- online resources 79- training 80- beliefs towards technology 81- communication 82- IT class lab 83- LMS effect on teaching 84- Online resources 85- LMS satisfaction (good) 86- IT skills 87- Training 88- Experience 89- Self-efficacy 90- School admin 91- Technical support 92- LMS effect on teaching	84) Policy (execution plan) 85) Policy (rapid update) 86) Policy (short period of usage) 87) Students (LMS skills) 88) LMS effect on teaching 89) Tim and work load 90) Curriculum (size) 91) Internet connection 92) Time and workload 93) Curriculum (updates) 94) MoEd policy (workload, documentation)

Interview: 09

Strong attributes	Issues and barriers
93- technology usage 94- beliefs towards technology 95- MoEd Support (technologies available) 96- Online resources 97- LMS effect on teaching 98- Ease of use 99- LMS satisfaction 100- Experience 101- Self-efficacy 102- System design 103- System functionality 104- Time (in some things) 105- Technical support 106- School admin 107- LMS system (importance) 108- LMS effect on teaching 109- Communication	95) Tablet availability 96) Consume in class time 97) Internet connection 98) Marks worth 99) Parents 100) Policy

A.3: Phase two

A nominal scale uses numbers as labels only, and could also use words or letters (Stevens, 1946). For example, a classroom number at a school such as 9-1 or 9-a, stands for year 9 students in classroom labelled 1. An example of using words is using names (Neuman, 2014).

An ordinal scale represents a ranking order (Boone, Jr & Boone, 2012; Neuman, 2014; Stevens, 1946), for example ranking the quality of 10 printers from highest to lowest, where number 1 stands for the highest quality printer and 10 the printer with the lowest quality. The difference in quality between the printers cannot be measured without additional data.

An interval scale has numerical data that can be measured and where the order matters, except for ratios. It has no true “0” starting point (Neuman, 2014). For example, temperature differences, a temperature of 0 °C is not the coldest temperature, as it could get colder with temperature such as -10 °C. Also, the difference here can be calculated; a 10 °C is the difference between 0 and -10 (Stevens, 1946).

A ratio scale is also one which has numerical data that can be measured and the order matters, and which also includes ratios and has a true “0” value (Neuman, 2014; Stevens, 1946). For example, students’ grades have a lowest point of “0” and cannot go lower than that. The higher the grade the higher in rank the student, hence order matters. Ratios are meaningful with this scale, for example student A had a grade of 80 and student B had a grade of 40, it can be measured that student A scored twice as much as Student B.

Version 1 of survey questionnaire (English)

The design of the survey instrument is based on the findings from data collected and analysed in the qualitative phase.

Survey Questions

1. Demographics information
    a. How many years have you worked as a teacher?
    b. How long have you been a teacher in Qatar?
    c. What is your nationality?
    d. Which age years are you teaching?
    e. What is your school name?
    f. What is your Gender?
    g. What is your age range?
    h. What subject/s do you teach?

2. Learning Management System
    a. To what extent to you agree or disagree with the following statements about the LMS system in general,
        i. It is useful for teachers to use for administrative tasks
        ii. It is useful for teachers to use for teaching practices
        iii. It helps students learning
        iv. It is easy to use
        v. It is reliable to use
    b. In terms of the system's design, to what extent do you agree or disagree with the following statements,
        i. The design is complex to work with
        ii. The system design is educational
        iii. The system design motivates students and teachers to use
        iv. The system design is competitive to other software such as WhatsApp
    c. In terms of the system functionalities, please choose all applicable functions you use
        i. Communication
        ii. Uploading materials and links
        iii. Online quizzes
        iv. Online Homework
        v. Share lesson plans
        vi. Customized
        vii. Auto-correcting
        viii. Other, ………
    d. If there are other functionalities that you use, please type them in the space below
    ………………………………………………………………………………
    ………………………………………………………………………………
    ………………………………………………………………………………
    ………………………………………………………………………………
    ………………………………………………………………………………
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e. In terms of communication, how often do you communicate with the following stakeholders, please chose only one
    i. Students (1/w at least, 1/m, 1/s, 1/y, never)
    ii. Parents
    iii. Colleagues
    iv. School administration
    v. MoEd

3. Personal Factors
    a. To what extent do you agree or disagree with the following statements
        i. I believe that LMS is useful for me to integrate in my practice
        ii. I am confident in my IT skills
        iii. I am confident in my LMS skills
        iv. I had the experience to work with LMS successfully from the beginning
        v. I gained the experience to use LMS with time

4. Students
    a. To what degree do you agree or disagree with the following statements about students and LMS,
        i. Students have the necessary skills to use the LMS
        ii. Students are motivated to use the LMS
        iii. Students have access to the internet at home
        iv. Students engage with the LMS at home
        v. Students engage with the LMS at school
        vi. Students believe that LMS will enhance their learning
        vii. Students in year 10 engage with the LMS for learning
        viii. Students in year 11 engage with the LMS for learning
        ix. Students in years 12 engage with the LMS for learning

5. Parents
    a. To what degree do you agree or disagree with the following statements about parents and LMS,
        i. Parents believe that LMS is useful for their children's learning
        ii. Parent provide the support needed for their children at home to use LMS

6. MoEd
    a. To what extent do you agree or disagree with the following statements about the MoEd Support of LMS
        i. The MoEd provide LMS experts to support LMS users' successful integration
        ii. LMS experts are quick in dealing with issues reported by users
        iii. MoEd should have continued providing tablets to students
        iv. Students with tablets would have better LMS integration
        v. MoEd provides sufficient training about LMS usage
        vi. MoEd LMS training courses are deep enough to be an expert with LMS
    b. To what extent do you agree or disagree with the following statements about MoEd's policies and LMS,
        i. MoEd's policies supports successful LMS integration
        ii. LMS policies of minimum LMS usage supports my teaching practice

iii. LMS policies brings too many administrative tasks that hinders my LMS usage for practice
iv. Those administrative tasks consume too much time and effort
v. MoEd's LMS policies affects my time in relation to covering the rapid changing curricula
vi. LMS integration by me and students mark worth is not sufficient compared to how MoEd is insisting on using the system

c. To what extent do you agree or disagree with the following statements related to IT lab class
    i. IT lab class is important for student's learning
    ii. IT lab class assist me in my practice
    iii. IT lab class waste my teaching time
    iv. IT lab class motivates student to use LMS
    v. IT lab class waste students in year 12's time
    vi. IT lab class is used to force students to use LMS
    vii. IT lab classes has a high occurrence frequency

Survey questionnaire – version 2 (English)

The design of the survey instrument is based on the findings from data collected and analysed in the qualitative phase.

Survey Questions

7. Demographics information

element	Answer				
How many years have you worked as a teacher?					
How long have you been a teacher in Qatar?					
What is your nationality?					
Which age years are you teaching?					
What is your school name?					
What is your Gender?	Female		Male		
What is your age range?	21 or less	22-31	32-41	42-51	52 or more
What subject/s do you teach?					

8. Learning Management System
   a. To what extent to you agree or disagree with the following statements about the LMS system in general,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It is useful for teachers to use for administrative tasks					
It is useful for teachers to use for teaching practices					
It helps students learning					
It is easy to use					
It is reliable to use					

   b. In terms of the system's design, to what extent do you agree or disagree with the following statements,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The design is complex to work with					
The system design is educational					
The system design motivates students and teachers to use					

The system design is competitive to other software such as WhatsApp					

c. In terms of the system functionalities, please choose all applicable functions you use or have used
   i. Communication
   ii. Uploading materials and links
   iii. Online quizzes
   iv. Online Homework
   v. Share lesson plans
   vi. Customised online one-to-one teaching
   vii. Auto-correcting
   viii. Creating questions in questions bank
   ix. Other, ………

d. If there are other functionalities that you use, please type them in the space below
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e. In terms of communication, how often do you communicate with the following stakeholders using LMS, please chose only one

Element	Once per week	Once per month	Once per semester	Once per year	Never
Student					
Parent					
Colleagues					
School Administration					
MoEd					

f. Please rate each of the following LMS related functionalities ease or difficulty of use

Element	Easy	Normal	Difficult	N/A
Communication				
Uploading materials and links				
Online Quizzes				
Online Homework				
Sharing lesson plans				
Customised online one-to-one teaching				
Auto-correcting				
Creating Questions in question bank				
………..				
………..				
………..				

9. Personal Factors
    a. To what extent do you agree or disagree with the following statements

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe that LMS is useful for me to integrate in my practice					
I am confident in my IT skills					
I am confident in my LMS skills					
I had the experience to work with LMS successfully from the beginning					
I gained the experience to use LMS with time					

10. Students
    a. To what degree do you agree or disagree with the following statements about students and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Students have the necessary skills to use the LMS					
Students are motivated to use the LMS					
Students have access to the internet at home					
Students engage with the LMS at home					
Students engage with the LMS at school					
Students believe that LMS will enhance their learning					
Students in year 10 engage with the LMS for learning					
Students in year 11 engage with the LMS for learning					
Students in years 12 engage with the LMS for learning					

11. Parents
    a. To what degree do you agree or disagree with the following statements about parents and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Parents believe that LMS is useful for their children's learning					
Parent provide the support needed for their children at home to use LMS					

12. MoEd
    a. To what extent do you agree or disagree with the following statements about the MoEd Support of LMS

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The MoEd provide LMS experts to support LMS users' successful integration					
LMS experts are quick in dealing with issues reported by users					
MoEd should have continued providing tablets to students					
Students with tablets would have better LMS integration					
MoEd provides sufficient training about LMS usage					
MoEd LMS training courses are deep enough to be an expert with LMS					

    b. To what extent do you agree or disagree with the following statements about MoEd's policies and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
MoEd's policies supports successful LMS integration					
LMS policies of minimum LMS usage supports my teaching practice					
LMS policies brings too many administrative					

tasks that hinders my LMS usage for practice					
Those administrative tasks consume too much time and effort					
MoEd’s LMS policies affects my time in relation to covering the rapid changing curricula					
LMS integration by me and students mark worth is not sufficient compared to how MoEd is insisting on using the system					

c. To what extent do you agree or disagree with the following statements related to IT lab class

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
IT lab class is important for student’s learning					
IT lab class assist me in my practice					
IT lab class waste my teaching time					
IT lab class motivates student to use LMS					
IT lab class waste students in year 12’s time					
IT lab class is used to force students to use LMS					
IT lab classes has a high occurrence frequency					

Survey Questionnaire – version 3 (English)

The design of the survey instrument is based on the findings from data collected and analysed in the qualitative phase.

Survey Questions

1. Demographics information

<table>
<tr><td>element</td><td colspan="30">Answer</td></tr>
<tr><td>How long have you been a teacher in Qatar?</td><td colspan="30"></td></tr>
<tr><td>What is your nationality?</td><td colspan="30"></td></tr>
<tr><td>Which age years are you teaching?</td><td colspan="10">10</td><td colspan="10">11</td><td colspan="10">12</td></tr>
<tr><td>What is your school name?</td><td colspan="30"></td></tr>
<tr><td>What is your Gender?</td><td colspan="15">Female</td><td colspan="15">Male</td></tr>
<tr><td>What is your age range?</td><td colspan="6">21 or less</td><td colspan="6">22-31</td><td colspan="6">32-41</td><td colspan="6">42-51</td><td colspan="6">52 or more</td></tr>
<tr><td>What subject/s do you teach?</td><td colspan="10"></td><td colspan="10"></td><td colspan="10"></td></tr>
</table>

2. Learning Management System
   a. To what extent to you agree or disagree with the following statements about the LMS system in general,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It is useful for teachers to use for administrative tasks					
It is useful for teachers to use for teaching practices					
It helps students learning					
It is easy to use					
It is reliable to use					

   b. In terms of the system's design, to what extent do you agree or disagree with the following statements,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The design is complex to work with					
The system design is educational					
The system design motivates students and teachers to use					
The system design is competitive to other software such as WhatsApp					

c. In terms of the system functionalities, please choose all applicable functions you use or have used
    i. Communication
    ii. Uploading materials and links
    iii. Online quizzes
    iv. Online Homework
    v. Share lesson plans
    vi. Customised online one-to-one teaching
    vii. Auto-correcting
    viii. Creating questions in questions bank
    ix. Other, ………

d. If there are other functionalities that you use, please type them in the space below
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e. In terms of communication, how often do you communicate with the following stakeholders using LMS, please chose only one

Element	Once per week	Once per month	Once per semester	Once per year	Never
Student					
Parent					
Colleagues					
School Administration					
MoEd					

f. Please rate each of the following LMS related functionalities' ease or difficulty of use

Element	Easy	Normal	Difficult	N/A
Communication				
Uploading materials and links				
Online Quizzes				
Online Homework				
Sharing lesson plans				
Customised online one-to-one teaching				
Auto-correcting				
Creating Questions in question bank				
………..				
………..				
………..				

3. Personal Factors
    a. To what extent do you agree or disagree with the following statements about yourself and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe that LMS is useful for me to integrate in my practice					
I am confident in my IT skills					
I am confident in my LMS skills					
I had the experience to work with LMS successfully from the beginning					
I gained the experience to use LMS with time					

4. Students
    a. To what degree do you agree or disagree with the following statements about students and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Students have the necessary skills to use the LMS					
Students are motivated to use the LMS					
Students have access to the internet at home					
Students engage with the LMS at home					
Students engage with the LMS at school					
Students believe that LMS will enhance their learning					
Students in year 10 engage with the LMS for learning					
Students in year 11 engage with the LMS for learning					
Students in years 12 engage with the LMS for learning					

5. Parents
    a. To what degree do you agree or disagree with the following statements about parents and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Parents believe that LMS is useful for their children's learning					
Parent provide the support needed for their children at home to use LMS					

6. School Admin
   a. To what degree do you agree or disagree with the following statements about the school administration and the LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
School administration supports LMS integration					
School administration provide enough in-house LMS training for teachers					
School Administration manages IT lab classes					
School administration have control over teacher's LMS integration					
School Administration enforce their own policies on LMS integration					

7. MoEd
   a. To what extent do you agree or disagree with the following statements about the MoEd Support of LMS

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The MoEd provide LMS experts to support LMS users' successful integration					
LMS experts are quick in dealing with issues reported by users					
MoEd should have continued providing tablets to students					
Students with tablets would have better LMS integration					

MoEd provides sufficient training about LMS usage					
MoEd LMS training courses are deep enough to be an expert with LMS					

b. To what extent do you agree or disagree with the following statements about MoEd's policies and LMS,

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
MoEd's policies supports successful LMS integration					
LMS policies of minimum LMS usage supports my teaching practice					
LMS policies brings too many administrative tasks that hinders my LMS usage for practice					
Those administrative tasks consume too much time and effort					
MoEd's LMS policies affects my time in relation to covering the rapid changing curricula					
LMS integration by me and students mark worth is not sufficient compared to how MoEd is insisting on using the system					

c. To what extent do you agree or disagree with the following statements related to IT lab class and LMS

Element	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
IT lab class is important for student's learning					
IT lab class assist me in my practice					
IT lab class waste my teaching time					
IT lab class motivates student to use LMS					

IT lab class waste students in year 12's time					
IT lab class is used to force students to use LMS					
IT lab classes has a high occurrence frequency					
IT lab class is supported by school Administration					

Thank you for your precious time and effort

Survey questionnaire – version 3 (Arabic)

تصميم وانشاء الاستبيان اعتمد على البيانات المجمعة والمحللة من المرحلة الأولى في تجميع البيانات من البحث

أسئلة الاستبيان:

8. المعلومات الديموغرافية:

العنصر	الجواب				
كم سنة خبرة في التدريس لديك في قطر؟					
ما هي جنسيتك؟					
أي المراحل الدراسية تُدَرّس/ تُدَرّسين؟	١٠		١١		١٢
في أي مدرسة تعمل/ تعملين؟					
في أي الخانات يقع عمرك؟	٢١ او أقل	٢٢ - ٣١	٣٢ - ٤١	٤٢-٥١	٥٢+
ما هي المواد التي تُدَرّسها/ تُدَرّسينها؟					

9. نظام إدارة المعلومات (LMS)

a. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة حول نظام إدارة المعلومات (LMS) بشكلٍ عام؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
هو مفيد للمعلمين/ للمعلمات للاستخدام في المهام الإدارية					
هو مفيد للمعلمين/ للمعلمات للاستخدام في عملية التعليم					
هو مساعد لعملية التعلم للطلاب					
هو سهل الاستخدام					
يمكن الاعتماد عليه للاستخدام في عملية التعليم (بمعنى مشاكله في الاستخدام قليلة او لا توجد)					

b. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة حول تصميم نظام إدارة المعلومات (LMS)؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
الLMS مصمم بطريقة يصعب استخدامه					
الLMS مصمم بطريقة تعليمية (يساعد في تعلم الطالب)					
تصميم ال LMS يدفع ويحفز المعلمين والطلاب للاستخدام					
تصميم ال LMS على مستوى منافس للنظم المشابهة مثل ال WhatsApp					

c. بالإشارة الى الخدمات المرتبطة بنظام ال LMS، الرجاء اختيار كل الخدمات التي تم استخدامها

i. التواصل
ii. رفع المواد, الانشطة والروابط التعليمية
iii. الاختبارات القصيرة الالكترونية (Quizzes)
iv. الواجبات الالكترونية
v. مشاركة تحضير الدروس مع باقي المعلمين الكترونياً
vi. تخصيص مواد تعليم فردية الكترونية حسب احتياج الطالب/ الطالبة
vii. التصحيح الذاتي (الكترونياً)
viii. كتابة أسئلة الكترونية وتخزينها في بنك الأسئلة
ix. غيرهم, يرجى كتابتها في المساحة المفتوحة في الأسفل

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....
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....

d. بالإشارة الى خدمة التواصل عن طريق الLMS, يرجى اختيار الحد الادنى تقريباً الذي يتم به التواصل مع عناصر التعليم الرئيسية التالية, يرجى اختيار جواب واحد لكل عنصر.

