THE USE OF DIGITAL MOBILE DEVICES IN ENHANCING TEACHING AND LEARNING AT THE UNIVERSITY OF VENDA.

By

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A dissertation submitted in fulfillment of the requirements for the award of Master of Commerce in Business Management (MCOM) Degree

IN THE

Department of Business Management
School of Management Sciences
University of Venda

2017

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DECLARATION

I, the undersigned **Ratchel Chikurunhe (11613045)** hereby declare that this dissertation on the topic “The use of Digital Mobile Devices in enhancing in teaching and learning at the University of Venda” is my own original work. This dissertation has not been submitted and will not be presented at any other University for a similar or any other degree award.

Signature …… Date ……

Chikurunhe Ratchel (11613045)

DEDICATION

I dedicate this research work to the Almighty God who gave me strength and covering during this study. I also dedicate this dissertation to my special family who were always there encouraging and motivating me throughout the academic journey.

ACKNOWLEDGEMENTS

I would like to thank the Lord Almighty Jehovah for blessing me with this opportunity to study further. The completion of this research was made possible with the supervision of Professor Kadyamatimba, Professor Runhare and Mr Munyoka. I would like to thank the Business Information Systems Department Staff for sacrificing their precious time in guiding me throughout the research journey. The staff members are Mr Manzira, Mr Madzvamuse, Mr Chibonda and Mr Tutani who is the Head of Business Information Systems Department..

I would like to thank my mum, Mrs Violah Mazhazhate and my sister, Mrs Partial Chikurunhe Mutasa for all their support, wisdom and unforgettable unconditional love, and for always believing in me. To my friends, Wellington Chakuzira, Joyce Manjowe, Muriel Munyavi thank you for being an inspiration in my life.

Many thanks are due to the Government of Zimbabwe for affording me a chance to study in South Africa and the National Research Fund (NRF) for ensuring that my dream became a reality their funding.

ABSTRACT

Mobile technology is progressively being used to support students' learning, extending learning and educator-student contact beyond class hours. Mobile technology has been identified as a potential solution to the problem of scarcity of computers to access online learning materials in higher education institutions. The University of Venda distributed tablet personal computers to students so that they could use them for facilitating and enhancing their studies. However, the provision of tablet PCs to students may not be a panacea for quality learning, especially to a population that is not familiar with latest information technologies. The aim of the study was to investigate the use of digital mobile devices (tablet personal computers and smartphones) for enhancing teaching and learning at the University of Venda. The research questions focused on determining the current level of use of mobile devices, how they could be used effectively for teaching and learning; and the perceptions of students and lecturers on mobile devices as tools for teaching and learning. Case study research design was considered most suitable for this study as it involves collecting and reporting descriptive information about a specific environment. Mixed methods approach was applied with data being solicited from a convenient sample of 370 students, 8 lecturers and 1 IT technician at the University. Semi-structured questionnaires were distributed to students. The results of the study indicated that many students are active and spending much time on the different internet activities. The study also found that students prefer mobile learning and spend much time on the internet surfing information. Lecturers found it easy to communicate with the students via emails and social media platforms where they send study materials. Students use their smartphones and tablet PCs to download learning materials. However, many lecturers and students are not making use of the Learning Management System, the Blackboard due to lack of training. The results of the study are to be used to explicate, forecast, and advance the integration of the digital mobile devices for promoting learning and teaching accomplishments and standard competencies at the University of Venda. Recommendations were made on how students and lecturers can effectively use digital mobile devices for teaching and learning.

Key words: *Teaching and Learning, Digital Mobile Devices, Mobile Technologies*

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LIST OF ABBREVIATIONS

Apps:	Applications
BYOD:	Bring Your Own Device
EFA:	Education for All
FCC:	Federal Communications Commissions
HEI:	Higher Education Institutions
HMH:	Houghton Mifflin Harcourt
ICT:	Information and Communication Technology
LTE:	Long Term Evolution
MoLeNET:	Mobile Learning Network
SCPD:	School Provided Devices
OPD:	Organisation Provided Devices
PLE:	Personal Learning Environments
SMILE:	Stanford Mobile Inquiry-based Learning Environment
UNIVEN:	University of Venda

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CHAPTER ONE: INTRODUCTION AND BACKGROUNG OF THE STUDY

1.1 INTRODUCTION

Technology has become part of human development. The latest explosion in technology is the development of digital mobile devices. These mobile devices are becoming ubiquitous, inexpensive and hence are within reach of many people in the world today. New value-added functions have been introduced within these devices. The variety of these advanced functions, results in the improved device user-friendliness to the extent that there is creation of opportunities to offer learning support anywhere at any time (Poon, 2013).

Other developments in wireless communication networks namely the 3G/data card, Wi-Fi, and Long Term Evolution (LTE) further extend the prospect of supporting education for mobile technology users (Paul, 2008). As the outcome of the advanced improvements in design, reduced size, improved functionality, enhancements in data storage capability, and the consistency and ubiquity of the networks that support them, mobile technologies have become important to people's daily lives (Evans-Cowley, 2010). The term 'mobile devices', as used in this study, refers to Tablet Personal Computers (tablet PCs) and smart mobile gadgets.

1.2 BACKGROUND TO THE STUDY

Mobile devices permit learning experiences which can effectively educate learners (Clark and Mayer, 2016). The devices can be dynamically used, providing access to a wide range of uses as well as situated learning activities. The nature of these technologies implies that they are suitable to engage students in individual learning experiences. Wong and Looi (2011) state the advantages of relating mobile technologies such as portable computers, smart phones, or personal digital assistants in Higher Education Institutions (HEI) to learning activities. They point out that within the education context, mobile technologies can give students the opportunity to take on 'user-led education,' collaboration and constructing knowledge with peers and learning communities within and beyond the schoolroom or computer center. Baran (2014) studied the use of mobile learning in the context of teacher education and reported positive outcomes from the investigation. Mobile devices were found to have the potential to help teachers understand and develop new literacies, engaging in rich language learning contexts and exploring physical education (Baran, 2014).

Mokoena (2012) states that the advances in mobile technologies brought additional opportunities in the era of mobile learning, which makes it possible to enrich the learning experiences of students. There are opportunities such as making it easy to enrich the learning experience, which are being offered by the most recent mobile technology in the development of mobile phones (Eteokleous and Ktoridou 2009).

1.2.1 Impact of Mobile Devices

Mokoena (2012) states that mobile devices can change the organisation of classrooms within teacher education programs by the increasing mobility. Mokoena also reported another benefit which includes features that associate pre-service teachers to their colleagues, improving professional learning due to collaboration, and simplifying mentoring processes. Closer relationships and more personalized learning experiences for teacher candidates are also built as needs change over time by utilisation of mobile gadgets. Baran (2014) states that teachers value the technology in terms of visual quality of teaching materials, evaluating students and finding teaching approaches with the use of tablet PCs in classrooms that enhance learning experiences, and improving students' participation.

Mobile devices are being embraced by institutions in higher education (Johnson, Becker, Cummins, Estrada, Freeman and Ludgate, 2013). Significant investments in arrangement of content, infrastructure, and resources associated with the integration of mobile devices into learning environments have been made by institutions (Johnson et al., 2013). The advent of a global economy and advancement in technology are major key drivers towards the transformation of the South African education sector (Department of Education and Training, 2008). To this extent, the South African education sector has undergone a radical transformation to incorporate and adapt to new sophisticated ways of learning by exploiting the digital learning phenomena. The national government has introduced iPads, tablets and laptops in schools (Hanson, 2016). According to Mokoena (2012), a quality IT driven and effective education system results in a high pass rate, reduced dropout rates, low absenteeism levels by teachers and increased efficiency and productivity of both teaching and learning in schools.

1.2.2 Infusion of Mobile Devices in Rural Universities

Most research done focused more on urban universities' use of mobile phones to support teaching and learning (Poon, 2013; Elzarka, 2012; Sevillano-García and Vázquez-Cano, 2015).

The case study of this research is the University of Venda, (UNIVEN), a rural based University in South Africa, which is situated in Thohoyandou in the Vhembe district of Limpopo province. It was established in 1982 and has established itself as a national asset through its niche on problem oriented, project based curriculum whose strength lies in nurturing under-prepared students into nationally competitive graduates. Technology is not something new at the University but it is increasingly progressing. After realising that there is an influx of mobile technologies worldwide in teaching and learning whereby students can do their work anywhere and anytime, UNIVEN also jumped on this technological bandwagon.

In 2015, the University made national history in Higher education by distributing tablet PCs to more than 13 000 students with the aim of enhancing the quality of teaching and learning (Nendila, 2015). This initiative was an 'add on' value to the lives of students. The tablet PCs investment demonstrated the University's commitment to offer students the necessary support, ensuring that they realise their dreams with minimal challenges and empowering them with the ability to compete favourably, both nationally and globally. This bridged the digital divide as most students at the University generally use computers from the computer centres, library and labs to access online learning resources.

Although the University has adopted the technology, the question is whether there is the necessary infrastructure to support its uptake? Are the students using the applications for learning? Is the University meeting the required bandwidth for nonstop or fast streaming and content security from authoring groups? The study, therefore, investigated the prevailing levels of utilisation of mobile technology in teaching and learning at the University of Venda, the factors and obstacles that affect the use of these technologies in teaching and learning and their impact on teaching and learning.

1.3 PROBLEM STATEMENT

While use of IT in teaching and learning is a welcome development, this has not come without challenges (Nigel, 2013). Research indicates that different countries and organisations have experienced different perceptions, opportunities and challenges in the adoption of IT in their teaching and learning service provisions (Johnson et al., 2013; Wright, 2014; Nagel, 2013). In South Africa's higher education system, which has both urban and rural components, formally disadvantaged and privileged universities, the use of IT in teaching and learning has its own problems when it comes to infrastructure development and IT skills.

The tremendous efforts made by the University of Venda in 2015, in the fulfilling some of the technological expectations of a modern University by providing tablet PCs to students resulted in much appreciation from students as some students had never seen and/or used them. It is however, not clear if such efforts have resulted in corresponding application and integration of these technologies in teaching and learning. There was no evidence of students' perceptions on the adoption of these technological innovations and how to use of them at the University.

The problem this study addresses is that the current status of mobile devices' usage in teaching and learning and Tablet PC's adoption by students and lecturers was educationally unknown since it was a new phenomenon at the University of Venda. The introduction of tablet PCs may not be a panacea for improving the quality of teaching and learning particularly to a population that is not familiar with the latest technologies. Therefore, there was need to investigate the pedagogical value and use of mobile technologies in teaching and learning. There was also need to investigate the extent to which the introduction of tablet PCs has potential usefulness in developing strategies that might help curb slow adoption, uncertainties, unfamiliarity, and presumably improve the quality of teaching and learning at UNIVEN.

1.4 AIM AND OBJECTIVES OF THE STUDY

The aim and objectives of the study were:

1.4.1 Aim

The study aimed at investigating the potential use of digital mobile devices in teaching and learning at the University of Venda.

1.4.2 Objectives

The objectives of the study were to:

- Assess the level of mobile devices' usage for teaching and learning purposes at UNIVEN
- Determine how mobile devices can be effectively used for teaching and learning at UNIVEN.
- Explore University students' and lecturers' perceptions on the usefulness of mobile devices in their educational experience.

1.5 RESEARCH QUESTIONS

The following were the research questions:

R.Q.1 – What is the level of mobile devices' usage at UNIVEN?

This question is relevant in order to understand what was already happening with the use of mobile devices, that is, educational approaches being used by lecturers in teaching, interactions between instructor and students, or interactions between students. This question also assisted in assessing if there is the required infrastructure for using mobile devices especially tablet PCs, if training was conducted on how to use them for academic purposes and if students and lecturers were using mobile technologies for teaching and learning.

R.Q.2 - How can mobile devices be effectively used for teaching and learning at UNIVEN?

The goal of this question was to determine how mobile devices can be used to enhance teaching and learning at UNIVEN. It helped in understanding the kinds of educational content and information that students are interested in receiving on their devices, and to determine how course content and information delivery on mobile devices affect the lecturers and students' motivation to teach and learn.

R.Q.3 – What are the perceptions of University students and lecturers on mobile devices as tools for teaching and learning?

This question indicated the views of students regarding the use of mobile devices as a learning tool. This question was extremely relevant in assessing whether the use of mobile devices is affecting the lecturers and students' achievements. It also indicated possible applications that would be easy to implement on the devices, yet provide value and relevance to students.

1.6 SIGNIFICANCY OF THE STUDY

It was significant to carry out a research on the impact of mobile technology on students learning at the University of Venda as the results would benefit the following stakeholders:

1.6.1 Students

The study will impact on the students' motivation to learn. The students will have knowledge on the importance of using mobile devices for their learning and the effect of these devices on their educational experience. It will help them improve their performance in school resulting in good grades.

1.6.2 Lecturers

The study is significant to lecturers of the University as it will constitute a framework of how the mobile devices can be a vital tool for assisting them in their teaching, interactions between instructor and students, and provide possible applications that would be easy to implement, yet provide value and relevance to students.

1.6.3 Management

The distribution of Tablet PCs to every registered student is a great investment. Therefore, the study will enable the University of Venda management to gain insights on the justification of their investment. It will highlight results on the use of the tablet PCs towards improving students' learning. This will motivate the management to use the outcomes in designing programs that integrate mobile devices as a learning and communication tool.

The ultimate rationale of the study was to give the management, students and lecturers a clear framework of the use of mobile devices for teaching and learning so that they recognise the use of mobile devices as an enhancer to educational experience.

1.7 DELIMITATIONS OF THE STUDY

The delimitations are those characteristics that limit the scope and define the boundaries of a study (Simon, 2011). The research focused on the potential use of mobile devices for teaching and learning at UNIVEN. This study was conducted at the University of Venda within a period of two years. The University of Venda is a comprehensive University with 8 Schools and 58 departments. The target population was students who received tablet PCs in 2015, from second year to Masters' level, IT technician and lecturers. 2016 first entering students were excluded from the study because they did not receive tablet PCs.