العنصر	مرة في الاسبوع	مرة في الشهر	مرة في الفصل	مرة في السنة	ولا مرة
الطالب					
ولي الامر					
الزملاء المعلمين					
إدارة المدرسة					
وزارة التعليم					

e. يرجى تقييم مدى صعوبة او سهولة استخدام كلٍّ من الخدمات الالكترونية (المرتبطة بالLMS) التالية:

العنصر	سهل	معتدل	صعب	لا يوجد (لا يمكن تطبيقه)
التواصل				
رفع المواد, الانشطة والروابط التعليمية				
الاختبارات القصيرة الالكترونية (Quizzes)				
الواجبات الالكترونية				
مشاركة تحضير الدروس مع باقي المعلمين الكترونياً				
تخصيص مواد تعليم فردية الكترونية حسب احتياج الطالب/ الطالبة				
التصحيح الذاتي (الكترونياً)				
كتابة أسئلة الكترونية وتخزينها في بنك الأسئلة				
....				
....				

………..				

10. العنااصر الذاتية (الشخصية)

a. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بك وعلاقتك بنظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
أنا أؤمن أن استخدام نظام الLMS يفيدني في عمليتي التعليمية					
أنا واثق/ واثقة من مهاراتي في استخدام تكنلوجيا المعلومات					
أنا على ثقة من مهاراتي لاستخدام نظام الLMS					
كانت لدي المهارات الكافية لاستخدام نظام الLMS منذ بدايته					
مع مرور الوقت اكتسبت الخبرة اللازمة لاستخدام نظام الLMS					

11. الطلاب

a. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بالطالب وعلاقته بنظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
يمتلك الطلاب المهارات اللازمة لاستخدام نظام الLMS					
الطلاب متحفزون لاستخدام نظام الLMS					
الطلاب لديهم اتصال بالإنترنت في البيت					
الطلاب يستخدمون نظام الLMS في البيت					
الطلاب يستخدمون نظام الLMS في المدرسة					
الطلاب يؤمنون أن نظام الLMS سيحسن من عملية تعلمهم					
طلاب مرحلة الصف العاشر يستخدمون نظام الLMS					
طلاب مرحلة الصف الحادي عشر يستخدمون نظام الLMS					
طلاب مرحلة الصف الثاني عشر يستخدمون نظام الLMS					

12. أولياء الأمور

a. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بأولياء الأمور وعلاقتهم بنظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
أولياء الأمور يؤمنون أن نظام الLMS مفيد لعملية تعلم ابنائهم					
أولياء الأمور يوفرون الدعم اللازم لأبنائهم في استخدام نظام الLMS في البيت					

13. إدارة المدرسة

a. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بإدارة المدرسة وعلاقتها بنظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
إدارة المدرسة تدعم استخدام نظام الLMS					
إدارة المدرسة توفر الدورات اللازمة للمعلمين لتعلم استخدام نظام الLMS					
إدارة المدرسة تدير حصص التعليم الالكتروني (الحصص النموذجية)					
إدارة المدرسة تتحكم في مدى استخدام المعلمين لنظام الLMS					
إدارة المدرسة تُلزم المعلمين بقوانينها وضوابطها الخاصة تجاه استخدام نظام الLMS					

14. وزارة التعليم والتعليم العالي

a. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بوزارة التعليم ودعمها لنظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
الوزارة توفر خبراء نظام الLMS اللازمين لدعم المستخدمين (المعلمين/ المعلمات) لحسن استغلال نظام الLMS للعملية التعليمية					
خبراء نظام الLMS ليدهم سرعة تجاوب وحلول للمشاكل المبلغ عنها من قِبَلْ المستخدمين					

على الوزارة استكمال واستمرار توزيع أجهزة الtablets على الطلاب					
امتلاك الطلاب لأجهزة الtablets يرفع من نسبة الاستفادة من نظام الLMS					
الوزارة توفر الدورات والورش الكافية للمعلمين لتعلم استخدام نظام الLMS					
الدورات والورش التي تقدمها الوزارة فيها العمق الكافي من المعلومات لاستخدام نظام الLMS بشكل احترافي					

b. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بضوابط وقوانين وزارة التعليم تجاه نظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة
ضوابط وقواني الوزارة تدعم الاستخدام الناجح لنظام الLMS					
متطلب الاستخدام الأدنى للLMS (واجب/ واجبين و تطبيق في الأسبوع) يدعم عملية تعليمي					
ضوابط وقوانين الوزارة تجاه استخدام نظام الLMS تضيف علي واجبات إدارية الكترونية تعطل عملية التعليم لدي					
هذه الواجبات الإدارية الالكترونية تأخذ جهد ووقت كبير مني					
ضوابط الوزارة تجاه استخدام نظام الLMS تشغلني عن تغطية المنهج المتغير					
حرص الوزارة الشديد على استخدام نظام الLMS لا يتناسب مع كم الدرجات المحسوبة على استخدامه من قِبَل المعلمين والطلاب					

c. إلى أي مدى تتفق/ تتفقين او لا تتفق/ لا تتفقين مع كلٍّ من الجمل الآتية المتعلقة بحصص التعليم الالكتروني (الحصص النموذجية) ونظام الLMS؟

العنصر	لا اتفق بشدّة	لا اتفق	معتدل	اتفق	اتفق بشدّة

					حصص التعليم الالكتروني مهمة لعملية تعلم الطلاب
					حصص التعليم الالكتروني تساعدني في عملية التعليم
					حصص التعليم الالكتروني تهدر وقت عملية تعليمي
					حصص التعليم الالكتروني تحفز الطلاب لاستخدام نظام الLMS
					حصص التعليم الالكتروني تهدر وقت التعلم لطلاب مرحلة الصف الثاني عشر
					حصص التعليم الالكتروني تستخدم لإجبار الطلاب على استخدام نظام الLMS
					عدد حصص التعليم الالكتروني للفصل كثيرة خلال العام الدراسي
					إدارة المدرسة تدعم حصص التعليم الالكتروني

شكراً جزيلاً لوقتكم وبذلكم في تعبئة هذا الاستبيان وجزاكم الله خيراً

Online Survey questionnaire – final version (Arabic)

LMS Qatar

المقدمة

أشـكر لكم مقدماً المشاركة في هذا الاسـتبيان المتواضـع٬ والـذي يرتكز حول العوامل المؤثرة على اسـتخدام نظام ال LMS لدى المعلمين والمعلمات في المرحلـة الثانويـة في قطر، حيث يسـلط الضوء على بعض العوامل الرئيسـية الـتي تـم اكتشافهـا خلاـل المقابلاـت الفرديــة الـتي أقيمـت قبـل انشـاء هـذا الاستبيان لمعرفة مدى تأثيرها وعلاقاتها ببعضها.

هـذا الاسـتبيان هو جزء من بحثي الـدكتوراه، ويعتبر المرحلة الثانية في خطوة تجميع البيانات حول الموضوع المذكور.

لكـم مطلـق الحريـة في المشاركـة، وبالامكـان التوقـف في اي وقـت وعـدم الاسـتمرار. جميع البيانات سـتحفظ بكامل السرية مع الباحث ومشرف البحث (اذا تطلب الامر ذلك).

يرجى الضغط على زر "موافق" لإعطاء الموافقه والبدء في الإستبيان.

1

LMS Qatar

معلومات عامة

1.

كم عدد سنوات الخبرة لديك في التدريس في قطر؟

- 0-5
- 6-10
- 11-15
- +16

2.

ما هي جنسيتك؟

3.

أي المراحل الدراسية تُدَرّس/ تُدَرّسين؟

- ١٠
- ١١
- ١٢

4.

في أي مدرسة تعمل/ تعملين؟

2

5.

في أي الفئات يقع عمرك؟

- ٢١ او أقل
- ٢٢ - ٣١
- ٣٢ - ٤١
- ٤٢-٥١
- ٥٢+

6.

ما هي المواد التي تدرِّسها/ تدرِّسينها؟

أحياء	لغة عربية	
العلوم اجتماعية	تربية اسلامية	
لغة انجليزية	رياضيات	
تكنولوجيا المعلومات	كيمياء	
المواد الاختيارية	فيزياء	

3

LMS Qatar
نظام ادارة المعلومات (LMS)

7.
إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة حول نظام إدارة المعلومات (LMS) بشكلٍ عام؟

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
هو مفيد للمعلمين/ للمعلمات للاستخدام في المهام الإدارية	○	○	○	○	○
هو مفيد للمعلمين/ للمعلمات للاستخدام في عملية التعليم	○	○	○	○	○
هو مساعد لعملية تعلم للطلاب	○	○	○	○	○
هو سهل الاستخدام	○	○	○	○	○
المشاكل التقنية في الاستخدام قليلة ويمكن الاعتماد عليه في عملية التعليم	○	○	○	○	○

4

8.

إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة حول تصميم نظام إدارة المعلومات (LMS)؟

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
ال LMS مصمم بطريقة يصعب استخدامه	○	○	○	○	○
ال LMS مصمم بطريقة تعليمية (يساعد في تعلم الطالب)	○	○	○	○	○
تصميم ال LMS يدفع ويحفز المعلمين والطلاب للاستخدام	○	○	○	○	○
تصميم ال LMS على مستوى منافس للنظم الاخرى المشابهة مثل ال Blackboard	○	○	○	○	○
نظام التواصل في ال LMS مصمم على مستوى منافس للنظم المشابهة مثل ال WhatsApp	○	○	○	○	○

9.

بالإشارة الى الخدمات المرتبطة بنظام ال LMS، الرجاء اختيار كل الخدمات التي تم استخدامها

- ☐ مشاركة تحضير الدروس مع باقي المعلمين الكترونياً
- ☐ التواصل
- ☐ تخصيص مواد تعليمية فردية الكترونية حسب احتياج الطالب/ الطالبة
- ☐ رفع المواد، الانشطة والروابط التعليمية
- ☐ الاختبارات القصيرة الالترونية (Quizzes)
- ☐ التصحيح الذاتي (الكترونياً)
- ☐ الواجبات الالكترونية
- ☐ كتابة اسئلة الكترونية وتخزينها في بنك الاسئلة

أخرى - يرجى التحديد

10.

بالإشارة الى خدمة التواصل عن طريق ال'LMS يرجى اختيار الحد الادنى تقريباً الذي يتم به التواصل مع عناصر التعليم الرئيسية التالية' يرجى اختيار جواب واحد لكل عنصر

	مرة واحدة في الاسبوع	مرة واحدة في الشهر	مرة واحدة في الفصل	مرة واحدة في السنة	ولا مرة
الطالب	○	○	○	○	○
ولي الأمر	○	○	○	○	○
الزملاء الملعمين/ المعلمات	○	○	○	○	○
إدارة المدرسة	○	○	○	○	○
وزارة التعليم والتعليم العالي	○	○	○	○	○

6

11.

يرجى تقييم مدى صعوبة او سهولة استخدام كلٍّ من الخدمات الالكترونية (المرتبطة بالLMS) التالية:

	سهل	معتدل	صعب	لا يستخدم
رفع المواد، الانشطة والروابط التعليمية	○	○	○	○
الاختبارات القصيرة الالكترونية (Quizzes)	○	○	○	○
الواجبات الالكترونية	○	○	○	○
مشاركة تحضير الدروس مع باقي المعلمين الكترونياً	○	○	○	○
تخصيص مواد تعليم فردية الكترونية حسب احتياج الطالب/ الطالبة	○	○	○	○
التصحيح الذاتي (الكترونياً)	○	○	○	○
كتابة أسئلة الكترونية وتخزينها في بنك الأسئلة	○	○	○	○

أخرى - يرجى التحديد مع التقييم

LMS Qatar
العناصر الذاتية

12.
إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة بك وعلاقتك بنظام الLMS؟

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
أنا أؤمن أن استخدام نظام الLMS يفيدني في عمليتي التعليمية	○	○	○	○	○
أنا واثق/ واثقة من مهاراتي في استخدام تكنولوجيا المعلومات	○	○	○	○	○
أنا على ثقة من مهاراتي لاستخدام نظام الLMS	○	○	○	○	○
كانت لدي المهارات الكافية لاستخدام نظام الLMS منذ بدايته	○	○	○	○	○
مع مرور الوقت اكتسبت الخبرة اللازمة لاستخدام نظام الLMS	○	○	○	○	○

8

LMS Qatar
أولياء الأمور

14.
إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة بأولياء الأمور وعلاقتهم بنظام الLMS؟

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
أولياء الأمور يؤمنون أن نظام الLMS مفيد لعملية تعلم ابنائهم	○	○	○	○	○
أولياء الأمور يوفرون الدعم اللازم لأبنائهم في استخدام نظام الLMS في البيت	○	○	○	○	○

10

LMS Qatar
إدارة المدرسة

15.
إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة بإدارة المدرسة وعلاقتها بنظام الLMS؟

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
إدارة المدرسة تدعم استخدام نظام الLMS	○	○	○	○	○
إدارة المدرسة توفر الدورات اللازمة للمعلمين لتعلم استخدام نظام الLMS	○	○	○	○	○
إدارة المدرسة تدير حصص التعليم الالكتروني (الحصص النموذجية)	○	○	○	○	○
إدارة المدرسة تتحكم في مدى استخدام المعلمين لنظام الLMS	○	○	○	○	○
إدارة المدرسة تُلزم المعلمين بقوانينها وضوابطها الخاصة تجاه استخدام نظام الLMS	○	○	○	○	○

16.

إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة بوزارة التعليم ودعمها لنظام الLMS؟

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
الوزارة توفر خبراء نظام الLMS اللازمين لدعم المستخدمين (المعلمين/ المعلمات) لحسن استغلال نظام الLMS للعملية التعليمية	○	○	○	○	○
خبراء نظام الLMS ليدهم سرعة تجاوب وحلول للمشاكل المبلغ عنها من قِبَلْ المستخدمين	○	○	○	○	○
على الوزارة استكمال واستمرار توزيع أجهزة الtablets على الطلاب	○	○	○	○	○
امتلاك الطلاب لأجهزة الtablets يرفع من نسبة الاستفادة من نظام الLMS	○	○	○	○	○
الوزارة توفر الدورات والورش الكافية للمعلمين لتعلم استخدام نظام الLMS	○	○	○	○	○
الدورات والورش التي تقدمها الوزارة فيها العمق الكافي من المعلومات لاستخدام نظام الLMS بشكل احترافي	○	○	○	○	○

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17.

إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة بضوابط وقوانين وزارة التعليم تجاه نظام الLMS

	اتفق بشدة	اتفق	معتدل	لا اتفق	لا اتفق بشدة
ضوابط وقواني الوزارة تدعم الاستخدام الناجح لنظام الLMS	○	○	○	○	○
متطلب الاستخدام الأدنى للLMS (واجب/ واجبين و تطبيق في الأسبوع) يدعم عملية تعليمي	○	○	○	○	○
ضوابط وقوانين الوزارة تجاه استخدام نظام الLMS تضيف علي واجبات إدارية الكترونية تعطل عملية التعليم لدي	○	○	○	○	○
هذه الواجبات الإدارية الالكترونية تأخذ جهد ووقت كبير مني	○	○	○	○	○
ضوابط الوزارة تجاه استخدام نظام الLMS تشغلني عن تغطية المنهج المتغير	○	○	○	○	○
حرص الوزارة الشديد على استخدام نظام الLMS لا يتناسب مع كم الدرجات المحسوبة على استخدامه من قِبَل المعلمين والطلاب	○	○	○	○	○

14

18.

إلى أي مدى تتفق/ تتفقين مع كلٍّ من الجمل الآتية المتعلقة بحصص التعليم الالكتروني (الحصص النموذجية) ونظام الLMS

	لا اتفق بشدة	لا اتفق	معتدل	اتفق	اتفق بشدة
حصص التعليم الالكتروني مهمة لعملية تعلم الطلاب	○	○	○	○	○
حصص التعليم الالكتروني تساعدني في عملية التعليم	○	○	○	○	○
حصص التعليم الالكتروني تهدر وقت عملية تعليمي	○	○	○	○	○
حصص التعليم الالكتروني تحفز الطلاب لاستخدام نظام الLMS	○	○	○	○	○
حصص التعليم الالكتروني تهدر وقت التعلم لطلاب مرحلة الصف الثاني عشر	○	○	○	○	○
حصص التعليم الالكتروني تستخدم لإجبار الطلاب على استخدام نظام الLMS	○	○	○	○	○
عدد حصص التعليم الالكتروني للفصل كثيرة خلال العام الدراسي	○	○	○	○	○
إدارة المدرسة تدعم حصص التعليم الالكتروني	○	○	○	○	○

15

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Appendix B

This appendix has copies of consent forms, information sheets used and other related documents.

Faculty of Health & Life Sciences

A GENERIC INFORMED CONSENT FORM

Project Title: ______________________________________

Principal Investigator: ______________________________

Please tick or initial where applicable

I have carefully read and understood the Participant Information Sheet.	☐
I have had an opportunity to ask questions and discuss this study and I have received satisfactory answers.	☐
I understand I am free to withdraw from the study at any time, without having to give a reason for withdrawing, and without prejudice.	☐
I agree to take part in this study.	☐

Signature of participant... Date.....………………….. (NAME IN BLOCK LETTERS)..………………………
Signature of Parent / Guardian in the case of a minor ....
Signature of researcher... Date.....………………….. (NAME IN BLOCK LETTERS)..………………………

northumbria
UNIVERSITY NEWCASTLE
Faculty of Health & Life Sciences

FOR USE WHEN PHOTOGRAPHS/VIDEOS/TAPE RECORDINGS WILL BE TAKEN

Project title: ___________________________________

Principal Investigator: ______________________

I hereby confirm that I give consent for the following recordings to be made:

Recording	Purpose	Consent
voice recordings	To capture all data carefully to inform on input	

Clause A: I understand that other individuals may be exposed to the recording(s) and be asked to provide ratings/judgments. The outcome of such ratings/judgments will not be conveyed to me. My name or other personal information will never be associated with the recording(s).

Tick or initial the box to indicate your consent to Clause A ☐

Clause B: I understand that the recording(s) may also be used for teaching/research purposes and may be presented to students/researchers in an educational/research context. My name or other personal information will never be associated with the recording(s).

Tick or initial the box to indicate your consent to Clause B ☐

Clause C: I understand that the recording(s) may be published in an appropriate journal/textbook or on an appropriate Northumbria University webpage, **which would automatically mean that the recordings would potentially be available worldwide**. My name or other personal information will never be associated with the recording(s). I understand that I have the right to withdraw consent at any time prior to publication, but that once the recording(s) are in the public domain there may be no opportunity for the effective withdrawal of consent

Tick or initial the box to indicate your consent to Clause C ☐

Signature of participant.. Date.....………………..