1.8 OPERATIONAL DEFINITIONS

Operational definitions are listed as follows:

Tablet PC

Merchant (2012) defines tablet PC as a single panel computer with a touch screen as input device. Tablet computers are mobile devices larger than a mobile phone and personal digital assistant. They are mobile devices that are integrated into a flat touch screen and mainly operated by touching the screen (Nosrati, Karimi and Hasanvand, 2012).

Mobile Device

According to Baran (2014), a mobile device is a wireless, portable device that allows a user to make calls and/or access data and information from the city's network. These devices exist in an ever-widening range of computer hardware types and include smartphones, tablets, netbooks, and laptops (Roberts and Rees, 2014).

Mobile Technology

Elzarka, (2012) defines the term mobile technology as any technology tool that is portable. He gave examples of laptops, tablet PCs and smartphones, among others. The mobile concept was introduced in the first-generation technology which made the large scale mobile wireless communication possible (Bhalla and Bhalla, 2010).

Mobile learning

According to El-Hussein and Cronje (2010) mobile learning is a learning environment that is based on mobility of technology, mobility of learners and mobility of learning that augments the higher educational landscape. Mobile learning is the use of portable electronic devices to access and share information (Miller, 2012).

Teaching and Learning

Teaching and learning is defined as the impacting of knowledge by teachers and the acquisition of knowledge by students through studying or being taught (Wallace, 2014). Saavedra and Opfer (2012: 12) defines the teaching and learning abilities with terms that include "21st century skills," "higher-order thinking skills," "deeper learning outcomes," and "complex thinking and communication skills."

1.9 OUTLINE OF THE RESEARCH

The applied research comprises of five chapters:

Chapter One: Introduction and Background to the study

The problem background of mobile devices was discussed in this chapter. The chapter was central to the formulation of the research problem with the aid of relevant mobile learning technology background literature, the research aim, objectives and the questions.

Chapter Two: Literature review

Chapter Two examined in greater depth the existing literature on mobile learning and refers to other sources such as textbooks and other relevant published articles.

In this chapter, the researcher explored the related literature on the current use of Tablet PCs in the academic world.

Chapter Three: Research Methodology

Data collection strategies, description of research methods, instruments, recording and transcribing of the data is provided in this chapter. The research methodology defines the modalities of the process and the systematic account of what will be done to assess the potential use of mobile devices at University of Venda.

Chapter Four: Data presentation and Interpretation of results

This chapter presents the research findings, which should meet the research objectives. Analysis and interpretation of all the primary and secondary data collected are presented in this chapter. Included also, are descriptive and inferential statistical analyses.

Chapter Five: Discussion, Conclusions and Recommendations

Chapter five describes the implications of the findings presented in chapter four in accordance with the constructs of the study. Conclusions and final considerations are elaborated in this chapter, which is also complemented by ideas for further studies that would be interesting to investigate but are considered out of the scope of the present study.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this chapter is to provide a review of the relevant literature on mobile learning technologies. In order to guarantee an in depth understanding of the topic under the study, a review of prior studies and literature was conducted inorder to identify the emergent themes regarding the integration of technology use in higher education. The aim of mobile learning technologies literature review was to showcase the relationship between the current knowledge on the key areas of the topic under study. The review showcased the state of the present mobile learning practices, which provided the basis for the selection of the methodology in this study.

2.2 HISTORY OF MOBILE PHONES

Lipscomb, Totten, Cook & Lesch (2005) indicated that businesses like Motorola and General Electric were given a task of improving mobile technology. The first mobile phone to emerge in the market during the 1970s was the size of a small briefcase (Lipscomb et al., 2005). From the 1980s up to today, the cellular phones are products that are even smaller than pack of cigarettes. They are being packaged differently to attract various customers. Some are being designed for men and others for women. A variety of features are being added and users can choose, for example, ring tones, push-to-talk, television clip playing, browsers, streaming video, mobile music, wireless cameras and entrance exam preparation reviews.

Nokia and other companies kept on advancing on mobile phones and came up with additional technology, creating a different hybrid that combines personal digital assistant functions, music and wireless internet capabilities and camera imaging, i.e. smart phones (Lipscomb et al., 2005). Dominating the market of smart phones are young people, which has resulted in the industry growth of mobile phones dominating tertiary institutions.

Lipscomb et al., (2005), further explained the first demonstration of a hand-held phone which was done by Martin Copper of Motorola in 1973 and the phone weighted 2 kg. He stated the two types of mobile phones as the low-end and the high-end whereby the low-end mobile phones are the ones referred to as feature phones. The high-end mobile phones, which have more advances in computing abilities are denoted as smartphones. Lipscomb further states that a company called IBM designed the first smart phone and they called it ‘simon’.

High-end mobile phones ('smartphones') permit users to install many advanced applications which are based on a specific platform. Rechargeable batteries help mobile phones to keep the power for uploading many applications. The first of Nokia's smartphones were the Nokia communicator lines which started as Nokia 9000 and was released in 1996 (Lipscomb et al., 2005).

According to Woodcock, Middleton and Nortcliffe (2012), smartphones emerged as hybrids of mobile phones and Personal Digital Assistants in the 1990s. They brought together connectivity features, a variety of hardware collection and software-based functionality. Smartphones continued to develop considerably and they became progressively commonplace following the Apple's iPhone released in 2007. More advances on mobile technologies kept on increasing and eventually an iPad was designed. Tablets then burst into the market after the release of the first Apple iPad in March 2010 (Johnson, Broen and Becker, 2013).

2.3 MOBILE DEVICES

The word mobile can be best described as 'portable' and 'movable'. Martin and Ertzberger (2013) explained the tablet PC and smartphone features regarding their relevance to mobile learning.

2.3.1 Tablet PC

Tablet PC is rated as the most functional of all the mobile devices. It has all the workstation PC features. It has the network support for Ethernet, Bluetooth and Wi-Fi. Tablet PCs incorporate handwriting recognition, voice to text conversion etc. for input. They support instant web surfing, instant messaging, email, Voice-over Internet Protocol connections, word processing and different other application programs. More interactivity and collaboration in research can also be supported. It provides the most powerful computing environment among mobile devices, since it is portable and handy. It is a good tool to carry files when moving. It is affordable and it has many combined features for storage and audio. However, some have sim cards while others do not.

Hlagala (2015) gives some of the tablet PC features which are explained as follows:

- **Operating System**: Tablet PCs makes use of an operating system. The operating systems enable different functionalities and downloadable applications.
- **Design:** the design of tablet PCs focuses on adding different functions that fit with the user's preferences in different ways.

There are different designs such as tablets with a keyboard and a swiveling touch-screen, multi-screen folding-booklet designs and detachable tablets with keyboard docking stations.

- **Screen size and resolution:** The screen shape, size and resolution of tablet PCs differ. While regular computer monitors have mostly conformed to a 16:9 aspect ratio, tablet PCs differ widely in their ratio of width to height. The sizes of the screen ranges from 7 inches to 12 inches and have resolutions as low as 800x480 to 1280x800 pixels (Ally and Prieto-Blázquez, 2014). Screen sizes allow students to read their work without hustles.

- **Weight:** There are tablets which are very light, though some weigh the size of a small laptop. The weight depends on size of the screen and tablet design. Many tablets weigh less than 0.45 kilograms. Their weight makes them more portable than laptops.

- **Storage space:** Tablets have a certain amount of onboard storage, ranging from 8 GB to 250 GB. The most common is 16GB to 64GB. Many tablets work easily with cloud storage so onboard storage may not be as much of an issue (Ally and Prieto-Blázquez, 2014). Students will be able to store their work on their devices and on the cloud.

Figure 2.1 shows a motorola tablet sample courtesy of Specout, (2016).

Figure 2.1: Motorola Tablet

2.3.2 SmartPhone

A smart phone incorporates telephone features and supports access to Internet. Users can edit text documents, download audio or video lectures, send instant messages and store data. Interactive learning is supported as it allows global collaboration. Smartphones are powerful and are user-owned computing devices which fit into the bags or pockets of students and academic staff. The rate of students owning these multifunctional mobile devices is exponentially growing (Looi, Sun, Seow and Chia, 2014). A host of options and features are easily combined in this portable device. The disadvantage of smartphones is that they have a small screen that causes difficulties when reading texts or browsing. The more advanced ones are costly.

Komado (2013) explains some of the features of a smartphone thus:

- **Battery Life:** long battery life is a feature of smartphones. With a smartphone, users are doing much more than just placing phone calls and texts, so there needs to be a battery that is powerful enough to support activities especially internet browsing, picture and video taking and more. That is why most smartphones have enough battery capacity to last at least a day's worth of general use.

- **Warp-speed processing**: To keep these super, high-end mobiles running smoothly, smartphones are equipped with powerful micro-processors (Lee, 2016). These are what enable smartphone users to access more than one function or app simultaneously and ensure that there's minimal lag at all times.

- **Connectivity:** Connectivity encompasses not only network connectivity, but also social media and wearable devices (Lee, 2016). This feature enables the smartphone to work as an essential tool for m-learning as students can access the internet anytime.

- **Messaging**: All cell phones can send and receive text messages, but what sets a smartphone apart is its handling of e-mail. A smartphone can sync with your personal and the professional e-mail account. Some smartphones can support multiple e-mail accounts. Others include access to the popular instant messaging services, hangouts. These are just some of the features that make a smartphone smart. The technology surrounding smartphones and cell phones is constantly changing (Lee, 2016).

Figure 2.2 shows a iphone smartphone sample courtesy of Brodkin (2013).

Figure 2.2: iPhone Smartphone

2.4 MOBILE LEARNING

According to Baran (2014), the definitions of mobile learning emphasize mobility in learning. The definition also emphasizes on access and situativity (Cheon, Lee, Crooks, and Song, 2012). Kearney, Schuck, Burden, and Aubusson (2012) indicated that it also emphasizes on convenience and contextuality as well as ubiquity. Mobile learning allows academics and learners' global and seamless access to information. It also enables convenience, suitability, and immediacy which are valued by students and teachers and enhances students' learning (Baran, 2014). Cheon et al., (2012) indicated that mobile learning provides chances for individualized, situated, concerted, and informal learning without being restricted to classroom contexts. Baran (2014) further mentioned that mobile learning comprises of the characteristics of mobility in social spaces, conceptual and physical.

Martin & Ertzberger (2013) believe portability and mobility made mobile devices more attractive tools. They added that developments like geospatial technologies, image and video capture, context awareness and search capabilities have further amplified their versatility by making promotions towards learning experiences. These developments also permit exploration within the authentic settings, thus supporting learning that is inquiry-based.

Sevillano-García and Vázquez-Cano (2015) argued that a direct relationship exists between the idea of global learning and the capability of mobile devices providing educational environments that are highly interconnected. According to Mokoena (2012: 22), mobile learning could be considered as "learning that happens when the learner is not stationed, at a predetermined location, or where handheld devices such as mobile phones, PDAs and palmtops and tablet PCs are dominant technologies". El-Hussein and Cronje (2010) explained that we can only conclude that the technology being used for learning can be considered fully mobile when there is use of wireless digital device technologies and when students are using it for self-management in higher education.

2.5 EXPERIENCES OF MOBILE DEVICES' USE

Many institutions are making use of mobile devices in teaching and learning and below are how mobile devices are being used for teaching and learning worldwide.

2.5.1 Mobile devices' use in Canada

Different provinces in Canada are promoting the use of technology in students' learning. According to Tsinakos and Ally (2013), a legislation on using assistive technology for special needs students from the province of Ontario and Alberta was developed to give a guide or framework to the important use of mobile technologies in schools. Universities are conducting mobile learning projects in Canada. According to Ally and Palalas (2011), the University of Athabasca (UA) has conducted several mobile learning projects, for example, a project of developing mobile accessible websites with the University library which enable students to access academic material and research resources using their mobile devices. The UA provided students with a mobile-friendly Digital Reading Room that enables them to access mobile language websites and read their courses on their mobile devices (Ally and Palalas, 2011).

Similarly, George Brown College made use of mobile devices, following the BYOD (Bring Your Own Device) model to enable interactions for the English as a second Language and Communications classes which resulted in many students improving (Adkins, 2013). Eighty percent of the students at Algonquin College go with their mobile devices to college as the college has adopted BYOD approach (Tsinakos and Ally, 2013). Algonquin College opened a mobile learning centre so as to create enough space for mobile computing devices facilitation and also collaboration among the students.

The college also started a project called “myDesktop” service that remotely delivers computer applications (such .as Microsoft Office, AutoCAD, etc.) to the student’s mobile devices (Tsinakos and Ally, 2013). At Wilfrid Laurier University, a BYOD pilot project was conducted leading to the incorporation of mobile technology into its MBA current full-time program. Ally and Palalas (2011) reported that many mobile learning projects have been housed at different universities such as University of Waterloo, Conestoga College, OCAD University, Seneca College, Ryerson University, McGill and several other Canadian schools.

2.5.1.1 Challenges in the adoption of Mobile Learning in Canada

Even though mobile learning projects are gaining popularity in Canada, a number of roadblocks are slowing down their adoption. These include the following:

- Lack of specific mobile educational policy increases the number of obstacles to mobile learning implementation and its practice in Canada (Ally and Palalas, 2011).
- Start-up costs of the mobile learning initiatives when the BYOD approach is not followed.
- The students’ security and privacy issues in the University environment.
- Fear of engaging technology that will be a destruction for the students.
- Resistance due to lack of knowledge on development and support of the technology and also fears from the students’ parents (Ally and Palalas, 2011).
- Disabled students having limited access to the technology
- Managers in Canada and other stakeholders are skeptical about using such mobile technology for educational as well as mobile learning as it is in its early stage (Tsinakos and Ally, 2013).