Signature of Parent / Guardian in the case of a minor

.... Date.....………………..

Signature of researcher.. Date.....………………..

Faculty of Health & Life Sciences

Study Title: Qatar's e-learning Project: LMS impact on teachers' teaching process

Investigator: Saoud Jamali

Participant Information Sheet

You are being invited to take part in this research study. Before you decide it is important for you to read this leaflet so you understand why the study is being carried out and what it will involve.

Reading this leaflet, discussing it with others or asking any questions you might have will help you decide whether or not you would like to take part.

<u>What is the Purpose of the Study</u>

The research aims to understand the impact of LMS integration on Qatar's male physics teachers' teaching process. To conclude if the e-learning system was useful and successfully integrated.

<u>Why have I been invited?</u>

Because you are a qualified teacher with the expertise in the field and teaching within the years range of this research. In addition to using e-learning element (LMS) in your teaching and learning complying with e-learning system in Qatar.

<u>Do I have to take part?</u>

You have the right to choose to do so. You may also choose not to, without being asked for reasons at any time during the research.

<u>What will happen if I take part?</u>

There will be some documents for you to sign which provides all the information you might need and asks for your consent to continue with the research. An interview time and location will be arranged based on your convenience which will take one hour maximum. Your identity will be anonymised and kept safe. Lastly, the interview will be sound recorded.

<u>What are the possible disadvantages of taking part?</u>

The interview will take some of your time, and to compensate for that, you have the right to choose the time and location of the interview, and you also may withdraw at any time of the research.

By participating in this research, your reflection on your experience with LMS integrations will help in understanding its impact on your teaching process. It will also help concluding if e-learning system was useful and successfully integrated.

Will my taking part in this study be kept confidential and anonymous?

Yes. It will be dealt with high privacy and confidentiality. Your name and information will be coded. The sound recording, notes taken during the interview and signed documents will be kept safe and secure within the university secured system.

How will my data be stored?

Data will be stored in sound recordings at the beginning of the research. Then they will be transcribed to text. Both data will be saved in safely protected University system within a private account safely secured by a password. All hardcopy papers and consent forms will be stored in a safe locked storage. At a final stage, the data will be kept with the supervisor within the university for him to dispose of. All hardcopy papers and consent forms will be stored in a safe locked storage.

What will happen to the results of the study?

The general findings of the research might be reported in an academic journal or report. The data will be anonymised so the participants' identities are kept confidential. The findings might also be shared with institutions/ organisations that took part in the study. Finally, a copy of the findings can be sent to you if requested.

Who is Organizing and Funding the Study?

The study is organised by Northumbria University in Newcastle. And it is funded by Qatar Foundation Research and Development department under Qatar National Research Funds (QNRF).

Who has reviewed this study?

The Faculty of Health and Life Science research ethics committee at Northumbria University have reviewed the study to safeguard your interest, and have granted approval to conduct the study. In addition, the Ministry of Education in Qatar has approved this research to be conducted and researcher support document was granted.

Contact for further information:

Researcher email: saoud.a.jamali@northumbria.ac.uk

Supervisor email:

Appendix C

This appendix includes full tables of results from various sections in phase two statistical analysis chapter in a systematic order. It is divided into three sections, Descriptive results, Results from Factor Analysis -1 and then Results from Factor Analysis – 2.

C.1: Descriptive Results

C.1.1: The following tables are results before filtering

Descriptive sample results (Table 22)

Scale item	Answered	Skipped	Total
Q01	396	3	399
Q02	387	12	399
Q03	368	31	399
Q04	359	40	399
Q05	391	8	399
Q06	378	21	399
Q07	329	70	399
Q08	328	71	399
Q09	326	73	399
Q10	328	71	399
Q11	328	71	399
Q12	317	82	399
Q13	315	84	399
Q14	313	86	399
Q15	313	86	399
Q16	305	94	399
Q17	304	95	399
Q18	305	94	399

(Table 23)

Answer choice	Number	Responses (%)

0-5	88	22.2
6-10	117	29.6
11-15	63	15.8
16+	128	32.3
Total	**396**	**100**

Table 24

Answers	**Number**	**Responses (%)**
Algeria	3	0.8
Belgium	1	0.3
Canada	1	0.3
Egypt	91	23.6
Iraq	4	1
Jordan	73	18.9
Kingdom of Saudi Arabia	2	0.5
Lebanon	8	2.1
Morocco	2	0.5
Oman	1	0.3
Pakistan	2	0.5
Palestine	19	4.9
Qatar	133	34.5
Sudan	9	2.3
Syria	18	4.7
Tunisia	10	2.6
USA	2	0.5
Yemen	5	1.3
Unknown	3	0.8
Total	**386**	**100**

Table 25

Answer choices	**Number**	**Responses (%)**
10	163	44.3
11	157	42.7
12	188	52.1
Total	**368**	

Table 26

Answer choices	**Number +** (outside of sample frame) = total	Responses (%)
Boys	29 + (11) = 40	10.5
Girls	279 + (13) = 292	76.6
Unknown	49	12.9
Total	357 + (24) = **381**	**100**

Table 27

Answer choices	Number	Responses (%)
Male	62	15.5
Female	319	79.9
Unknown	5	1.3
Total	**386**	**100**

(Table 28)

Answer choices	Number	Responses (%)
21 or below	12	3.1
22 – 31	49	12.5
32 – 41	162	41.4
42 – 51	118	30.2
51 +	50	12.8
Total	**391**	**100**

Table 29

Answer choices	Number	Responses (%)
Arabic Language	44	11
Islamic Studies	44	11
Mathematics	41	10.3
Chemistry	30	7.5
Physics	18	4.5
Biology	65	16.3

Social Science	24	6
English Language	45	11.3
Information Technology	27	6.8
Selective Subjects	15	3.8
Mixed subjects	25	6.3
Total	**378**	**100**

The majority of participants in the questionnaire were female. Three hundred of the participants were female, which is five times more than the figure for males. Figure 25 below illustrates this.

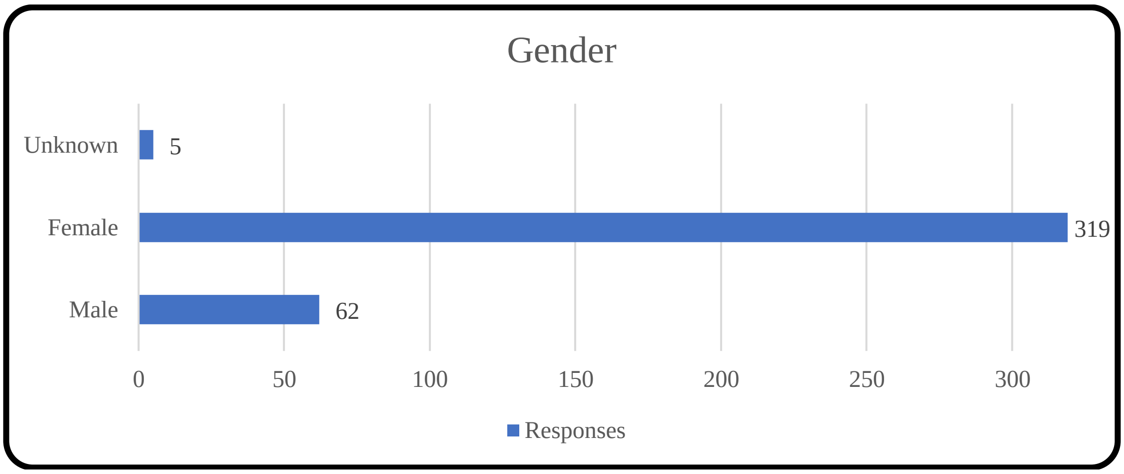

Figure 69. Gender distribution of participants

Figure 26 below shows that most of the participants were in the middle age range of 32-41, hence most of the participants were neither very old nor very young.

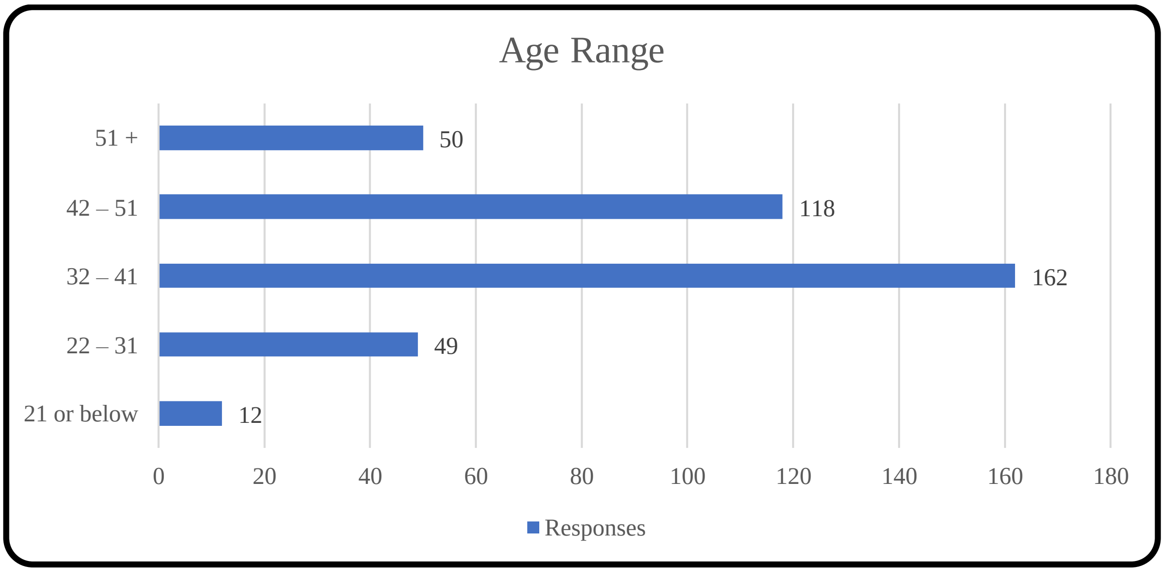

Figure 70. Age range of participants (all responses)

Figure 27 below illustrates that biology teachers comprised the highest number of participants and elective subjects teachers the lowest number of participants.

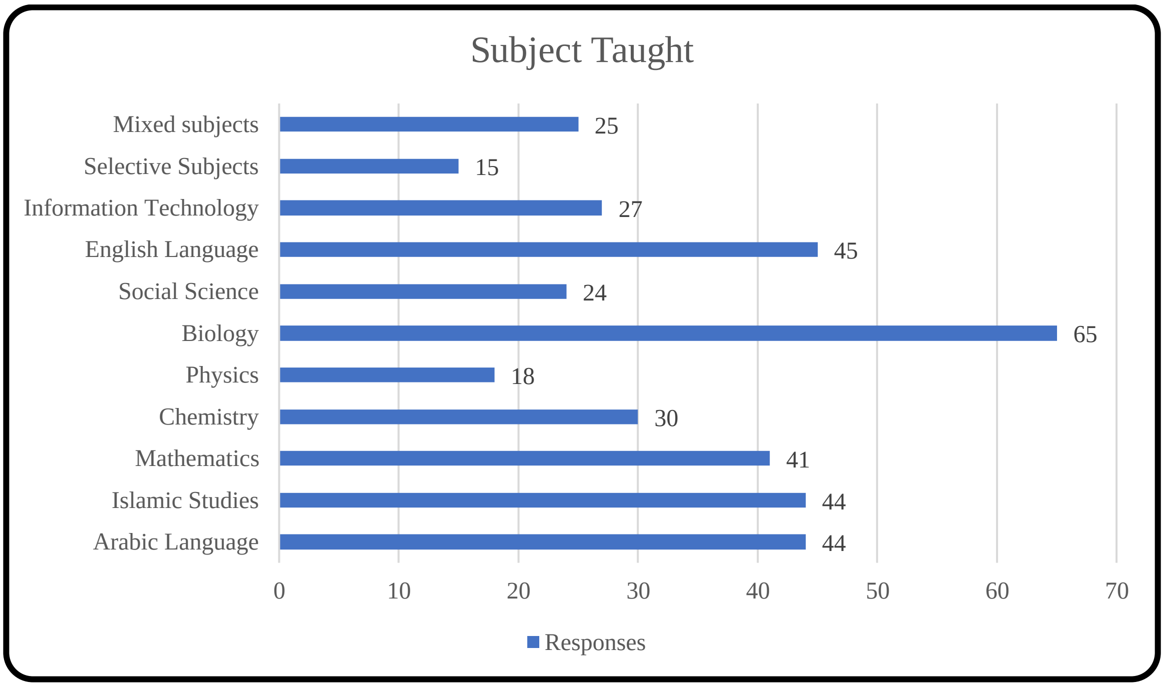

Figure 71. Subjects taught by survey participants

C.1.2: The following tables are descriptive results after filtration:

Table 30 questions with missing values

	Valid	Missing	Total	Final valid responses
Q07_mean	329	70	399	247
Q08_mean	328	71	399	247
Q10_mean	328	71	399	247
Q11_mean	328	71	399	247
Q12_mean	317	82	399	247
Q13_mean	315	84	399	247
Q14_mean	313	86	399	247
Q15_mean	313	86	399	247
Q16_mean	305	94	399	247
Q17_mean	304	95	399	247
Q18_mean	305	94	399	247

Qatar's teaching experience

Answer choice	Number	Responses (%)
0-5	47	19
6-10	79	32
11-15	40	16.2
16+	81	32.8
Total	**247**	**100**

Table 32 natinoalities

Answers	Final valid responses	Responses (%)
Algeria	1	0.4
Belgium	1	0.4
Canada	1	0.4
Egypt	59	23.9
Iraq	4	1.6
Jordan	49	19.8
Kingdom of Saudi Arabia	2	0.8
Lebanon	7	2.8
Morocco	1	0.4
Oman	1	0.4
Pakistan	1	0.4
Palestine	14	5.7
Qatar	74	30
Sudan	7	2.8
Syria	9	3.6
Tunisia	8	3.2
USA	2	0.8
Yemen	3	1.2
Unknown	3	1.2
Total	**247**	**100**

Table 23 shows the contribution percentage of each nationality in terms of the total number of participants.

Table 81. Participants' nationalities: percentages

Answers	Percentage (%)	Answers	Percentage (%)	Answers	Percentage (%)
Algeria	0.4	**Kingdom of Saudi Arabia**	0.8	**Qatar**	30
Belgium	0.4	**Lebanon**	2.8	**Sudan**	2.8
Canada	0.4	**Morocco**	0.4	**Syria**	3.6
Egypt	23.9	**Oman**	0.4	**Tunisia**	3.2
Iraq	1.6	**Pakistan**	0.4	**USA**	0.8
Jordan	19.8	**Palestine**	5.7	**Yemen**	1.2
Unknown	1.2	**Total (#)**	**247**	**Total (%)**	**100**

Year taught

Answer choices	Number
Year 10	95
Year 11	113
Year 12	128
Total	**336**

School working at

Answer choices	Number + (outside of sample frame) = total	Responses (%)
Boys	18 + (8) = 26	10
Girls	202 + (6) = 208	79.7
Unknown	27	10.3
Total	**247** + (14) = 261	**100**

Gender

Answer choices	Number	Responses (%)
Male	29	11.7
Female	216	87.4
Unknown	2	0.8
Total	**247**	**100**

Age group

Answer choices	Number	Responses (%)
21 or below	6	2.4
22-31	24	9.7
32-41	111	44.9
42-51	74	30
51+	32	13
Total	**247**	**100**

Subjects taught

Answer choices	Number	Responses (%)
Arabic Language	27	10.9
Islamic teaching	32	13
Mathematics	25	10.1
Chemistry	24	9.7
Physics	11	4.5
Biology	44	17.8
Social Science	16	6.5
English Language	33	13.4
Information Technology	17	6.9
Selective Subjects	7	2.8
Mixed subjects	11	4.5
Total	**247**	**100**

C.2: Results from Factor Analysis – 1

Table 40

Items codes						
Q07_01	Q08_05	Q11_04	Q13_01	Q15_01	Q16_05	Q18_02
Q07_02	Q10_01	Q11_05	Q13_02	Q15_02	Q16_06	Q18_03_R
Q07_03	Q10_02	Q11_06	Q13_03	Q15_03	Q17_01	Q18_04
Q07_04	Q10_03	Q11_07	Q13_04	Q15_04	Q17_02	Q18_05_R
Q07_05	Q10_04	Q12_01	Q13_05	Q15_05	Q17_03_R	Q18_06_R
Q08_01_R	Q10_05	Q12_02	Q13_06	Q16_01	Q17_04_R	Q18_07_R
Q08_02	Q11_01	Q12_03	Q13_07	Q16_02	Q17_05_R	Q18_08
Q08_03	Q11_02	Q12_04	Q14_01	Q16_03	Q17_06_R	
Q08_04	Q11_03	Q12_05	Q14_02	Q16_04	Q18_01	

Table 42

Communalities					
item code	Extraction	item code	Extraction	item code	Extraction
Q07_01	0.66	Q11_06	0.55	Q15_05	0.78
Q07_02	0.82	Q11_07	0.61	Q16_01	0.72
Q07_03	0.81	Q12_01	0.78	Q16_02	0.68
Q07_04	0.64	Q12_02	0.82	Q16_03	0.87
Q07_05	0.67	Q12_03	0.86	Q16_04	0.87
Q08_01_R	0.52	Q12_04	0.71	Q16_05	0.82
Q08_02	0.76	Q12_05	0.77	Q16_06	0.83
Q08_03	0.8	Q13_01	0.58	Q17_01	0.61
Q08_04	0.71	Q13_02	0.79	Q17_02	0.64
Q08_05	0.66	Q13_03	0.75	Q17_03_R	0.65
Q10_01	0.6	Q13_04	0.58	Q17_04_R	0.75
Q10_02	0.64	Q13_05	0.79	Q17_05_R	0.74
Q10_03	0.65	Q13_06	0.76	Q17_06_R	0.46
Q10_04	0.73	Q13_07	0.7	Q18_01	0.76
Q10_05	0.67	Q14_01	0.72	Q18_02	0.79
Q11_01	0.71	Q14_02	0.71	Q18_03_R	0.7
Q11_02	0.74	Q15_01	0.76	Q18_04	0.76
Q11_03	0.53	Q15_02	0.79	Q18_05_R	0.61
Q11_04	0.56	Q15_03	0.83	Q18_06_R	0.53
Q11_05	0.46	Q15_04	0.69	Q18_07_R	0.51
Extraction Method: Principal Component Analysis.				Q18_08	0.66