2.5.2 Mobile devices’ use in the USA

USA provides mobile devices directly to students or students are allowed to bring to school their own mobile devices as most of the students have mobile devices. The Qualcomm’s Wireless Reach initiative is a project which started in 2006 and it is one of the longest running mobile learning initiatives which encourages and supports district mobile learning initiatives (Tsinakos and Ally, 2013). Fritschi and Wolf (2012: 17) note that “The initiative’s education projects aimed at increasing student access to educationally relevant content and enable communication with teachers and peers through online tools and resources for 24/7 learning”. The Learning On-the-Go program provides necessary funds to support twenty districts in fourteen States needed for purchasing a variety of devices such as smartphones, tablets, iPads etc. The Katy Independent

School District in Texas received funding in order to develop a program whereby students and teachers use smartphones for interactions while the teachers use a learning management system to create and manage assignments.

In addition, grant was given to another Board of Cooperative Educational Services through the project of Federal Communications Commission (FCC). This board supports twenty-one districts in New York. The project was for the utilizing virtual classroom software program by providing high and middle school students with smartphones and netbooks (Tsinakos and Ally, 2013). Forsyth County School District in Georgia has adopted the BYOD approach with a pilot program. This program started with few schools and has extended afterwards to twenty schools (Tsinakos and Ally, 2013). According to the project, students were given permission to bring their own mobile gadgets in school everyday for the teaching and learning process. However, in some districts schools and universities, they are using a mobile learning combined approach in which part of the device cost is funded and the required access plan, while the remaining expenses are funded by students or their parents.

2.5.2.1 Challenges in the adoption of Mobile Learning in the US

The policies in the US remedy the problem of content and resource development due to the multiplicity of operating platforms available in the mobile learning field. According to Fritschi and Wolf (2012), state, provincial and local policies are there in the USA and they critically affect the mobile learning facilitations in their areas.The barriers are:

- High start-up cost of mobile learning programs.
- Students becoming frustrated by shifting from their own mobile device to a new one due to the project's requirements.
- Misusing or losing the mobile devices is also cumbersome for mobile learning projects.
- Equity issues among students' ability to have access to smartphones due to low earnings or due to social-demographic origins, might arise as part of a BYOD project (Tsinakos and Ally, 2013).
- Lack of detailed educational plans or guidance both for teachers and students on how to use their personal devices for educational purposes and lack of appropriate broadband resources within the universities may also prohibit mobile learning activities (Basset and Kelly, 2013).
- Hardware challenges, for example small screens of the mobile devices, or their use by disabled students as a potential drawback (Basset and Kelly, 2013).

- Students' exposure to risk environments having inappropriate material, and to hostile behaviours such as sexual offenses, cyber bullying, or potential cheating during school's examinations are some additional drawbacks towards the adoption of mobile learning in the USA (Adkins, 2013).

2.5.3 Mobile devices' use in Europe

Mobile learning nationally funded projects are being implemented in the United Kingdom for mobile learning. The most diverse and largest mobile learning initiative was the Mobile Learning Network (MoLeNET) which was followed by the Shared Cost Provided Devices (SCPD) approach in Europe which ran from 2007 up to 2010 (Tsinakos and Ally, 2013). The mobile learning technologies for supporting teaching and learning were defined and it enabled student retention and decreased drop-out rates. An SMS network was developed whereby students and faculty of the Wolverhampton University engaged in text conferences (MELaS, 2012). The UK proved to be the most active country in Europe in the field of mobile learning from 2000 to 2009 (Tsinakos and Ally, 2013). The UK makes provision of fertile ground for bottom-up initiatives due to mobile devices such as smartphones and tablet devices becoming cheaper. Nationally funded mobile learning projects adopting the BYOD approach were implemented by the Netherlands as well and yielded positive results, (Tsinakos and Ally, 2013).

In 2009, the government's national e-learning center published the mobile learning guidelines and the web portal for teachers and students contains educational advice on mobile learning (Adkins, 2013). In supporting a range of mobile learning pilot projects, Denmark invested almost one million Euros as governmental funding. (Hylén, 2012). Private educational publishing companies requested school subscriptions for accessing digital learning materials on mobile devices adopting the School Provided Devices (SCPD) approach (Tsinakos and Ally, 2013). Since October 2012, "The University Mobile Internet" is a national SCPD project which provides wireless connectivity via 3G networks up to 4GB of data exclusively for students, faculty and staff of the Greek universities and colleges.

Other initiatives include Organisation Provided Device (OPD) project which was implemented in 2009-2011, in Switzerland, which was school-based and students were given an Apple iPhone 3G as part of their personal learning environments (PLE) (Tsinakos and Ally, 2013).

2.5.3.1 Challenges in the adoption of Mobile Learning in Europe

- Mobile learning is not mentioned among the priorities of the Ministries of Education in Europe (Lewin et al., 2011). Nevertheless, in Denmark, the UK, and the Netherlands, some strategies have been addressed by policy-makers.
- The government of Netherlands does not have intentions of making mobile learning a policy priority in the near future, therefore, mobile technologies' use is described as low (Tsinakos and Ally, 2013).
- There is lack of policy support, governmental investment and negative social attitudes towards mobile devices in the school environment (i.e., in Italy, Greece, UK) because of issues like cheating, cyber-bullying, etc (Adkins, 2013).

However, mobile devices' growing functionalities, the low cost of devices, and the proliferation of powerful hand-held devices may be the drivers to increase the implementation of mobile learning.

2.5.4 Mobile devices' use in Latin America

In Latin America, most of the mobile learning programs provide devices to teachers or students, or supervisors adopting the OPD approach whereas a few only allow students to bring their own mobile devices. In Argentina, there is a mobile learning initiative called "Mobile for supervisors" which was aimed at indirectly improving the educational process (Tsinakos and Ally, 2013). The school supervisors would track data and prepare reports on the performance of the students and schools' needs in terms of both infrastructures and human resources. The school supervisors were provided with 350 3G mobile phones with unlimited internet access. These phones run applications such as Word, Excel, PowerPoint and PDF files. This platform permits supervisors to connect schools in rural areas to the internet for the provision of online students' performance reports and other schools' needs.

A new mobile interactive application called Stanford Mobile Inquiry-based Learning Environment (SMILE) was developed by Dr. Paul Kim along with his research assistants at Stanford University and supports both iOS and Android (Adkins, 2013). This resulted in students and teachers being able to access educational materials from their smartphones. Therefore, this project was shifted to SCPD project since both devices were provided to education stakeholders and students. It allows the use of students' smartphones for accessing the provided educational content.

There are also projects adopting the BYOD approach which were conducted in Latin America, for example, the PSU Movil in Chile (Tsinakos and Ally, 2013). The Chile Ministry of Education launched 'Educarchile', a national educational internet portal with the aim of helping low-income students improve their performance on Prueba de Sleccion Universitaria (PSU) exams. A mobile application called PSU mobile was developed to enable students to easily access the educational content on the portal (Tsinakos and Ally, 2013). This application was available for use by smartphones in providing educational content to students and including exercises and online tests for practice.

In Paraguay, another BYOD initiative was implemented entitled Learning Assessment through Mobile Phones. It focused on mathematics and Spanish language and students were able to perform tests using their mobile phones while uploads on their responses were made directly to the Paraguay's Ministry of Education according to this project. The project was implemented in 300 public schools (Escolar, 2011).

2.5.4.1 Challenges in the adoption of Mobile Learning in America

Due to high rates of literacy in both urban and rural areas, governments of Latin America countries were motivated to invest in mobile learning. However, the mobile learning initiatives operate as small scale projects mostly. There are immediate plans to support mobile learning in Latin American countries due to the huge investments into national 1:1 training programs which provide one laptop for every student (Tsinakos and Ally, 2013). Consequently, such efforts claim a lot of resources for them to be implemented, thus leaving limited resources for mobile learning evolution and future policies. Another barrier is restrictive educational regulations which affect the integration of mobile learning in Latin America. Low percentage of 3G or 4G network coverage is another drawback towards mobile learning in Latin America. The coverage is less than 55% whereas in the developed countries, the average coverage is about 90% (Tsinakos and Ally, 2013).

2.5.5 Mobile devices' use in Asia and the Pacific

Mobile learning initiatives are mainly targeted to enhance the level of education in areas where mobile infrastructure and minor ICT exists. OPD projects are being conducted and in Pakistan, where 250 girls living in Punjab rural areas were provided with mobile devices to improve their English language skills by means of daily messages (Adkins, 2013).

In places where ICT and mobile infrastructures are sufficient, mobile learning were focused on informal learning services and provision of distance education.

The Philippines' Open University conducted a BYOD project called the Pan Asia Networking Distance and Open Resource Access (PAN-DORA) as part of a mega-project, (Tsinakos and Ally, 2013). Another typical example of a large scale successful project which was sponsored by Nokia was the Text2Teach initiative which combined BYOD and SCPD models. The project allow students to access and download educational materials. Students can even request multimedia educational materials in sciences and mathematics via SMS. According to the Ayala Foundation, the project has expanded further to include 550 schools and thousands of students in the Philippines (Ayala Foundation, 2011).

Bangladesh, Japan and South Korea launched large scale mobile learning projects, nationally in some cases, as their national policy permits the use of mobile devices in education. This is a great initiative considering that most students are equipped with mobile devices. Moreover, SK Telecom in South Korea has partnered with the largest U.S. education company, Houghton Mifflin Harcourt (HMH) in order to provide mobile content that will enhance the English proficiency and academic outcomes of students throughout Korea (Houghton Mifflin Harcourt, 2012). SK Telecom and HMH announced that they will further offer smart learning in other countries with high demand for education, including India and China due to the program's success (TelecomTiger, 2012). Finally, in countries with strong ICT infrastructure and a mature mobile market with high penetration of mobile phones, mobile learning projects intend to promote future learning environments.

China introduced the concept of mobile learning via Desmond Keegan's presentation Distance Education, Digital Education, Mobile Learning at the 40th anniversary of Shanghai Radio and Television University in 2000 (Long, Liang and Yu, 2013). The mobile learning services started to appear as a new marketing strategy for mobile manufacturers to attract customers and to generate new revenue (Broadkin 2013). China has become one of the countries with the highest mobile learning growth rate (over 60%) since 2010 (Adkins, 2011). According to Adkins (2011), Ambient Insight also predicted that by 2015, China would be the second largest buying country of mobile learning products after the US. As predicted, China was the second mobile learning products buying country in Jan 2015, (Adkins, 2015). As one of many kinds of mobile devices, tablet computers received particular attention at the International Electronic Consumer Electronics Show in February 2011 (Broadkin, 2013).

2.5.5.1 Challenges in the adoption of Mobile Learning in Asia and the Pacific

The issue of policy in Asia–Pacific region is a barrier as the policies related to mobile learning are in line with the controversial spread and use of mobile devices in different areas. In areas where the mobile penetration rate is high, such as Australia, China, New Zealand, Japan, South Korea, Singapore, Thailand, Malaysia, etc., mobile learning is strongly supported by the governments who promote new Educational Laws and ICT policies (SAMEO, 2012). The barriers are:

- The risks of inappropriate content exposure to students, inappropriate behaviours such as gaming addiction, cyber-bullying and the perception of mobile devices' distraction rather than facilitating the educational process.
- Potential health implications are also a barrier to mobile learning as students might suffer from asthenopia, or excessive eye strain due to mobile devices' use, radiation absorption, thermal and non-thermal effects, cancer, etc. (Cohen, 2012) affecting both their psychological and physical development
- Availability and cost of mobile devices is another crucial barrier which leads universities to follow the BYOD projects approach. It is also not rare for young students in primary and secondary levels to possess their own mobile devices which makes the schools to follow the OPD approach.
- Concerns on lack of teacher training and support or the lack of high quality educational material is a drawback (Cohen, 2012). This makes most the teachers to be reluctant to adopt this new emerging teaching/ learning method.

As elsewhere in the world, there is need for a set of clear policies and guidelines at a governmental level on mobile devices' use in the school/university environment in order to overcome the above mentioned barriers.

2.5.6 Mobile devices' use in Africa

Some typical examples of mobile learning initiatives in Africa which try to meet the Education for All (EFA) goals are reported below:

- Pesinet was a project in Mali which intended to introduce mobile phones as pedagogical tools to teach and reinforce literacy as well as the organization and management skills taught in Tostan's Community Empowerment Program (Adkins, 2013).
- Jokko, an SCDP initiative launched in Senegal by UNICEF is SMS based and learners use a free based platform to communicate with a network of people by sending SMS to a single number (Tsinakos and Ally, 2013).

This project is in line with the third EFA goal which calls for lifelong learning where children and adults can satisfy their learning needs by having access to suitable learning and life-skills programs (Tsinakos and Ally, 2013).

Long, Liang and Yu (2013) state both the junior and higher education segments across Africa making use of mobile devices in classrooms and other small-scale initiatives which will enhance teaching and learning worldwide. Tablets are a major distribution channel for educational content suppliers competing in Africa. In October 2012, Microsoft announced an agreement with the Kenyan government and Indigo Telecom to supply 2,000 tablets preloaded with educational content to rural Kenyan schools (Long et al., 2013). This is an example of a relatively small-scale deployment.

In June 2013, according to Adkins (2013), the governor of Osun State in Nigeria announced the Opon-imo (tablet of knowledge) program that distributed tablets to every secondary school student in the state. The first phase deployed 150,000 tablets preloaded with an e-library of 63 eTextbooks, a virtual classroom, and an integrated test zone.

In June 2013, the Kenyan government announced a four-year $622 million project to provide computing devices to every primary and secondary school student in the country and there are just under 10 million school children in Kenya (Adkins, 2013). In July 2013, the government indicated that a significant amount of those devices would be tablets.

The NGO Worldreader distributes Kindle eReaders to schools in Africa preloaded with over 1,200 eBooks localized for the various countries in which they operate including Nigeria, Ethiopia, Ghana, Kenya, Uganda, Rwanda, and Tanzania (Adkins, 2013). The goal is to reach many students worldwide. According to Adkins (2013), Ghana Technology University College (GTUC) launched a new educational tablet called the Campus Companion in November 2012. The tablet was built in collaboration with UK-based Learning Nugget. Adkins explains that the tablet comes preloaded with Mobile Learning content from several educational publishers and is sold to University students at heavily discounted prices.