Table 43

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	18.96	31.08	31.08	18.96	31.08	31.08	7.66	12.56	12.56
2	5.56	9.12	40.2	5.56	9.12	40.2	6.48	10.63	23.19
3	3.27	5.36	45.55	3.27	5.36	45.55	4.66	7.63	30.82
4	2.62	4.3	49.85	2.62	4.3	49.85	4.41	7.24	38.06
5	2.22	3.63	53.49	2.22	3.63	53.49	3.46	5.67	43.73
6	2	3.28	56.76	2	3.28	56.76	3.21	5.27	48.99
7	1.75	2.87	59.63	1.75	2.87	59.63	2.97	4.88	53.87
8	1.6	2.62	62.25	1.6	2.62	62.25	2.52	4.13	58
9	1.31	2.14	64.39	1.31	2.14	64.39	2.23	3.66	61.66
10	1.24	2.03	66.42	1.24	2.03	66.42	2.07	3.39	65.04
11	1.11	1.82	68.24	1.11	1.82	68.24	1.75	2.87	67.92
12	1.03	1.68	69.92	1.03	1.68	69.92	1.22	2.01	69.92
13	0.99	1.63	71.55						
14	0.96	1.57	73.12						
15	0.85	1.39	74.51						
16	0.8	1.31	75.82						
17	0.78	1.27	77.1						
18	0.73	1.19	78.29						
19	0.69	1.14	79.43						
20	0.68	1.11	80.54						
21	0.65	1.06	81.6						
22	0.6	0.98	82.59						
23	0.58	0.95	83.53						
24	0.53	0.87	84.41						
25	0.5	0.82	85.23						
26	0.49	0.8	86.03						
27	0.48	0.78	86.82						
28	0.47	0.77	87.58						
29	0.44	0.71	88.3						
30	0.42	0.68	88.98						
31	0.39	0.64	89.62						
32	0.38	0.62	90.25						
33	0.37	0.61	90.86						
34	0.37	0.61	91.47						
35	0.33	0.55	92.01						
36	0.32	0.53	92.54						
37	0.3	0.5	93.04						

38	0.29	0.48	93.52						
39	0.29	0.47	94						
40	0.27	0.44	94.44						
41	0.27	0.44	94.87						
42	0.26	0.43	95.3						
43	0.24	0.39	95.69						
44	0.21	0.35	96.04						
45	0.21	0.35	96.39						
46	0.21	0.34	96.72						
47	0.19	0.32	97.04						
48	0.19	0.31	97.35						
49	0.18	0.29	97.64						
50	0.17	0.28	97.92						
51	0.16	0.26	98.18						
52	0.15	0.24	98.43						
53	0.15	0.24	98.67						
54	0.13	0.22	98.89						
55	0.13	0.21	99.1						
56	0.11	0.18	99.28						
57	0.1	0.16	99.45						
58	0.09	0.15	99.6						
59	0.09	0.15	99.75						
60	0.08	0.13	99.89						
61	0.07	0.11	100						
Extraction Method: Principal Component Analysis.									

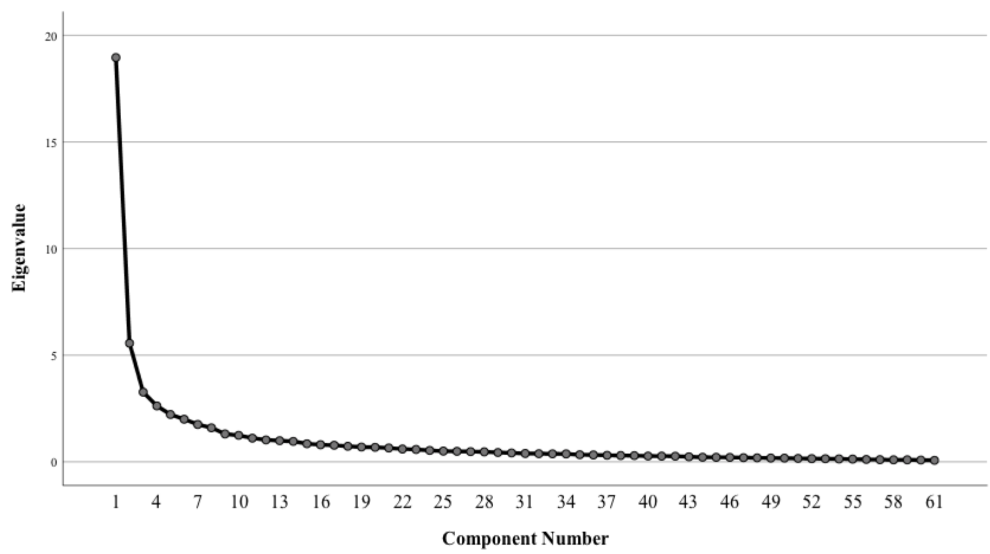

Figure 72. Scree plot

The numbers from the previous table are shown in this graph. The first 12 components reflect most of the change in the line. It can be seen that component 1 has the highest eigenvalue of 19.5, and when it reaches component 12 the line becomes nearly horizonal with very little change afterwards in eigenvalues.

Table 44

Component Matrix [a]

	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
Q07_02	0.81	-0.18	0.04	0	-0.18	0.09	-0.22	0.14	-0.09	-0.05	-0.05	-0.13
Q08_03	0.8	-0.22	-0.02	-0.01	-0.01	0.03	-0.24	0.06	-0.14	0.03	-0.14	-0.06
Q08_02	0.78	-0.16	0.01	-0.01	-0.14	0.02	-0.24	0.11	-0.16	-0.03	-0.08	-0.02
Q12_01	0.78	-0.27	0.03	-0.07	-0.19	0.07	-0.16	-0.06	0.05	-0.06	-0.05	-0.11
Q07_03	0.77	-0.27	-0.01	-0.04	-0.24	0.01	-0.23	0.1	-0.05	0	-0.1	-0.11
Q18_04	0.75	-0.2	-0.11	0.01	-0.21	0	-0.02	-0.04	0.02	-0.14	0.26	-0.09
Q18_02	0.73	-0.25	-0.07	0.07	-0.29	0	-0.04	-0.04	0.12	-0.17	0.17	-0.15
Q18_01	0.72	-0.29	-0.09	0.1	-0.22	-0.05	0.01	-0.07	0.09	-0.12	0.19	-0.16
Q13_02	0.72	-0.27	-0.21	-0.14	0.11	-0.16	0.18	-0.05	0.12	0.21	0.03	-0.08
Q08_04	0.7	-0.06	-0.12	0.05	0.04	0.08	-0.23	0.19	-0.28	-0.01	-0.1	0.15
Q13_05	0.69	-0.35	-0.31	-0.12	0.07	-0.17	0.13	0	0.13	0.05	0.09	0.03
Q07_04	0.69	0.09	0.12	-0.17	0.1	0.06	-0.17	-0.05	-0.03	0.07	-0.17	0.21
Q17_02	0.69	-0.23	-0.13	0.17	0.06	0.05	-0.14	-0.18	0.09	-0.09	0.01	-0.05
Q07_01	0.68	-0.22	0.02	0.03	-0.15	0.18	-0.14	0.16	-0.11	-0.03	-0.15	-0.07
Q14_01	0.68	-0.26	-0.26	-0.11	0.1	-0.19	0.06	-0.04	0.03	-0.14	-0.11	0.15
Q07_05	0.68	-0.12	0.08	0.05	0.15	-0.07	-0.19	0.02	-0.26	0	-0.17	0.17
Q13_06	0.67	-0.27	-0.36	-0.09	0.18	-0.14	0.15	0.07	0.06	0	0.1	0.04
Q13_03	0.65	-0.25	-0.32	-0.2	0.15	-0.18	0.1	-0.03	0.13	0.14	0.11	0.04
Q13_04	0.63	-0.15	-0.23	-0.17	-0.03	-0.19	0.06	-0.02	0.09	0.09	0.11	-0.05
Q14_02	0.63	-0.25	-0.27	-0.21	0.14	-0.24	0.14	-0.01	-0.05	-0.02	-0.04	0.18
Q13_07	0.61	-0.34	-0.32	0	0.16	-0.14	0.2	-0.01	0.04	-0.07	-0.02	0.14
Q08_05	0.61	-0.18	-0.13	-0.08	0.17	0.17	-0.24	0.19	-0.25	-0.02	-0.13	0.03
Q17_01	0.6	0.18	-0.07	0.28	0.19	-0.01	0.07	-0.14	-0.13	-0.09	0.13	-0.19
Q16_02	0.6	0.31	-0.05	0.27	0.28	-0.16	0.01	-0.15	-0.1	0.11	0	0
Q16_06	0.58	0.33	0.05	0.34	0.32	-0.06	0.14	-0.23	-0.19	0.02	-0.04	-0.23
Q11_07	0.57	0.2	0.21	-0.27	0.17	0.07	-0.18	-0.05	0.1	-0.12	0.18	0.05
Q16_01	0.56	0.42	0.04	0.34	0.12	-0.13	0.11	-0.16	-0.15	0.14	-0.11	-0.05
Q18_03_R	0.55	-0.25	0.41	0.24	-0.19	-0.08	0.03	0.08	-0.02	-0.17	0.14	0.08
Q13_01	0.55	0.05	-0.07	-0.28	0.23	-0.16	0.06	0.02	-0.02	0.31	0	-0.11
Q12_05	0.55	0.4	0.14	-0.27	-0.35	-0.05	0.22	-0.11	-0.13	0.05	-0.09	0.05
Q16_05	0.54	0.34	0.08	0.36	0.35	-0.07	0.1	-0.23	-0.22	0.03	-0.05	-0.2
Q12_03	0.53	0.42	0.2	-0.35	-0.33	-0.08	0.3	-0.09	-0.15	0.04	-0.11	0.01
Q11_01	0.51	0.31	0.29	-0.34	0.28	0.04	-0.12	0	0.16	-0.14	0.11	-0.07
Q11_02	0.51	0.32	0.24	-0.33	0.28	0.23	-0.06	0.05	0.26	-0.02	0.1	-0.02
Q11_05	0.49	0.09	0.05	-0.12	0.14	0.16	0.06	-0.05	0.03	-0.24	-0.16	-0.24
Q11_04	0.46	0.33	0.11	-0.23	0.19	0.26	0	-0.05	0.03	-0.22	0.07	0.11
Q08_01_R	0.45	0.15	0.39	-0.1	0.17	-0.03	-0.03	0	-0.09	0.08	0.1	0.28
Q10_01	0.43	0.06	0.05	-0.03	-0.09	0.24	0.13	0.19	-0.12	0.42	0.3	0.06
Q11_03	0.43	0.21	0.15	-0.12	0.34	0.36	0.01	-0.04	0.11	-0.07	0.03	0.03
Q12_04	0.4	0.33	-0.03	-0.35	-0.31	-0.05	0.37	-0.05	-0.17	-0.21	-0.04	-0.02

Q18_05_R	0.37	-0.33	0.34	0.29	-0.01	-0.17	0.13	0.1	-0.03	-0.26	0.05	0.2
Q15_03	0.45	0.68	-0.09	0.17	-0.1	-0.18	-0.12	0.23	0.16	0.02	-0.02	0.06
Q15_02	0.45	0.66	-0.1	0.27	-0.04	-0.14	-0.11	0.14	0.02	0.1	0.05	0.02
Q15_05	0.35	0.62	-0.24	0.23	-0.18	-0.05	0	0.2	0.16	-0.12	-0.04	0.21
Q15_01	0.45	0.61	-0.15	0.24	-0.15	-0.1	-0.12	0.15	0.12	0.08	0.05	0.12
Q18_08	0.37	0.56	-0.11	0.05	-0.12	-0.2	-0.14	0.15	0.2	-0.03	0.01	-0.24
Q15_04	0.35	0.51	-0.32	0.2	-0.16	-0.1	0.01	0.16	0.27	-0.06	-0.1	0.13
Q11_06	0.34	0.41	0.22	-0.37	0.16	0.06	-0.1	0.05	0.04	-0.11	0.15	0.02
Q17_05_R	0.51	-0.15	0.59	0.12	-0.06	-0.11	0.07	0.03	0.15	0.17	-0.15	-0.02
Q17_04_R	0.45	-0.23	0.55	0.04	-0.01	-0.05	0.09	0.07	0.28	0.19	-0.23	-0.06
Q17_03_R	0.34	-0.24	0.5	0.14	-0.06	-0.09	0.11	0.13	0.31	0.03	-0.14	-0.23
Q18_06_R	0.22	-0.22	0.44	0.3	0.11	-0.17	0.22	0.11	0	-0.16	0.1	0.12
Q17_06_R	0.23	-0.32	0.36	0.01	0.06	-0.15	0.04	0.13	0.13	0.25	-0.1	0.21
Q12_02	0.42	0.32	0.19	-0.33	-0.45	-0.08	0.28	-0.25	-0.19	-0.02	-0.08	0.01
Q10_03	0.43	0.01	-0.06	0.19	-0.09	0.49	0.23	0.21	-0.09	0.02	0.21	0.15
Q10_04	0.32	-0.03	-0.29	0.24	0.02	0.49	0.42	0.17	0.07	-0.05	-0.18	0.03
Q10_05	0.31	-0.08	-0.13	0.11	0.2	0.42	0.44	0.15	0.15	-0.13	-0.28	-0.03
Q16_04	0.46	-0.03	-0.04	0.21	-0.23	0.29	-0.18	-0.61	0.17	0.11	0.05	0.17
Q16_03	0.45	-0.07	-0.07	0.21	-0.2	0.33	-0.13	-0.55	0.24	0.19	-0.1	0.2
Q10_02	0.39	0	0	0	-0.14	0.36	0.09	0.26	-0.11	0.41	0.2	-0.2
Q18_07_R	0.23	-0.18	0.35	0.32	-0.03	-0.06	0.13	-0.03	-0.17	-0.08	0.37	0.09
Extraction Method: Principal Component Analysis.												
a: 12 components extracted.												

Table 45

Rotated Component Matrix [a]												
	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
Q13_05	0.83	0.24	0.04	0.06	0.05	0.04	0.09	0.08	0.08	0.09	0.08	0.06
Q13_03	0.82	0.16	0.05	0.14	0.07	0.03	0.06	-0.03	0.07	0.02	0.11	-0.01
Q13_06	0.8	0.23	0.07	0.1	0.11	-0.01	0	0.08	-0.01	0.15	0.08	0.01
Q13_02	0.78	0.2	0.01	0.1	0.18	0.1	0.22	-0.03	0.08	0.06	0.16	0.05
Q14_02	0.75	0.26	0.01	0.1	0.08	0.15	0.01	0.07	-0.02	0.06	-0.06	-0.18
Q13_07	0.74	0.23	0.01	0	0.11	0	0.02	0.15	0.06	0.23	-0.05	-0.07
Q14_01	0.7	0.35	0.07	0.1	0.08	0.1	0.04	0.1	0.07	0.13	-0.17	-0.08
Q13_04	0.66	0.23	0.12	0.1	0.06	0.15	0.08	0	0.07	-0.05	0.12	0.1
Q18_01	0.52	0.4	0.09	0.03	0.08	0.12	0.13	0.29	0.24	0.04	0.1	0.36
Q18_04	0.51	0.43	0.13	0.13	0.05	0.16	0.01	0.29	0.21	0.02	0.15	0.31
Q13_01	0.5	0.13	0.06	0.27	0.26	0.14	0.18	-0.2	-0.09	-0.09	0.22	-0.08
Q18_02	0.47	0.46	0.14	0.07	0.01	0.14	0.12	0.28	0.25	0.05	0.09	0.39
Q17_02	0.45	0.43	0.07	0.13	0.23	-0.08	0.08	0.14	0.33	0.1	-0.03	0.16
Q07_02	0.32	0.73	0.13	0.17	0.08	0.13	0.19	0.13	0.11	0.05	0.15	0.15
Q07_03	0.39	0.72	0.1	0.07	0.01	0.14	0.23	0.07	0.14	-0.01	0.11	0.14
Q08_02	0.34	0.72	0.14	0.15	0.1	0.14	0.14	0.13	0.09	0	0.11	0.03
Q08_03	0.4	0.72	0.06	0.16	0.18	0.06	0.18	0.04	0.12	0.02	0.09	0
Q07_01	0.25	0.68	0.06	0.09	0.05	0.1	0.19	0.09	0.09	0.18	0.14	0.06
Q08_04	0.3	0.67	0.19	0.15	0.17	0.03	-0.04	0.11	0.02	0.09	0.13	-0.2
Q08_05	0.32	0.66	-0.01	0.22	0.13	-0.06	-0.04	-0.03	-0.05	0.14	0.11	-0.14
Q12_01	0.42	0.61	0.03	0.17	0.03	0.17	0.23	0.11	0.26	0.04	0.06	0.21
Q07_05	0.31	0.58	0.06	0.18	0.28	0.05	0.13	0.16	0.06	-0.02	-0.02	-0.28
Q07_04	0.27	0.43	0.15	0.42	0.15	0.18	0.18	-0.01	0.18	0.01	0.02	-0.26
Q15_03	0.03	0.11	0.85	0.21	0.19	0.14	0.04	-0.02	-0.03	-0.03	0.05	-0.02
Q15_05	0.02	0.06	0.83	0.1	0.06	0.15	-0.12	0.04	0.06	0.17	-0.02	-0.04
Q15_01	0.05	0.11	0.8	0.14	0.19	0.11	-0.03	0.02	0.11	-0.03	0.14	-0.04
Q15_04	0.15	0.03	0.78	0.04	0.05	0.1	-0.05	-0.07	0.09	0.17	-0.06	0.01
Q15_02	0.01	0.11	0.77	0.16	0.35	0.1	-0.03	0.01	0.01	-0.06	0.15	-0.03
Q18_08	0.07	0.1	0.67	0.2	0.18	0.13	0.06	-0.15	-0.08	-0.11	0.02	0.27
Q11_02	0.13	0.08	0.16	0.79	0.07	0.08	0.18	-0.07	0.04	0.08	0.13	0.04
Q11_01	0.14	0.12	0.13	0.76	0.14	0.13	0.15	0.01	-0.04	-0.07	-0.01	0.08
Q11_06	0.02	0.06	0.17	0.67	0.05	0.21	-0.01	-0.02	-0.09	-0.11	0.06	0
Q11_07	0.2	0.23	0.13	0.66	0.09	0.11	0.07	0.11	0.1	-0.1	0.04	0.03
Q11_04	0.07	0.14	0.15	0.64	0.11	0.19	-0.09	0.06	0.09	0.17	0	-0.03
Q11_03	0.07	0.11	0.04	0.62	0.19	-0.01	0.05	0	0.12	0.26	0.09	-0.03
Q08_01_R	0.09	0.13	0.07	0.45	0.16	0.15	0.2	0.26	0.04	-0.12	0.13	-0.31
Q11_05	0.16	0.28	0.02	0.37	0.24	0.17	0.1	-0.05	0	0.26	-0.11	0.21
Q16_05	0.1	0.13	0.21	0.2	0.82	0.07	0.06	0.12	0.06	0.08	0.02	0
Q16_06	0.16	0.13	0.21	0.2	0.81	0.1	0.06	0.11	0.07	0.11	0.04	0.05
Q16_01	0.11	0.12	0.4	0.1	0.66	0.19	0.12	0.08	0.12	0.05	0.07	-0.1

Q16_02	0.28	0.14	0.35	0.19	0.62	0.03	0.04	0.1	0.11	-0.01	0.04	-0.12
Q17_01	0.26	0.2	0.21	0.19	0.57	0.04	-0.06	0.2	0.09	0.11	0.08	0.17
Q12_02	0.07	0.09	0.11	0.14	0.08	0.86	0.07	0.04	0.14	-0.07	0.05	0.02
Q12_03	0.12	0.11	0.23	0.26	0.13	0.82	0.14	-0.01	0.01	0	0.11	-0.04
Q12_04	0.18	0.07	0.17	0.18	0.03	0.75	-0.11	0.03	-0.08	0.14	0	0.09
Q12_05	0.12	0.16	0.28	0.23	0.12	0.74	0.1	0	0.1	0	0.13	-0.05
Q17_04_R	0.12	0.19	-0.05	0.17	0.05	0.08	0.79	0.15	0.09	0.07	0.05	-0.01
Q17_05_R	0.09	0.23	0.01	0.15	0.16	0.15	0.72	0.27	0.1	-0.03	0.08	-0.04
Q17_03_R	0.07	0.14	-0.02	0.07	0.05	0.01	0.72	0.22	-0.01	0.08	0	0.22
Q17_06_R	0.19	0.09	-0.1	0.02	-0.07	-0.05	0.53	0.19	0.01	-0.06	0.08	-0.27
Q18_07_R	0.02	0.05	-0.08	0	0.17	0.01	0.09	0.65	0.06	-0.07	0.18	0.03
Q18_05_R	0.17	0.22	-0.02	-0.02	0.05	0	0.3	0.64	-0.01	0.08	-0.13	-0.05
Q18_03_R	0.15	0.36	0.05	0.08	0.05	0.12	0.35	0.62	0.1	0	0.05	0.09
Q18_06_R	0.06	0.01	-0.06	0.03	0.14	-0.04	0.35	0.6	-0.1	0.08	-0.05	-0.06
Q16_04	0.14	0.2	0.07	0.09	0.14	0.08	0.01	0.06	0.87	0.01	0.06	0.05
Q16_03	0.16	0.19	0.07	0.05	0.11	0.05	0.11	-0.03	0.87	0.13	0.05	-0.04
Q10_04	0.16	0.11	0.12	-0.05	0.08	0.02	-0.03	0.01	0.1	0.79	0.19	0.02
Q10_05	0.18	0.06	-0.01	0.1	0.11	0	0.12	-0.02	0	0.77	0.03	0.02
Q10_02	0.09	0.25	0.06	0.07	0.07	0.08	0.1	-0.05	0.01	0.16	0.71	0.11
Q10_01	0.18	0.14	0.1	0.15	0.06	0.13	0.07	0.1	0.07	0.06	0.68	-0.1
Q10_03	0.09	0.22	0.14	0.12	0.02	0.05	-0.1	0.29	0.14	0.47	0.47	-0.02
Extraction Method: Principal Component Analysis.												
Rotation Method: Varimax with Kaiser Normalisation. [a]												
a Rotation converged in 9 iterations.												

(not available in Analysis chapter)

Component Transformation Matrix												
Component	1	2	3	4	5	6	7	8	9	10	11	12
1	0.54	0.52	0.26	0.33	0.28	0.23	0.2	0.17	0.18	0.12	0.15	0.04
2	-0.37	-0.25	0.65	0.34	0.28	0.29	-0.21	-0.21	-0.06	-0.04	0.03	-0.05
3	-0.47	-0.01	-0.24	0.33	0.05	0.16	0.61	0.4	-0.04	-0.2	0.02	-0.06
4	-0.23	0.02	0.32	-0.47	0.42	-0.42	0.09	0.41	0.22	0.2	0.01	0.05
5	0.18	-0.2	-0.23	0.44	0.45	-0.54	-0.04	-0.08	-0.27	0.12	-0.14	-0.27
6	-0.37	0.18	-0.22	0.29	-0.13	-0.11	-0.19	-0.13	0.35	0.6	0.37	0.06
7	0.23	-0.53	-0.14	-0.17	0.13	0.44	0.11	0.2	-0.19	0.55	0.13	0
8	-0.05	0.23	0.32	-0.02	-0.36	-0.22	0.14	0.08	-0.71	0.21	0.29	-0.06
9	0.19	-0.38	0.31	0.21	-0.38	-0.3	0.44	-0.14	0.3	0.13	-0.18	0.3
10	0.08	-0.14	-0.01	-0.22	0.14	-0.07	0.33	-0.41	0.15	-0.24	0.66	-0.33
11	0.15	-0.29	-0.01	0.22	-0.09	-0.15	-0.37	0.48	0.03	-0.34	0.49	0.3
12	0.08	-0.09	0.16	0.06	-0.35	0	-0.14	0.33	0.26	0.04	-0.1	-0.79
Extraction Method: Principal Component Analysis.												
Rotation Method: Varimax with Kaiser Normalization.												

C.3: Results from Factor Analysis – 2

Not available in analysis chapter

Communalities					
	Extraction		Extraction		Extraction
Q07_01	0.665	Q12_02	0.821	Q16_02	0.688
Q07_02	0.808	Q12_03	0.863	Q16_03	0.857
Q07_03	0.804	Q12_04	0.694	Q16_04	0.868
Q07_05	0.601	Q12_05	0.77	Q16_05	0.808
Q08_02	0.768	Q13_01	0.566	Q16_06	0.802
Q08_03	0.8	Q13_02	0.795	Q17_01	0.566
Q08_04	0.685	Q13_03	0.755	Q17_03_R	0.614
Q08_05	0.656	Q13_04	0.586	Q17_04_R	0.749
Q10_01	0.632	Q13_05	0.795	Q17_05_R	0.746
Q10_02	0.664	Q13_06	0.752	Q17_06_R	0.408
Q10_04	0.749	Q13_07	0.697	Q18_01	0.656
Q10_05	0.738	Q14_01	0.726	Q18_03_R	0.697
Q11_01	0.696	Q14_02	0.683	Q18_04	0.684
Q11_02	0.745	Q15_01	0.745	Q18_05_R	0.619
Q11_03	0.548	Q15_02	0.784	Q18_06_R	0.552
Q11_04	0.588	Q15_03	0.819	Q18_07_R	0.565
Q11_06	0.571	Q15_04	0.676	Q18_08	0.583
Q11_07	0.621	Q15_05	0.741	Extraction Method: Principal Component Analysis.	
Q12_01	0.763	Q16_01	0.722		

Table 48

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.763	30.477	30.477	16.763	30.477	30.477	7.041	12.801	12.801
2	5.505	10.009	40.487	5.505	10.009	40.487	5.847	10.631	23.432
3	3.132	5.695	46.182	3.132	5.695	46.182	4.619	8.399	31.83
4	2.55	4.637	50.819	2.55	4.637	50.819	3.759	6.835	38.665
5	2.06	3.745	54.564	2.06	3.745	54.564	3.372	6.131	44.796
6	1.832	3.331	57.895	1.832	3.331	57.895	3.153	5.733	50.529
7	1.665	3.028	60.923	1.665	3.028	60.923	2.985	5.426	55.956
8	1.518	2.76	63.682	1.518	2.76	63.682	2.314	4.208	60.163
9	1.295	2.354	66.037	1.295	2.354	66.037	2.102	3.822	63.985
10	1.188	2.16	68.197	1.188	2.16	68.197	1.797	3.267	67.252
11	1.043	1.896	70.093	1.043	1.896	70.093	1.563	2.841	70.093
12	0.941	1.712	71.805						
13	0.841	1.529	73.334						
14	0.836	1.521	74.855						
15	0.782	1.421	76.276						
16	0.745	1.355	77.631						
17	0.73	1.328	78.959						
18	0.674	1.226	80.186						
19	0.642	1.167	81.353						
20	0.608	1.106	82.459						
21	0.577	1.049	83.508						
22	0.519	0.943	84.452						
23	0.507	0.922	85.374						
24	0.473	0.86	86.233						
25	0.451	0.821	87.054						
26	0.442	0.804	87.858						
27	0.396	0.72	88.578						
28	0.385	0.7	89.279						
29	0.384	0.698	89.976						
30	0.367	0.668	90.644						
31	0.358	0.651	91.296						
32	0.336	0.611	91.906						
33	0.317	0.577	92.484						
34	0.303	0.551	93.035						
35	0.286	0.521	93.556						
36	0.284	0.516	94.071						
37	0.271	0.493	94.564						

38	0.264	0.479	95.043						
39	0.251	0.457	95.501						
40	0.239	0.434	95.934						
41	0.21	0.382	96.316						
42	0.199	0.362	96.677						
43	0.195	0.355	97.032						
44	0.189	0.344	97.376						
45	0.174	0.317	97.693						
46	0.166	0.302	97.995						
47	0.161	0.293	98.288						
48	0.156	0.283	98.571						
49	0.15	0.273	98.844						
50	0.132	0.24	99.084						
51	0.121	0.22	99.304						
52	0.104	0.189	99.493						
53	0.097	0.177	99.67						
54	0.096	0.175	99.844						
55	0.086	0.156	100						

Extraction Method: Principal Component Analysis.

Table 49

Component Matrix [a]											
Component	1	2	3	4	5	6	7	8	9	10	11
Q07_01	0.68	-0.23	0.04	-0.01	-0.16	-0.24	-0.09	0.19	-0.14	0.01	-0.05
Q07_02	0.80	-0.19	0.06	-0.03	-0.17	-0.18	-0.20	0.10	-0.11	-0.01	-0.03
Q07_03	0.76	-0.28	0.01	-0.06	-0.26	-0.13	-0.22	0.03	-0.04	-0.02	-0.08
Q07_05	0.67	-0.13	0.05	0.10	0.10	-0.03	-0.19	-0.07	-0.22	-0.03	-0.14
Q08_02	0.78	-0.17	0.03	-0.03	-0.15	-0.14	-0.24	0.03	-0.15	0.00	-0.07
Q08_03	0.80	-0.23	-0.02	0.00	-0.03	-0.16	-0.21	-0.02	-0.12	-0.07	-0.14
Q08_04	0.70	-0.07	-0.12	0.06	0.01	-0.18	-0.24	0.08	-0.26	-0.01	-0.10
Q08_05	0.61	-0.19	-0.15	-0.06	0.17	-0.24	-0.24	0.11	-0.24	-0.04	-0.12
Q10_01	0.44	0.04	0.05	-0.09	-0.05	-0.16	0.13	0.27	0.00	-0.40	0.39
Q10_02	0.39	-0.01	0.01	-0.06	-0.10	-0.27	0.10	0.35	0.01	-0.48	0.26
Q10_04	0.32	-0.02	-0.24	0.18	0.05	-0.29	0.49	0.43	-0.02	0.15	-0.16
Q10_05	0.30	-0.10	-0.14	0.10	0.22	-0.21	0.50	0.45	0.03	0.18	-0.17
Q11_01	0.51	0.28	0.26	-0.34	0.35	-0.02	-0.14	-0.04	0.11	0.13	0.09
Q11_02	0.50	0.31	0.20	-0.35	0.37	-0.17	-0.03	0.10	0.22	0.07	0.09
Q11_03	0.43	0.20	0.14	-0.14	0.40	-0.30	0.10	0.06	0.08	0.10	0.10
Q11_04	0.45	0.33	0.12	-0.26	0.27	-0.21	0.04	-0.05	-0.03	0.26	0.07
Q11_06	0.34	0.40	0.19	-0.39	0.26	-0.03	-0.16	-0.05	0.03	0.09	0.06
Q11_07	0.56	0.21	0.19	-0.29	0.24	-0.11	-0.15	-0.12	0.05	0.16	0.10
Q12_01	0.77	-0.28	0.05	-0.10	-0.19	-0.15	-0.09	-0.07	0.04	0.05	-0.06
Q12_02	0.43	0.32	0.21	-0.42	-0.37	0.14	0.32	-0.16	-0.20	-0.02	-0.04
Q12_03	0.54	0.39	0.18	-0.41	-0.27	0.20	0.26	-0.01	-0.13	-0.06	-0.11
Q12_04	0.41	0.33	-0.03	-0.40	-0.24	0.21	0.29	0.02	-0.23	0.13	-0.03
Q12_05	0.55	0.40	0.14	-0.35	-0.29	0.12	0.22	-0.04	-0.11	-0.05	-0.07
Q13_01	0.56	0.01	-0.11	-0.22	0.23	0.18	-0.02	-0.03	0.08	-0.32	-0.01
Q13_02	0.72	-0.29	-0.25	-0.07	0.08	0.20	0.12	-0.03	0.18	-0.18	0.06
Q13_03	0.65	-0.27	-0.37	-0.12	0.11	0.21	0.03	-0.06	0.19	-0.07	0.12
Q13_04	0.64	-0.16	-0.25	-0.13	-0.05	0.19	-0.01	-0.06	0.12	-0.07	0.13
Q13_05	0.69	-0.35	-0.34	-0.05	0.04	0.21	0.05	-0.03	0.14	0.00	0.12
Q13_06	0.67	-0.28	-0.39	-0.02	0.15	0.19	0.04	0.02	0.06	0.04	0.08
Q13_07	0.61	-0.35	-0.35	0.09	0.11	0.18	0.13	0.00	0.03	0.13	0.03
Q14_01	0.68	-0.27	-0.29	-0.04	0.07	0.17	0.01	-0.07	-0.01	0.21	-0.15
Q14_02	0.64	-0.26	-0.31	-0.13	0.11	0.26	0.03	-0.07	-0.04	0.07	-0.07
Q15_01	0.45	0.61	-0.10	0.24	-0.18	0.04	-0.16	0.10	0.14	-0.01	0.04
Q15_02	0.45	0.66	-0.06	0.28	-0.08	0.08	-0.17	0.08	0.05	-0.09	0.01
Q15_03	0.45	0.67	-0.04	0.18	-0.13	0.11	-0.22	0.16	0.14	0.05	0.02
Q15_04	0.35	0.53	-0.26	0.21	-0.20	0.07	-0.05	0.16	0.22	0.18	0.03
Q15_05	0.36	0.62	-0.18	0.23	-0.22	0.03	-0.07	0.19	0.11	0.22	0.06
Q16_01	0.56	0.41	0.07	0.35	0.08	0.10	0.13	-0.12	-0.09	-0.19	-0.12
Q16_02	0.60	0.30	-0.02	0.32	0.24	0.11	0.01	-0.21	-0.05	-0.12	-0.04
Q16_03	0.44	-0.06	-0.01	0.17	-0.22	-0.47	0.24	-0.42	0.35	0.01	-0.04
Q16_04	0.45	-0.02	0.02	0.15	-0.25	-0.45	0.20	-0.51	0.27	0.03	0.04

Q16_05	0.55	0.33	0.12	0.38	0.33	0.02	0.16	-0.20	-0.20	-0.14	-0.11
Q16_06	0.58	0.33	0.08	0.35	0.30	0.04	0.19	-0.18	-0.18	-0.13	-0.11
Q17_01	0.60	0.19	-0.04	0.29	0.17	0.00	0.12	-0.10	-0.16	-0.01	0.10
Q17_03_R	0.34	-0.26	0.51	0.10	-0.02	0.15	0.01	0.15	0.28	0.01	-0.17
Q17_04_R	0.44	-0.27	0.53	0.01	0.01	0.11	0.05	0.14	0.33	-0.10	-0.21
Q17_05_R	0.51	-0.18	0.59	0.07	-0.04	0.12	0.03	0.06	0.18	-0.11	-0.20
Q17_06_R	0.24	-0.34	0.33	0.00	0.08	0.17	-0.05	0.08	0.18	-0.10	-0.19
Q18_01	0.71	-0.27	-0.06	0.09	-0.19	0.00	0.03	-0.08	0.05	0.10	0.09
Q18_03_R	0.55	-0.25	0.45	0.19	-0.18	0.06	-0.02	0.05	-0.08	0.18	0.17
Q18_04	0.75	-0.19	-0.09	0.00	-0.18	-0.04	-0.01	-0.07	-0.02	0.12	0.17
Q18_05_R	0.37	-0.35	0.36	0.29	-0.05	0.20	0.01	0.07	-0.10	0.25	0.19
Q18_06_R	0.22	-0.23	0.46	0.28	0.10	0.28	0.08	0.10	-0.07	0.16	0.18
Q18_07_R	0.23	-0.18	0.39	0.27	-0.03	0.06	0.09	-0.06	-0.19	0.06	0.45
Q18_08	0.37	0.56	-0.1	0.08	-0.12	0.14	-0.2	0.12	0.16	0.01	-0.08
Extraction Method: Principal Component Analysis.											

a 11 components extracted.