In May 2013, Microsoft launched a tablet-based initiative that targets university students in Dar es Salaam, Tanzania. UhuruOne, a local internet service provider, offers an inexpensive data bundle that includes a Windows 8 tablet, wireless broadband connectivity, and educational applications (Adkins, 2013).

2.5.6.1 Challenges in the adoption of Mobile Learning in Africa

Although there is fast growth of mobile penetration in the Africa region, there are various roadblocks to the expansion of mobile learning initiatives. Among them are the following:

- The relative unawareness of the government decision of the potential of mobile devices and the role they can play in enhancing the quality of education.
- There is lack of effective initiatives and research projects that would provide evidence on the usefulness of mobile learning.
- There is a limitation in terms of modern mobile phones in many poor areas. Many learners usually possess their own mobile phones when they are older thereby missing the opportunity to benefit from them whilst they are young (Adkins, 2013).
- Absence of industry standards affects mobile learning, when issues like resolution, screen size, audio and video formats, support for programming languages, memory sizes and internet browsers are not standardized.
- Lastly, there are anti-mobile sentiments in Africa to mobile learning. Concerns about the disruptive nature of mobile devices and the students' safety around them expressed by parents, teachers and the media have led to complete banishment of mobile devices from school premises in many cases (Tsinakos and Ally, 2013).

2.5.7 Mobile devices' use in South Africa

The South African education sector has undergone a radical transformation through the incorporation and adaptation of new sophisticated ways of learning such as digital learning. The national government has introduced iPads, tablets and laptops in schools. In June 2013, the Gauteng government, a highly urbanized province in South Africa that includes the cities of Johannesburg and Pretoria, distributed 88,000 Huawei tablets to 2,200 schools in the province. In August 2013, the University of South Africa, the largest online education provider in Africa with over 310,000 students, launched a program to provide students with 3G connectivity and a tablet at "massively discounted prices" (Adkins, 2013).

Significant investments to arrange for content, infrastructure, and resources associated with the integration of mobile devices into learning environments have been made by SA institutions (Johnson et al., 2013). The advent of a global economy and advancement in technology are major key drivers towards the transformation of the South African education sector (Mokoena, 2012).

Some of the mobile learning projects in SA include the Nokia Mobile Learning project for Mathematics (MoMath) (Roberts and Vanska, 2011). The aim of this project is to equip both students and teachers with affordable access to interactive mathematics learning material among the grade 10 to grade12 pupils using mobile phones. The project was initiated in 2009 and enables students to access a wide variety of mathematics question papers from the database classified by grade, topic names and the degree of complexity (easy, medium or difficult).

Students are able to answer the questions, share their results with their peers, teachers and anyone from any location. Teachers can use MoMath to monitor the learner's skills level, enhance those experiences by recommending useful exercises and tests available on the MoMath services to individual learners. The findings of this project indicate that learners who used MoMath frequently improved in their studies and developed a positive attitude towards mathematics than those who did not use MoMath service (Roberts and Vanska, 2011).

Jantjies and Joy (2015) report that South Africa is a multilingual diverse country whereby the majority of learners are not taught in their first language. As a result, teachers and learners sometimes have difficulties in interpreting and understanding the learning content, hence they converse between languages (code-switching). Their study evaluated M-Thuto (Mobile Education), which is a mobile learning tool developed to support mathematics bilingual learning in South Africa. This web-based application consisted of the learning material, interactive class activities with recommended solutions to enhance and support the learners' understanding. This tool uses the code switching technique between Setswana and English language to deliver the learning content, and can be accessed on any mobile phone that has a Wireless Application Protocol (Jantjies and Joy, 2015).

Jantjies and Joy's study indicated that 67% of the students in the rural areas struggle to understand the learning content whereas 42% of the students in the urban areas struggle to understand the learning content. The findings also indicated that the majority of the learners from the four participating schools either owned a mobile phone or had access to a mobile phone at home. The study illustrated that schools located in the urban area are well resourced. All 90 learners believe that mobile learning resources would effectively support them in the learning process and using their first language (Setswana) in the learning process enables them to clearly understand mathematics learning tasks.

2.5.8 Mobile devices' use at UNIVEN

The University of Venda distributed Tablet PCs to more than 13 000 students at the beginning of 2015 with the aim of enhancing the quality of learning and teaching. This initiative is an 'add on' value to the lives of students (Sanders, Rodrigues and Li, 2016). The tablet PCs investment demonstrated the University's commitment to offer students with the necessary support, ensuring that they realise their dreams with minimal challenges and empowering them with the ability to compete favorably. This bridged the digital divide at this University as most students at the University generally used computers from the computer centres and labs to access the online learning resources. There is therefore, the need to investigate the current use of mobile technologies at UNIVEN and how best they can be used to enhance teaching and learning at similar rural universities.

Alhough the University adopted the technology, there were many factors that should have been considered such as:

- Connectivity Challenges and Security
- Social and Educational Challenges
- Teaching and Learning Theories
- Teaching and Learning Applications
- Social networking as a learning platform
- The Blackboard use at UNIVEN

2.5.8.1 Connectivity Challenges and Security

The immediate challenge of tablet PCs was the internet connection issue to University LAN backbone. There was a need of total Wi-Fi hotspots covering the entire campus. There was also a challenge of limited and low broadband. Meeting the required bandwidth for nonstop/fast streaming on campus is a challenge, especially during certain hours when most students will not be attending lectures. With due time, bandwidth will not be an issue as there are improvements on Wi-Fi around campus which students can make use of. Limited memory space on Tablets affects students' utilisation of these devices as well.

The risk of sudden obsolescence is crucial as students might lose important data which will negatively affect their academic work especially if they do not have knowledge about online back-ups. Tracking of the tablet PCs is a crucial issue considering that some students might be stealing the tablet PCs from their fellow students.

Most of the students do not have knowledge to use the applications on their tablet PCs. This is due to the fact that most students are from rural backgrounds with no access to such technology. This is a potential setback to the mobile learning progression.

2.5.8.2 Social and educational challenges

Assessing learning outside the classroom is a challenge. Students might not be able to know how to access learning materials when they are alone and out of classroom. Also, supporting learning across many contexts may affect many students when they are not in lectures which will be a problem. As this is now the mobile age, developing an appropriate theory of learning maybe a challenge to students due to other distractions such as watching movies using their tablet PCs (Adkins, 2013). Other students may have difficulties on the conceptual differences between M-Learning and E-Learning. Using tablet PCs for learning may result in the disruption of the students' personal and academic lives. Students might fail to control the risk of distraction during lectures, whereby they might chat to friends during lecture time and not paying attention (Poon, 2013).

2.5.8.3 Teaching and Learning theories

Sams and Bergmann (2013) explained a theory called the flipped classroom which is an emergent method of teaching and learning. Students will make use of their mobile devices to watch instructional videos online. They will also complete tasks they are assigned to during lesson or class time. This pedagogy permits lecturers to spend more time giving tutorials to students in place of lectures which results in a quality teaching and learning. Students use lecture hours to undertake practical work and set tasks. The lecturer tutors the students as needed which allows greater pedagogical space and time for differentiated educational intervention.