Table 50

Rotated Component Matrix [a]											
	Component										
	1	2	3	4	5	6	7	8	9	10	11
Q13_05	0.83	0.24	0.05	0.04	0.03	0.04	0.09	0.1	0.09	0.07	0.09
Q13_03	0.83	0.17	0.05	0.11	0.06	0.02	0.07	-0.01	0.08	0.01	0.13
Q13_06	0.8	0.25	0.07	0.09	0.11	-0.01	0.02	0.07	0	0.14	0.05
Q13_02	0.79	0.19	0.03	0.07	0.15	0.09	0.21	0.01	0.1	0.06	0.21
Q13_07	0.74	0.23	0.02	-0.01	0.12	-0.02	0.03	0.14	0.05	0.22	-0.05
Q14_02	0.74	0.28	-0.01	0.09	0.13	0.15	0.05	0.01	-0.05	0.07	-0.1
Q14_01	0.69	0.37	0.05	0.09	0.11	0.1	0.08	0.05	0.05	0.15	-0.21
Q13_04	0.67	0.22	0.13	0.09	0.03	0.16	0.07	0.04	0.09	-0.07	0.14
Q18_01	0.52	0.41	0.12	0.01	0.05	0.12	0.15	0.28	0.29	0.06	0.05
Q18_04	0.5	0.45	0.15	0.11	0.03	0.17	0.04	0.28	0.26	0.05	0.09
Q13_01	0.5	0.13	0.05	0.26	0.25	0.14	0.17	-0.18	-0.09	-0.1	0.25
Q08_02	0.33	0.73	0.14	0.14	0.1	0.14	0.16	0.12	0.11	-0.01	0.09
Q07_02	0.32	0.73	0.15	0.15	0.05	0.14	0.2	0.15	0.14	0.05	0.16
Q08_03	0.39	0.72	0.06	0.15	0.19	0.07	0.19	0.04	0.13	0.01	0.09
Q07_03	0.39	0.71	0.11	0.05	-0.02	0.14	0.23	0.1	0.18	-0.02	0.11
Q08_04	0.29	0.7	0.16	0.15	0.23	0.03	0	0.04	-0.01	0.08	0.07
Q07_01	0.24	0.67	0.07	0.09	0.01	0.11	0.16	0.14	0.11	0.19	0.17
Q08_05	0.31	0.67	-0.02	0.22	0.17	-0.07	-0.01	-0.05	-0.06	0.12	0.09
Q12_01	0.42	0.6	0.05	0.15	-0.01	0.18	0.25	0.12	0.3	0.02	0.06
Q07_05	0.3	0.57	0.05	0.15	0.34	0.04	0.16	0.12	0.01	-0.03	-0.02
Q15_03	0.02	0.1	0.84	0.21	0.19	0.14	0.02	0	-0.03	-0.04	0.06
Q15_05	0.02	0.06	0.81	0.1	0.08	0.13	-0.13	0.05	0.06	0.15	-0.02
Q15_01	0.05	0.12	0.8	0.12	0.22	0.11	-0.02	-0.01	0.09	-0.03	0.11
Q15_04	0.14	0	0.78	0.05	0.05	0.09	-0.09	-0.02	0.09	0.14	-0.02
Q15_02	0.01	0.11	0.77	0.14	0.37	0.1	-0.02	-0.02	-0.01	-0.05	0.12
Q18_08	0.07	0.08	0.7	0.15	0.13	0.14	0.05	-0.13	-0.04	-0.06	0.01
Q11_02	0.12	0.08	0.17	0.78	0.07	0.1	0.17	-0.05	0.03	0.09	0.16
Q11_01	0.14	0.12	0.15	0.75	0.12	0.15	0.16	0.05	-0.03	-0.08	0.02
Q11_06	0.01	0.08	0.17	0.67	0.08	0.22	0.02	-0.06	-0.07	-0.14	0.01
Q11_07	0.18	0.25	0.13	0.67	0.11	0.15	0.08	0.08	0.09	-0.09	0
Q11_04	0.06	0.15	0.14	0.67	0.14	0.2	-0.07	0.06	0.09	0.14	-0.04
Q11_03	0.07	0.11	0.05	0.63	0.19	-0.01	0.04	0.04	0.12	0.24	0.14
Q16_05	0.09	0.14	0.2	0.2	0.81	0.07	0.07	0.12	0.08	0.09	0.01
Q16_06	0.14	0.13	0.23	0.19	0.79	0.11	0.06	0.11	0.09	0.12	0.02
Q16_01	0.11	0.11	0.4	0.07	0.68	0.19	0.12	0.06	0.1	0.05	0.08
Q16_02	0.27	0.14	0.33	0.19	0.65	0.03	0.06	0.07	0.1	-0.04	0.01
Q17_01	0.26	0.2	0.24	0.17	0.53	0.06	-0.06	0.23	0.11	0.12	0.08
Q12_02	0.05	0.09	0.1	0.16	0.08	0.86	0.05	0.05	0.13	-0.05	0.06
Q12_03	0.12	0.12	0.23	0.23	0.13	0.82	0.15	-0.02	0.01	0	0.11
Q12_04	0.18	0.07	0.18	0.17	0.03	0.75	-0.1	0.02	-0.06	0.11	-0.01

Q12_05	0.12	0.15	0.27	0.22	0.13	0.75	0.1	-0.01	0.08	-0.01	0.12
Q17_04_R	0.13	0.15	-0.03	0.13	0.04	0.07	0.8	0.15	0.09	0.05	0.09
Q17_05_R	0.07	0.23	0.01	0.13	0.17	0.15	0.74	0.22	0.1	0	0.08
Q17_03_R	0.08	0.12	0.01	0.06	0	0.01	0.73	0.24	0.05	0.06	-0.01
Q17_06_R	0.16	0.12	-0.15	0.02	0.02	-0.04	0.58	0.08	-0.05	-0.03	0
Q18_07_R	0.01	0.07	-0.09	0.02	0.15	0.01	0.07	0.7	0.08	-0.07	0.17
Q18_05_R	0.18	0.21	-0.02	-0.03	0.05	-0.02	0.29	0.67	-0.01	0.05	-0.08
Q18_06_R	0.06	0	-0.05	0.02	0.14	-0.03	0.35	0.62	-0.12	0.04	-0.03
Q18_03_R	0.13	0.37	0.06	0.07	0.05	0.12	0.35	0.62	0.12	0.01	0.04
Q16_04	0.14	0.2	0.07	0.08	0.16	0.08	0.02	0.05	0.87	0	0.03
Q16_03	0.16	0.18	0.06	0.06	0.14	0.03	0.1	-0.02	0.87	0.1	0.05
Q10_05	0.18	0.06	-0.01	0.1	0.09	0	0.09	0.01	0	0.82	0.08
Q10_04	0.15	0.14	0.11	-0.03	0.09	0.04	-0.03	-0.01	0.09	0.81	0.12
Q10_02	0.1	0.25	0.08	0.05	0.04	0.07	0.07	-0.01	0.05	0.14	0.74
Q10_01	0.17	0.16	0.1	0.15	0.07	0.14	0.03	0.13	0.04	0.08	0.71
Extraction Method: Principal Component Analysis.											
Rotation Method: Varimax with Kaiser Normalization.											
a Rotation converged in 8 iterations.											

Not available in analysis chapter

Component Transformation Matrix											
Component	1	2	3	4	5	6	7	8	9	10	11
1	0.54	0.52	0.28	0.30	0.29	0.24	0.22	0.17	0.17	0.10	0.14
2	-0.37	-0.25	0.66	0.31	0.28	0.29	-0.25	-0.20	-0.04	-0.05	0.02
3	-0.53	0.00	-0.17	0.26	0.07	0.16	0.61	0.43	0.02	-0.17	0.04
4	-0.12	0.00	0.33	-0.47	0.47	-0.51	0.06	0.35	0.15	0.15	-0.08
5	0.14	-0.22	-0.29	0.57	0.42	-0.46	-0.01	-0.09	-0.32	0.15	-0.07
6	0.41	-0.40	0.15	-0.24	0.08	0.25	0.24	0.19	-0.53	-0.30	-0.24
7	0.08	-0.46	-0.27	-0.12	0.21	0.43	-0.01	0.10	0.27	0.61	0.13
8	-0.10	0.11	0.26	-0.04	-0.33	-0.10	0.19	0.03	-0.56	0.56	0.36
9	0.22	-0.42	0.30	0.15	-0.33	-0.31	0.47	-0.24	0.42	-0.01	0.06
10	0.01	0.02	0.14	0.26	-0.35	0.00	-0.17	0.39	0.07	0.31	-0.72
11	0.15	-0.24	0.04	0.19	-0.20	-0.12	-0.41	0.60	0.06	-0.23	0.50
Extraction Method: Principal Component Analysis.											
Rotation Method: Varimax with Kaiser Normalization.											

10- Communication (factor 10)

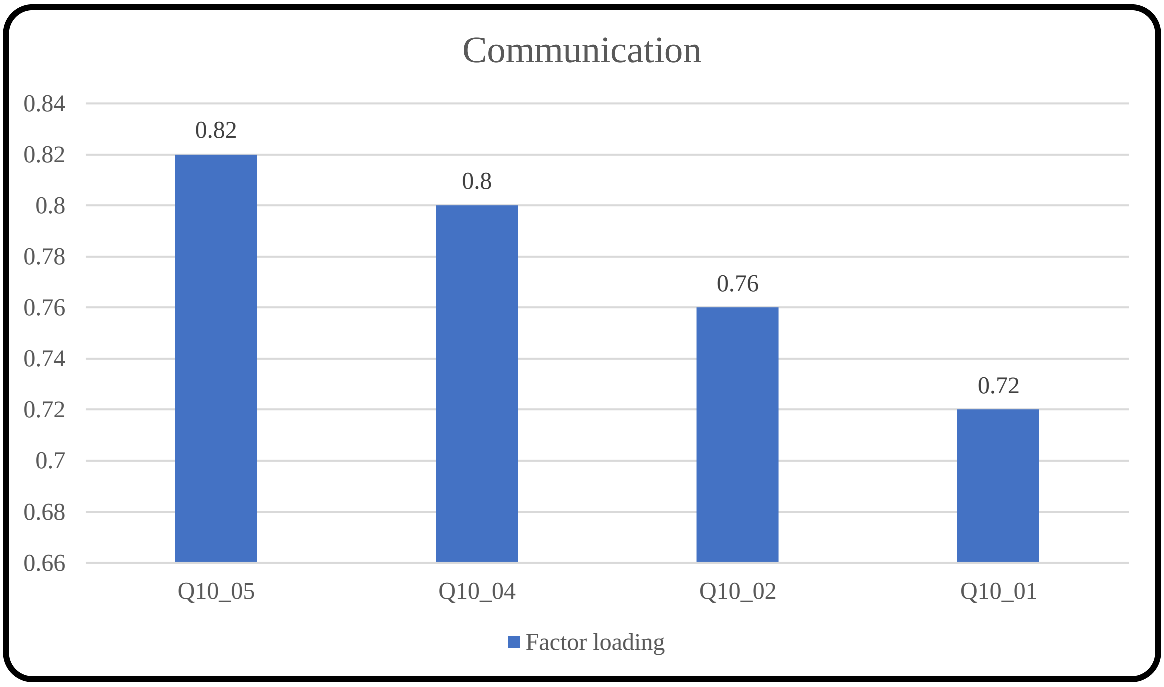

Figure 73 communication factor loading

Table 82 COM reliability, mean and standard deviation

Reliability alpha coefficient	**0.61**
Mean Value	2.81
Standard Deviation	1.409

Table 83. Factor 10: Communication – 1

Indicator code	Indicator question
Q10_05	MoEd
Q10_04	School administration

Table 84. Factor 11: Communication – 2

Indicator code	Indicator question
Q10_02	Parents
Q10_01	Students

C.4: Constructing scales

Table 85

No.	Factor	Cronbach's alpha coefficient
1	Students and Parents (SP)	0.93
2	LMS design and usefulness (LMSS)	0.94
3	School Administration (SA)	0.91
4	LMS Functions (LMSF)	0.84
5	MoEd Support (MEdS)	0.89
6	Personal Factors (PF)	0.89
7	MoEd Policies (MEdP)	0.79
8	IT Lab Class (ITL)	0.75
9	Tablets (T)	0.89
10	Communication – 1 (COM1)	0.73
11	Communication – 2 (COM2)	0.61
	COM (combined) (COM)	0.61

Factor 10: Communication (COM) – descriptive statistics

participants were requested to determine their frequency of communication with all stakeholders.

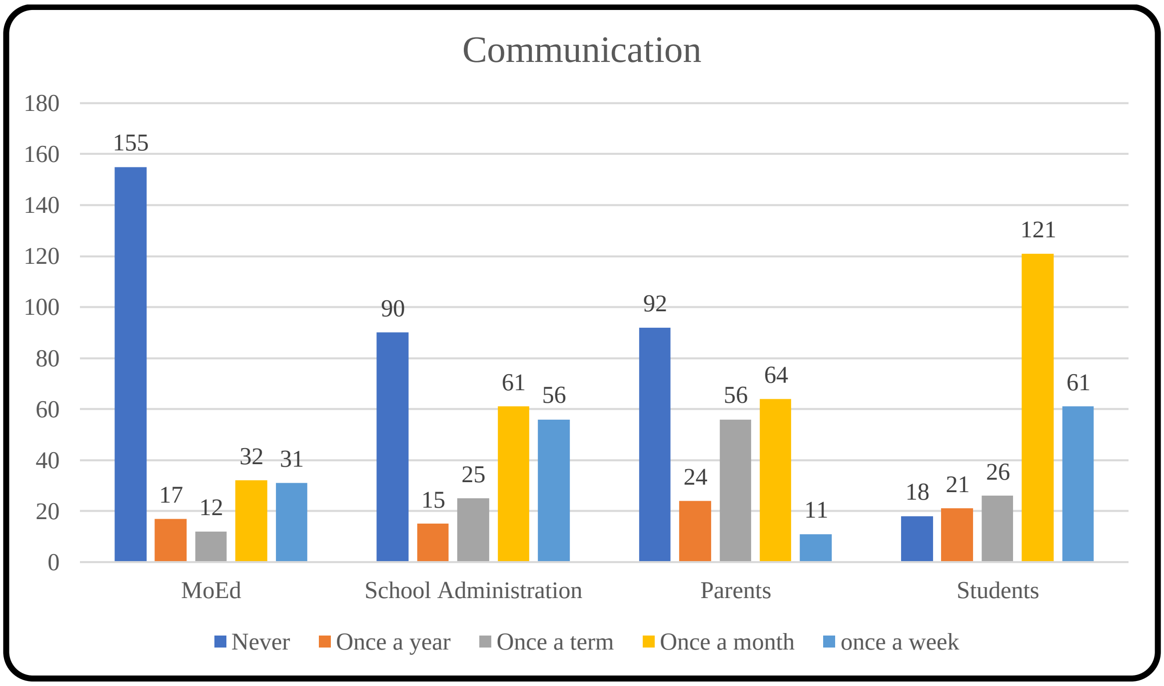

Figure 74. communication statistic results

The results of communication frequency with different stakeholders are presented in the graph above. the results show that participants have used the communication through the LMS with their students more than any other stakeholder. Whilst the lowest stakeholder they communicated with through the LMS were the MoEd. School administration and parents were communicated with less frequently and showed that one third of the participants never communicated with them through LMS. Those findings in this factor provided supporting evidence for other factors and items in the data collected. Hence, it is an important supporting factor to be considered when using the LMS.

Table 85. COM statistics results

Factor 10 - COM	**Mean**	**Std. Deviation**
COM1		
MoEd	2.06	1.526
COM2		
School administration	2.91	1.636
COM3		
Parents	2.51	1.337
COM4		
Students	3.75	1.137
Overall	**2.81/ 3.03**	**1.409**

The results shown in the table above indicated that the factor COM had a neutral influence on teachers' LMS integration. Hence, further exploration about this factor could yield more understandings.

C.5: Factors Statistics tables

Table (renumbering of tables should be done)

Factor 1 – SP		Disagree	Neutral	Agree	Mean	Std. Deviation
SP01 Students believe the LMS enhances their learning practice		149	73	25	2.28	0.992
SP02 Students use the LMS at home		157	71	19	2.24	0.93
SP03 Years 10&11 students are interested in using LMS		130	81	36	2.43	1.025
SP04 Students are motivated to use LMS		152	63	32	2.27	1.06
SP05 Year 12 students are interested in using LMS		175	50	22	1.97	1.045
SP06 Parents provide the support at home for their children to use the LMS		147	73	27	2.32	0.999
SP07 Students use the LMS at school		78	112	57	2.85	0.963
SP08 Parents believe LMS is useful for their children's learning		137	80	30	2.34	1.055
SP09 IT lab class are important for students learning		74	73	100	3.13	1.208
SP10 IT lab classes motivate students to use the LMS		80	82	85	2.96	1.173
SP11 Students have skills to use LMS		70	87	90	3.08	1.086
Least frequency	Highest frequency	1349	845	523	2.53	1.049

Factor 8 - ITL	Agree	Neutral	Disagree	Mean	Std. Deviation
ITL1 They waste year 12 students' learning time	143	61	43	2.36	1.178

ITL2 There are too many in an academic year		64	102	81	3.04	1.083
ITL3 They are used to force the students to use the LMS		109	62	76	2.71	1.198
ITL4 They waste my (participant's) teaching practice time		143	57	47	2.46	1.077
Least frequency	Highest frequency	459	282	247	2.64	1.134

Factor 2 - LMSS		Disagree	Neutral	Agree	Mean	Std. Deviation
LMSS1 It is Educationally designed		65	91	91	3.12	1.07
LMSS2 It is useful for teaching practice		70	72	105	3.15	1.177
LMSS3 Its design motivates students and teachers to use		104	73	70	2.77	1.166
LMSS4 Its design is competitive related to Blackboard		78	100	69	2.91	1.05
LMSS5 It supports student learning		71	73	103	3.16	1.163
LMSS6 Its designed communication is competitive in relation to WhatsApp		144	59	44	2.46	1.038
LMSS7 It is useful for administration tasks		74	60	113	3.19	1.221
LMSS8 It is reliable to use		107	61	79	2.79	1.145
LMSS9 I (participant) believe that LMS is useful for my teaching practice		93	62	92	2.96	1.228
Least frequency	Highest frequency	806	651	766	2.95	1.140

Factor 10 - COM	Never	Once a year	Once a term	Once a month	Once a week	Mean	Std. Deviation
COM1 MoEd	155	17	12	32	31	2.06	1.526
COM2	90	15	25	61	56	2.91	1.636

School administration							
COM3 Parents	92	24	56	64	11	2.51	1.337
COM4 Students	18	21	26	121	61	3.75	1.137
Least frequency / Highest frequency	355	77	119	278	159	2.81	1.409

Factor 9 - T	Disagree	Neutral	Agree	Mean	Std. Deviation
T1 Students having tablets would increase benefits from LMS	60	50	137	3.54	1.299
T2 MoEd should continue distributing tablet devices to students	62	50	135	3.46	1.293
Least frequency / Highest frequency	122	100	272	3.50	1.296

Factor 4 – LMSF	Not used	Difficult	Normal	Easy	Mean	Std. Deviation
LMSF1 Online quizzes	3	16	103	125	2.42	0.669
LMSF2 Uploading materials	6	14	108	119	2.38	0.704
LMSF3 Auto-correction	15	9	71	152	2.46	0.83
LMSF4 Creating questions bank	7	27	90	123	2.33	0.783
LMSF5 Sharing lesson plans with colleagues	15	19	100	113	2.26	0.844
LMSF6 Online homework	17	23	103	104	2.19	0.87
Least frequency / Highest frequency	63	108	575	736	2.34	0.783

Factor 6 - PF	Disagree	Neutral	Agree	Mean	Std. Deviation
PF1 Confident in my IT skills	8	45	194	4.11	0.897
PF2 Confident in my LMS skills	11	50	186	4.02	0.93
PF3 I (participant) previously had skills to use LMS	40	62	145	3.61	1.095

PF4 I (participant) gained experience to use LMS with time		8	38	201	4.21	0.847
Least frequency	Highest frequency	67	195	726	3.99	0.942

C.6: Factors Correlation:

Correlation is bivariate approach used to find the relationship between two variables and a type of inferential statistics (Hair et al., 2014; de Vaus, 2014). It measures the size and direction of linear relationships between variables (Hair et al., 2014). Correlation is determined by the correlation coefficient r (de Vaus, 2014). The value of r is between -1 and 1. If the value of r was equal to 1 then it means that both variables are perfectly correlated. A negative value indicates an inverse relation, as one variable increases the other variable decreases. A positive value indicates a linear relation, as one variable increases the other variable also increases (de Vaus, 2014; Greasley, 2007). r^2 is used to measure the strength of association of the two variables (Hair et al., 2014).

Significance p value is a statistical test that assists the reliability of the association between two variables. p scores less than 0.05 are considered statistically significant, which means that there is a statistically significant difference between the variables and that it is unlikely this occurred by chance (Greasley, 2007; Teddlie & Tashakkori, 2009). Pearson's correlation was used in SPSS as data were composed and were considered interval.

The description of the strength of a relationship r coefficient is indicated in the table below using Davis (1971), Cohen (1988) and de Vaus (2014) descriptions, which are applied equally to positive and negative relationships:

Table 86. Coefficient r and related strength descriptor

Coefficient r	Strength descriptor
0.00	No relationship
0.01 – 0.09	Very low relationship
0.10 – 0.29	Low to moderate relationship
0.30 – 0.49	Moderate to substantial relationship
0.50 – 0.69	Substantial to strong relationship
0.70 – 0.89	Very strong relationship
0.90 +	Nearly perfect relationship

In statistical analysis, to compare the difference between two nominal groups such as male and female against an interval variable, an independent t-test is used. t-test was used to compare the differences in: gender (male/ female); subjects taught (science/ other); age (younger/ older); and experience (less/ more) against the important factors identified from the factor statistics.

Correlations

		1	2	3	4	5	6	7	8	9	10	11
SP	Pearson Correlation	1										
	Sig. (2-tailed)											
LMSS	Pearson Correlation	.773**	1									
	Sig. (2-tailed)	0										
SA	Pearson Correlation	.290**	.311**	1								
	Sig. (2-tailed)	0	0									
LMSF	Pearson Correlation	.384**	.453**	.423**	1							
	Sig. (2-tailed)	0	0	0								
MEdS	Pearson Correlation	.498**	.493**	.543**	.482**	1						
	Sig. (2-tailed)	0	0	0	0							
PF	Pearson Correlation	.371**	.385**	.434**	.479**	.376**	1					
	Sig. (2-tailed)	0	0	0	0	0						
MEdP	Pearson Correlation	.378**	.453**	0.033	.255**	.271**	.204**	1				
	Sig. (2-tailed)	0	0	0.609	0	0	0.001					
ITL	Pearson Correlation	.360**	.434**	0.02	.162*	.319**	.139*	.569**	1			
	Sig. (2-tailed)	0	0	0.755	0.011	0	0.029	0				
T	Pearson Correlation	.374**	.430**	.183**	.249**	.319**	.212**	.226**	.177**	1		
	Sig. (2-tailed)	0	0	0.004	0	0	0.001	0	0.005			
COM1	Pearson Correlation	.352**	.309**	.150*	.145*	.280**	0.116	0.091	0.115	.224**	1	
	Sig. (2-tailed)	0	0	0.019	0.023	0	0.068	0.152	0.071	0		
COM2	Pearson Correlation	.381**	.440**	.224**	.302**	.271**	.309**	.237**	.200**	.245**	.222**	1

	Sig. (2-tailed)	0	0	0	0	0	0	0	0.001	0	0	
** Correlation is significant at the 0.01 level (2-tailed).												
* Correlation is significant at the 0.05 level (2-tailed).												
[green]: strong correlations – [yellow]: moderate correlations												

Correlation was used to find the relationships, and their strength, between two variables (Creswell, 2014; Teddlie & Tashakkori, 2009). In this research, the relationships between factors were correlated using SPSS and the results are shown in the following table.

Table 87. Factors' correlations

Correlations

		1	2	3	4	5	6	7	8
SP	Pearson Correlation	1							
	Sig. (2-tailed)								
LMSS	Pearson Correlation	.773**	1						
	Sig. (2-tailed)	0							
SA	Pearson Correlation	.290**	.311**	1					
	Sig. (2-tailed)	0	0						
LMSF	Pearson Correlation	.384**	.453**	.423**	1				
	Sig. (2-tailed)	0	0	0					
MEdS	Pearson Correlation	.498**	.493**	.543**	.482**	1			
	Sig. (2-tailed)	0	0	0	0				
PF	Pearson Correlation	.371**	.385**	.434**	.479**	.376**	1		
	Sig. (2-tailed)	0	0	0	0	0			
MEdP	Pearson Correlation	.378**	.453**	0.033	.255**	.271**	.204**	1	
	Sig. (2-tailed)	0	0	0.609	0	0	0.001		
ITL	Pearson Correlation	.360**	.434**	0.02	.162*	.319**	.139*	.569**	1
	Sig. (2-tailed)	0	0	0.755	0.011	0	0.029	0	
T	Pearson Correlation	.374**	.430**	.183**	.249**	.319**	.212**	.226**	.177**
	Sig. (2-tailed)	0	0	0.004	0	0	0.001	0	0.005
**** Correlation is significant at the 0.01 level (2-tailed).**									
*** Correlation is significant at the 0.05 level (2-tailed).**									
[green]: strong correlations – [yellow]: moderate correlations									

Many correlations resulted. However, this study focused more on exploring the most important factors and how they correlate, in an attempt to answer research question 3. From the descriptive factors' statistics, four limiting factors were identified: SP; LMSS; MEdP; and ITL.

5.3.6) Correlation analysis (important limiting factors)

This section focused on the four factors identified as the important factors, the following table summarises their mean scores.

Table 88. Limiting factors mean scores

Factor	Mean score
MEdP	2.38
SP	2.53
ITL	2.81
LMSS	2.95

MEdP had the lowest mean score of 2.38 with 4 components. The second lowest factor was SP which had the highest number of components, with 11 components and an eigenvalue of 19.54 and variance explained by 32.04%. The following table focuses on limiting factor correlations.

Table 89. Limiting factors correlations

Correlations

		MEdP	SP	ITL
MEdP	Pearson Correlation	1		
	Sig. (2-tailed)			
SP	Pearson Correlation	.378**	1	
	Sig. (2-tailed)	0.00		
ITL	Pearson Correlation	.569**	.360**	1
	Sig. (2-tailed)	0.00	0.00	
LMSS	Pearson Correlation	.453**	.773**	.434**
	Sig. (2-tailed)	0.00	0.00	0.00
**** Correlation is significant at the 0.01 level (2-tailed).**				
*** Correlation is significant at the 0.05 level (2-tailed).**				

5.3.6.1) MEdP and SP correlation

The relationship between SP and MEdP had a correlation coefficient score of 0.378. This reflected a moderate correlation. This relationship is statistically significant at $p<0.05$ and R^2 explaining 14.3% of the variation between those variables. The following graph shows the direction and strength of the relationship.

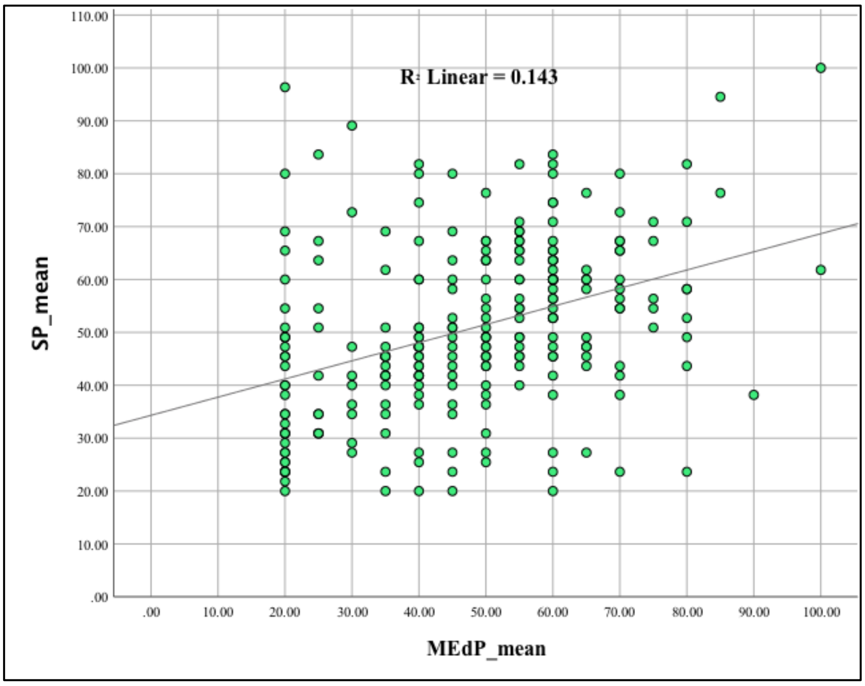

Figure 75. SP against MEdP Scatter plot

5.3.6.2) MEdP and ITL correlation

The relationship between MEdP and ITL had a correlation coefficient score of 0.569. This reflected a strong relationship. This relationship is statistically significant at $p<0.05$ and R^2 explaining 32.4% of the variation between those variables. The following graph shows the direction and strength of the relationship.

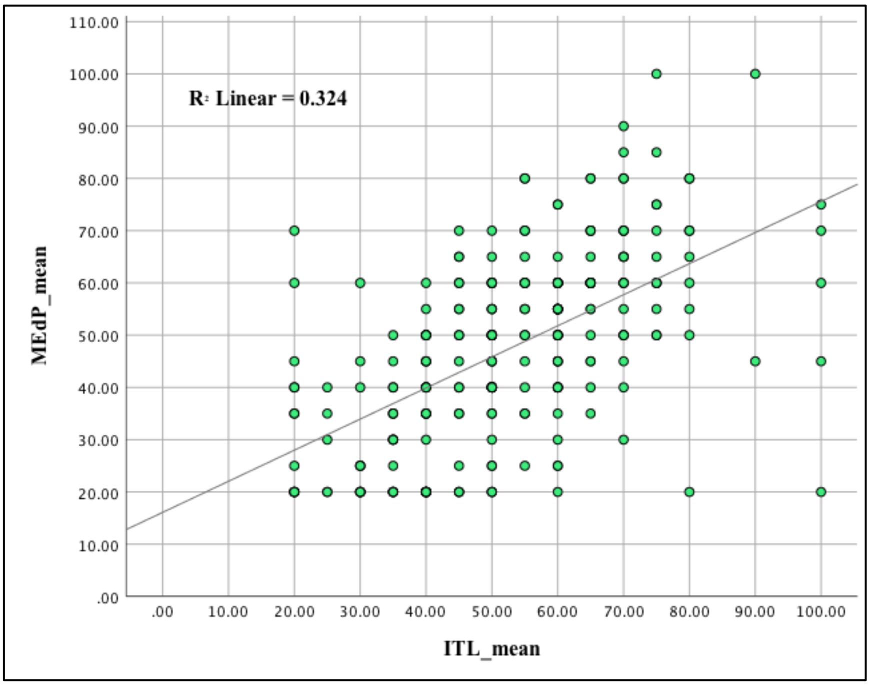

Figure 76. MEdP against ITL Scatter plot

5.3.6.3) MEdP and LMSS correlation

The relationship between LMSS and MEdP had a correlation coefficient score of 0.453. This reflected a substantial relationship. This relationship is statistically significant at $p<0.05$ and R^2 explaining 20.5% of the variation between those variables. The following graph shows the direction and strength of the relationship.

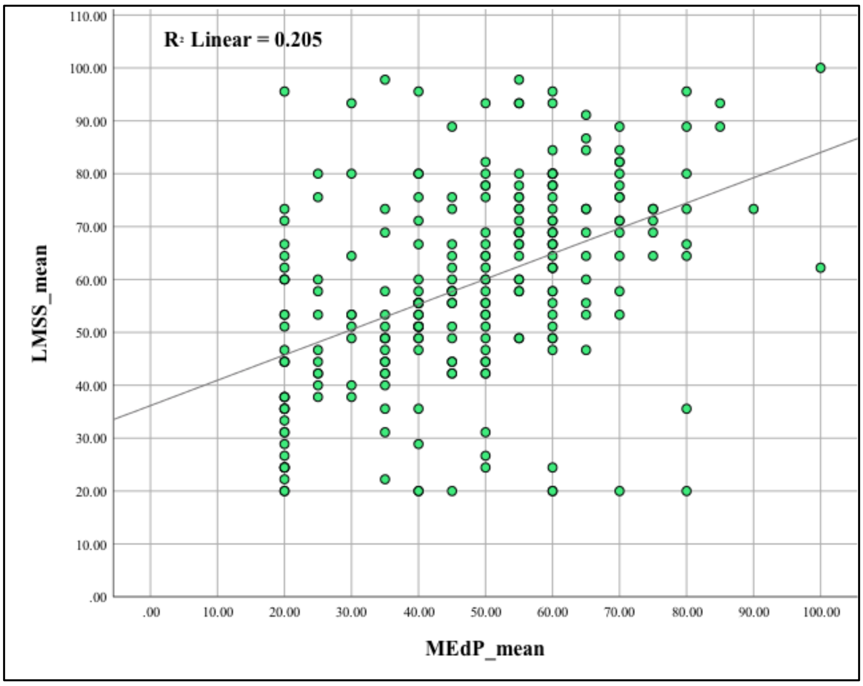

Figure 77. LMSS against MEdP Scatter plot

5.3.6.4) SP and ITL correlation

The relationship between SP and ITL had a correlation coefficient score of 0.360. This reflected a moderate relationship. This relationship is statistically significant at $p<0.05$ and R^2 explaining 13% of the variation between those variables. The following graph shows the direction and strength of the relationship.

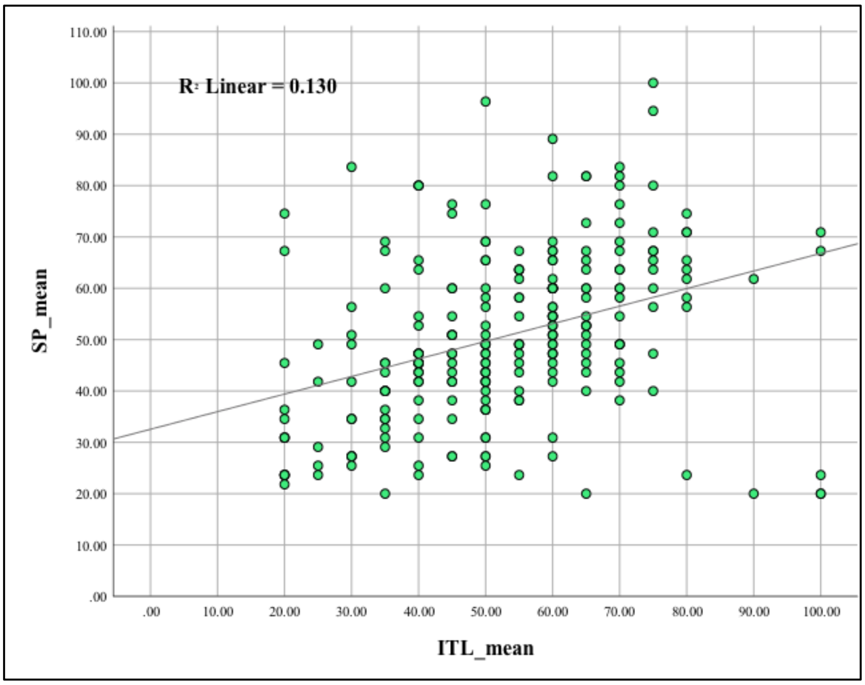

Figure 78. SP against ITL Scatter plot

5.3.6.5) SP and LMSS correlation

The relationship between SP and LMSS had the highest correlation coefficient score of 0.773. This reflected a very strong relationship. This relationship is statistically significant at $p<0.05$ and R^2 explaining 59.7% of the variation between those variables. The following graph shows the direction and strength of the relationship.

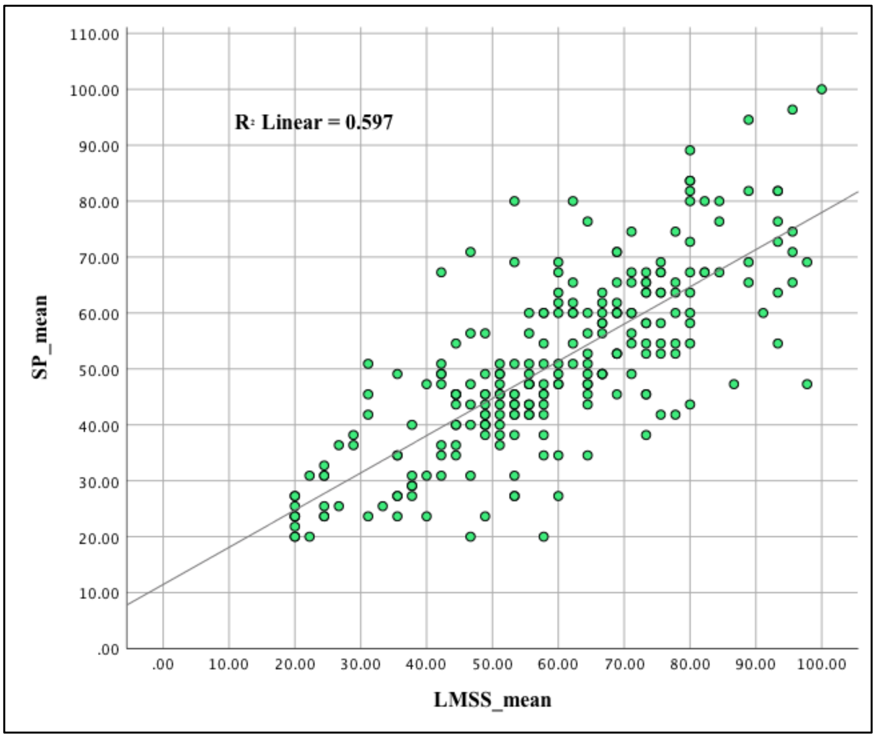

Figure 79. SP against LMSS Scatter plot

5.3.6.6) ITL and LMSS correlation

The relationship between LMSS and ITL had a correlation coefficient score of 0.434. This reflected a substantial relationship. This relationship is statistically significant at $p<0.05$ and R^2 explaining 18.8% of the variation between those variables. The following graph shows the direction and strength of the relationship.

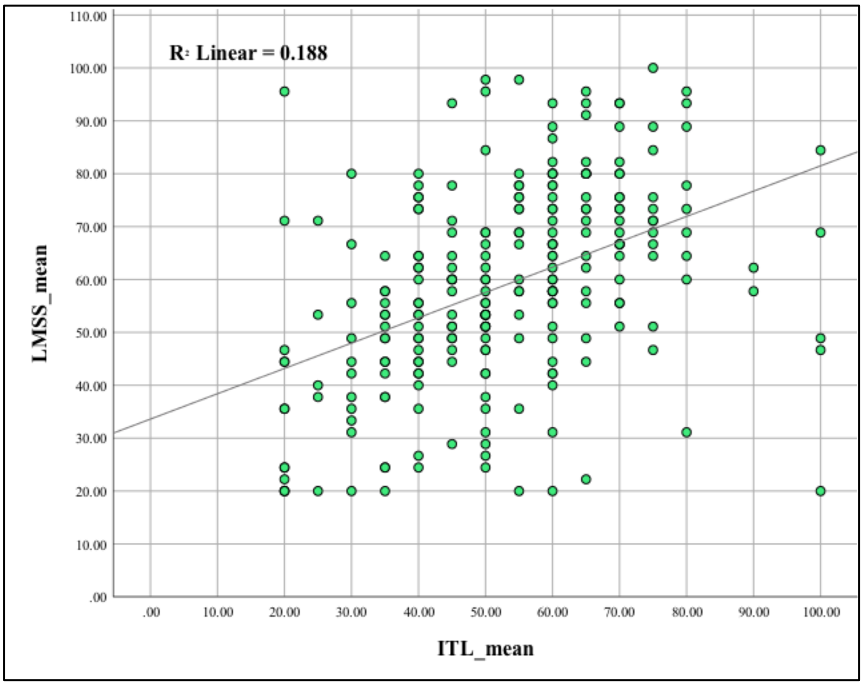

Figure 80. LMSS against ITL Scatter plot

C.7: Integrated Analysis Tables

Phase one finding	Item	Phase two finding
"Many of the … students don't have the interest [in LMS]" (P07)	**SP01** Students believe that the LMS enhances their learning	60.3% disagree, 29.6% are neutral, 10.1% agree
Comment: Phase two finding indicated that most of the participants disagree that students believe that the LMS enhances their learning.		
Participants indicated that students are reluctant to use LMS at home	**SP02** Students use the LMS at home	63.6% Disagree, 28.7% are neutral, 7.7% Agree
Comment: Phase two finding that most of the participants confirmed that students are reluctant to use LMS at home.		
Participants indicated that years 10 & 11 are more engaging with LMS than year 12 students, however, it was rated as acceptably useful	**SP03** Years 10 & 11 students are interested in using LMS	52.6% Disagree, 32.8% are neutral, 14.6% Agree
Comment: Phase two finding indicated that most of the participants did not agree with the item, hence it is similar to phase one's participants review as they rated its usefulness as acceptable in comparison with year 12 students.		
Students are not motivated to use the LMS	**SP04** Students are motivated to use the LMS	61.5% disagree, 25.5% are neutral, 13% agree
Comment: Phase two finding indicated that the majority of participants disagreed with the item, confirming phase one finding.		
Year 12 students are not interested in using the LMS as there are no marks on its usage	**SP05** Year 12 students are interested in using the LMS	70.9% disagree, 20.2% are neutral, 8.9% agree
Comment: Phase two finding confirms what was stated by some of phase one's participants, that most of the participants disagree with the item.		
Parents to don't provide their children with the support and tools they need to use the LMS	**SP06** Parents provide the support at home for their children to use the LMS	59.5% disagree, 29.6% are neutral, 10.9% agree
Comment: Phase two finding indicated that most of the participants disagree with the item and that students don't get the necessary support to use LMS at home.		
"The student at school honestly answer to you, he doesn't have a problem" (P07)	**SP07** Student use the LMS at school	45.3% are neutral, 31.6% disagree, 23.1% agree
Comment: Phase two finding indicated that most of the participants were neutral towards the item, and some participants in phase one indicated that students use the LMS at school when they are told.		
"Parents are not much convinced about [the LMS]" (P06)	**SP08** Parents believe LMS is useful for their children's learning	55.5% disagree, 32.4% are neutral, 12.1% agree
Comment: Phase two finding indicated that most of the participants disagree with the item, as similarly indicated by participants in phase one.		

Phase one finding	Item	Phase two finding
IT lab class motivates students' engagement with LMS and promotes collaborative learning (P07) Very little engagement with LMS through the academic year, there is no need to waste time on IT lab classes	**SP09** IT lab class are important for students' learning	40% agree, 30% disagree, 29.5% are neutral
Comment: Phase two finding shows that most of the participants agree with the item, which was similarly indicated by some of the participants in phase one. Also, in phase one, some participants indicated that IT lab classes could be important for students learning collaboratively. On the other hand, there were some participants who didn't appreciate wasting their teaching time on IT lab class due to the little engagement with the LMS throughout the academic year, which was reflected by 30% of participants in phase two.		
IT lab classes motivates students' engagement with the LMS	**SP10** IT lab class motivated students to use the LMS	34.4% agree, 33.2% are neutral, 32.4% disagree
Comment: Phase two finding indicated a slightly more agreement with the item as other neutral and disagreeing participants had very close percentages.		
Students are not taught the skills to use the LMS at early stages Students can easily learn from their peers in the class	**SP11** Students have the skills to use the LMS	36.4% agree, 35.2% are neutral, 28.3% disagree
Comment: Phase two findings indicated that participants agreeing with the item had the highest percentage, and in phase one, some participants agreed, and others didn't.		

Phase one finding	Item	Phase two finding
"year 12 students don't have [marks on LMS], this is another problem" (P07)	**ITL1** They waste year 12 students' learning time	57.9% agree, 24.7% are neutral, 17.4% disagree
Comment: Most of the participants in phase two agreed with this item which also confirmed what was reported by some of the participants in phase one.		
The e-learning class is very limited, it only occurs twice per module per year for a class	**ITL2** They are too many for one academic year	41.3% are neutral, 32.8% disagree, 25.9% agree
Comment: The majority of participants in phase two are neutral toward this item. However, more disagreed with it than agreed. In phase one, it was reflected that it does not occur very frequently, but sometimes it could be scheduled on an unwanted date as presented earlier in SA factor.		
"you have to take students to the lab class, and would force students to go back and solve equations, things like this" (P03)	**ITL3** They are used to force the students to use the LMS	44.1% agree, 30.8% disagree, 25.1% are neutral
Comment: A majority of the participants in phase two agreed with this item, confirming what was mentioned by some of the participants in phase one.		
Some participants use the IT lab class to introduce new topics, others to practice previous topics	**ITL4** They waste my teaching time	57.9% agree, 23.1% are neutral, 19% disagree

Phase one finding	Item	Phase two finding
A few indicated that IT lab class interrupts their teaching activities		
Comment: The phase two finding was that the majority of participants agreed with this item, whereas in phase one only a few indicated so.		

Phase one finding	Item	Phase two finding
"it has to be attractive; this is what we want … it has to be educational" (P03)	**LMSS1** LMS is educationally designed	36.8% agree, 36.8% are neutral, 26.3% disagree
Comment: Phase two findings showed more agreement and neutrality towards the item, where some participants in phase one stated that it is not and others that it is like a normal page.		
It is amazing *"It is very important … it is not a luxury anymore" (P04)*	**LMSS2** LMS is useful for teaching practice	42.5% agree, 29.1% are neutral, 28.3% disagree
Comment: Phase two finding confirms phase one finding, as most of the participants agree with the item.		
"it is a normal page, questions and answers" (P07) *"the LMS is static [not user friendly]" (P03)*	**LMSS3** LMS design motivates students and teachers to use it	42.1% disagree, 29.6% are neutral, 28.3% agree
Comment: Phase two finding mostly disagree with the item, similarly, indicated by some participants in phase one.		
LMSS4 LMS design is competitive compared to Blackboard	It would be more supportive to learning if it was up to date in relation to its competitors	40.5% are neutral, 31.6% disagree, 27.9% agree
Comment: Most of phase two participants were neutral. However, there was more disagreement with the item than agreement. Some phase one participants have highlighted the same.		
"you could send them materials that are more related to their level" (P09)	**LMSS5** LMS supports students Learning	41.7% agree, 29.6% are neutral 28.7% disagree
Comment: Phase two finding supports phase one finding, as it agrees more with the item.		
"all classes have a WhatsApp group; it is competing with us [using LMS, and when I want to share something … I share it through [WhatsApp]]" (P04)	**LMSS6** LMS's designed communication is competitive in comparison to WhatsApp	58.3% disagree, 23.9% are neutral, 17.8% agree
Comment: Findings from phase two confirms that the majority of the participants don't agree with the item, which was similarly indicated by some participants in phase one.		
(There was no direct reflection from phase one)	**LMSS7** LMS Is useful for administration tasks	45.7% agree, 30% disagree, 24.3% are neutral
Comment: Most of phase two participants agree with the item.		
"they have paid a lot … but I don't know why they didn't succeed?" … "as soon as there is a problem	**LMSS8** LMS is reliable to use	43.3% disagree, 32% agree, 24.7% are neutral

Phase one finding	Item	Phase two finding
reoccurring twice or three times, I will get bored and leave it [LMS]" (P05)		

Comment:
Phase two finding mostly disagree with the item, which was also highlighted by some of the participants in phase one.

Participants didn't question the usefulness of the system in education	**LMSS9** I (teachers) believe that LMS is useful for my teaching practice	37.7% disagree, 37.2 % agree, 25.1% are neutral

Comment:
Phase two finding indicated a nearly equal disagreement and agreement with the item, where disagreement with the item had a 0.5% over the agreement score. Most of phase one participants believed that LMS is useful, but there were some issues.

1- Communication (COM)

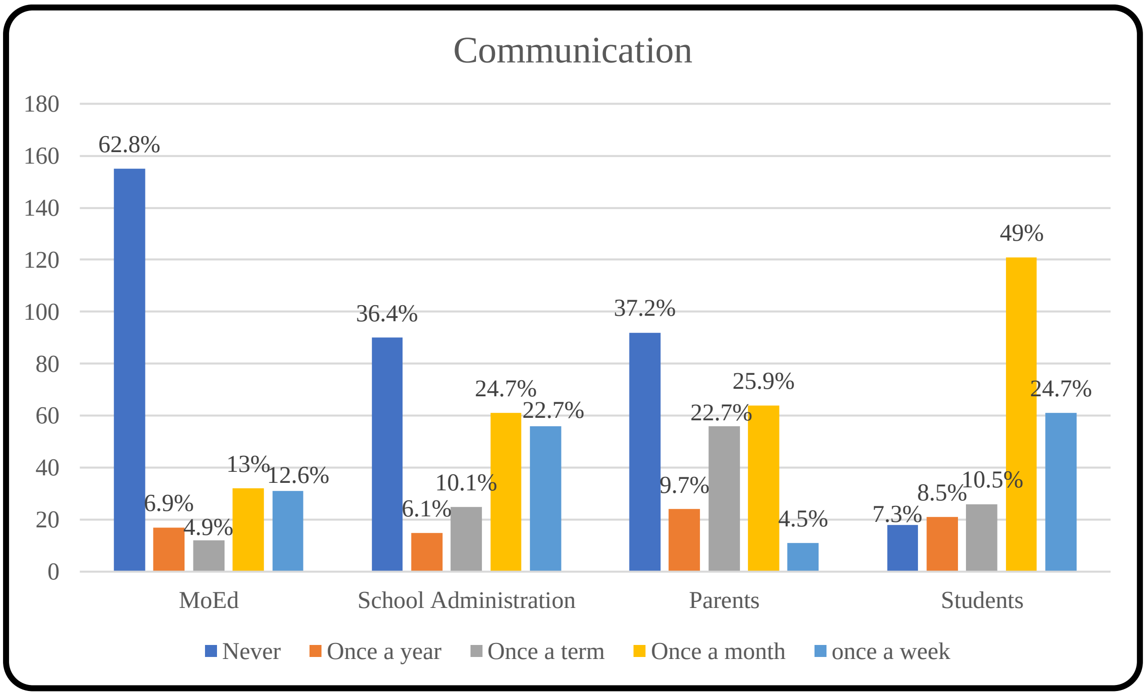

Figure 81. communication score percentages

Table 90. COM and Phase one relation table

Theme	Item number	Title
2	5.1.3.2	Minor effect

Communication was one of the main features mentioned by participants in phase one *"it is similar to an electronic webpage, it can be used for communication between teachers and students, and parents and administrators" (P08)*. To understand more about this feature, the frequency of its usage was inquired from phase two participants. The results have showed that participants were mostly communicating with students were 49% used it once a month at least. The least communication was with the MoEd with 62.7% never used it. One of the reasons for this factor's inclusion in this section, is that it brings new useful data for further investigation and analysis, that would help understanding more about the LMS for future research.

Appendix D

- Important factors

It was found that Students and Parents (SP), LMS design and usefulness (LMSS), MoEd policies (MEdP) and IT lab classes (ITL) were the most important and limiting factors. Their mean scores were lower than 3. The benefit of further explorations of those factors highlighted the interesting areas of comparisons and for further investigation, which is expected to yield in further understandings of factors for better LMS integration by teachers at schools.

From the analysis of both phases, the idea of LMS inclusion in educational practice was perceived positively by teachers. However, there were certain factors that affected using it to its full potential. Those factors were not simply and independently limiting LMS integration, and the strengths and directions of their influences were not straightforward.

For example, Students and Parents (SP) was found as one of the limiting factors that was repeatedly reported by participants in both phases. This factor in itself is a combination of two stakeholders, which were combined for simpler analysis and presentation. If they would have been separated and then correlated, an interesting result is expected to have been found. In this research the author, will continue to treat them as a one factor.

This finding means that students and parents beliefs towards the LMS usefulness are strongly correlated with the teachers' beliefs towards the LMS usefulness; the more the students and parents believe in the LMS's usefulness the more the teachers believe in its usefulness. and vice versa. In addition, SP are affected by the LMSS design, where if the LMS was better designed educationally and with a more motivational layout, student and parent interest and belief in its usefulness could become more positive. As a result, teachers would use the LMS more.

The Ministry of Education's policies (MEdP) was found to be strongly correlated with the IT lab Class (ITL) factor. Hence, the IT lab class is strongly influenced by MEdP, as many of the participants were forced to the take the students to the IT lab class and force the students to use the LMS, even if they didn't see its benefit to their teaching or it was not scheduled at the appropriate time. Which also means that IT lab class benefit is affected by teachers' beliefs about the LMS's usefulness and its design.

The correlation between LMSS and ITL was substantial. This relationship is explained by how teachers would use the IT lab class, as it has been found that some of them were able to introduce new subjects, continue a previous subject or revise old subjects through the LMS.

Another interesting relationship was found between the MoEd's policies and LMS system. The correlation between them was substantial. MEdP affected LMSS usefulness, which was reflected when teachers were asked to use the LMS for extra administrative work that consumed their time and effort, in addition to utilising many of the LMS functions at the same time. This was also expressed by some of the participants who felt some LMS functions to be a waste of time and of no value to students' learning.

MEdP relation to SP, and SP to ITL were moderate in the strengths. Further exploration of these relationships could be better done with students and parents as participants, so they would be able to reflect their own experiences with those factors. MEdP and SP showed a statistically significant correlation, though not many elements could be found linking them except that the mark given to students when using the LMS had little value in terms of their overall mark, resulting in students' hesitancy in using the LMS. More exploration is needed in future research focusing on students as the participants. However, in this research SP were found not interested in the ITL, especially students in Grade 12.

All of these factors interrelate with each other, which demonstrates the complexity in applying technologies in educational organisation. In addition, other supporting factors may also have showed some interesting correlations, which would be interesting to be explored further.