Using mobile devices simplifies teaching and learning (Kafyulilo, 2014). Lecturers can pre-assign the task or work to students through use of email or school web portal before attending a class or a day before. Learners can access and view the tasks and class schedule in advance. Interactive classroom activities also simplify teaching and learning (Wallace, 2014). Lecturers can make use of tablets for one to one interactive activities with the students by means of having a quick survey, quiz or web-based science and mathematical simulations creating a good environment of delivering knowledge in a more enjoyable and easy way to understand for the learners. While delivering presentations, lecturers can make use of the tablets PCs to provide students with the required information electronically.

Learners will then take notes in the form of interactive annotations and side notes to understand the idea better and review them later.

2.5.8.4 Applications for teaching and learning

Educational software applications (apps) are increasing, including various for literacy, numeracy and different other subject areas (Poon, 2013). Special educational needs area and specialist apps are also available for different areas. These apps generally are available online via the Google, Apple or Microsoft online 'app-stores'. Most of the educational apps are free and some few which have more featured versions are generally available at a low price. These apps are easy to install on the mobile devices. The tablet PCs come with well-known document editing, presentation softwares and spreadsheets such as Microsoft Office which are important for school work. Apps are created and some companies like Apple made agreements with universities regarding their products such that students are eligible to purchase Apple products from the University Book Store at a discounted price (Mokoena, 2012). Students at UNIVEN can make use of these applications on their tablet PCs and smartphones to enhance their learning experience.

2.5.8.5 Social networking as a learning platform

Social networks have a long history in higher education. There are different social networking platforms for teaching and learning such as Facebook, Wikis, WhatsApp, and YouTube. Their immediate predecessors were the managed learning environments which transformed into virtual learning environments, later to be known as teaching and learning platforms (Sams and Bergmann, 2013). The latest incarnation of these platforms are web based interfaces that reflect the classrooms as they provide online access to innovative collaboration tools adding to the traditional teaching tools which are tests, revision materials and links to external web based material (Wallace, 2014). Following the trend of other popular social networking platforms such as Facebook, they in turn have evolved into online social environments where students and teachers can communicate and engage in online dialogue in a safe and secure environment.

Although social learning platforms are seen as tools for enhancing remote learning they are often also used within the schools. Using social networking tools, students can share knowledge and exchange ideas with peers and teachers to enrich their knowledge and make the learning environment more interactive.

Social networks such as Facebook and Twitter permit students to engage in groups formation which will allow them to distribute and add together their knowledge, and share information with ease (Ericson, 2013). Mobile devices such as tablet PCs and smartphones are one of the pillar tools which can be used as a platform for social networking at the University. It is crucial to convert the social networking platform into an edu-networking platform so that students can edu-network as there is Wi-Fi on campus by means of an awareness program.

2.5.8.6 The Blackboard use at UNIVEN

The introduction of student tablet personal computers in 2015 at UNIVEN ushered in a new era of an information communications technology driven, academic-programme delivery. The University of Venda introduced the Blackboard. The Blackboard is a learning management system which provides a password protected environment and has administration tools that make teaching online easier (Martin, 2008). The Blackboard provides access to learning materials and activities online. All that is needed to access Blackboard is a computer with internet access. The Blackboard can be accessed from the mobile devices such as smartphone and tablet PC. Course sites are created in Blackboard for programmes or modules of study. These course sites can then be populated with learning materials and activities by members of academic and administrative staff who have been provided with access (Baran, 2014).

The Blackboard includes tools for:

- Organising and publishing course materials
- Communication between tutors and students
- Collaborative working, including discussion forums, wikis, blogs and shared group areas
- Online assessments with automatic marking facilities
- Course administration such as calendars and task lists
- Tracking students' online activities and course work submissions

According to Greenburg (2015), the advantages of a Blackboard include:

- Students can access reference materials, handouts, reading lists, web links and activities anytime, anywhere (as long as you have internet access)
- Allows for web-based presentations and tutorials
- Aids discussions and collaborative work with other students (campus-based and Distance Learners) and tutors via discussion forums, wikis and blogs
- Facilitates the completion and submission of assignments

- Allows tracking and monitoring of students' access and progress through the course
- Reduces the need for paperwork and printed handouts
- Content can be updated easily
- Provides an easy way to inform course members about course information, announcements and deadlines.

2.6 SUMMARY

From the foregoing review of existing literature, it may be noted that numerous benefits exist for the enhancement of teaching and learning using mobile learning platforms. Reviewing the status of mobile learning around the globe, some critical issues can be highlighted. There are problems, hesitations and mindsets across the six reviewed regions of Canada, USA, Latin America, Europe, Africa, Asia and the Pacific. More emphasis is given not on the benefits but on the common roadblocks towards mobile leaning in an effort to identify the cause of the problems which slow down the adoption of mobile learning. Lack of educational policies which address mobile learning issues specifically is an impediment poses on the adoption mobile learning. In almost all of the examined regions, parents report hesitations about the misuse of mobile devices in the class. The most commonly reported hesitations in all six regions concern students‘ distraction in the class, security issues, exposure of students to risk environments containing inappropriate material, hostile behaviours such as cyber bullying, potential cheating during school’s examination and gaming addiction. Until clear scientific evidence emerges proving the appropriateness of the use of mobile devices, especially by young students without any potential negative implications on their health and specialised educational policies are formed, such critical concerns will continue to lead districts and other key role players to exclude mobile devices from the school environment. Although challenging issues are apparent, these can be avoided by giving careful and well planned thought to the implementation of mobile devices use in education. The reviewed literature gives an insight into the benefits of mobile learning and the potential of mobile devices in education. There is no information on whether the University of Venda students and lecturers are using their mobile devices for teaching and learning. Therefore, the remainder of this project looked further into students’ perceptions, challenges and how best students and lecturers can use smartphones and tablet PCs in enhancing teaching and learning. The next Chapter examines the study’s research design and methodology. The approach, strategy and methods used will be unpacked in detail.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The literature review highlighted the background of mobile devices' use worldwide, the advantages of mobile learning in higher education and the potential use of mobile devices in education. This chapter looked at the research design and methodology. The research methodology of the study is also described further in terms of the research methods that were used. The chapter also defined the scope and limitations of the research design and positions the research approach and methodology used in the study by examining the acceptance and usage of mobile devices by both students and lecturers. It also extended the identification of the population under study, the processes used for data collection, methods, processing, analysis and ethical considerations.

3.2 RESEARCH DESIGN

As defined by Zikmund (2011), research design is a master plan that specifies the methods and procedures for collecting and analysing the information needed. Kothari (2007:31) defined research design as "a conceptual structure for the collection, measurement and analysis of data which combines relevance and economy". Bryman and Bell (2014) defined research design as a structure that guides the execution of a research method and the analysis of the subsequent data. It shows how all the major parts of the research study that is the samples or groups, measures, treatments or programs, and work together in an attempt to address the research questions. Research design is similar to an architectural outline. The research design can be seen as actualisation of logic in a set of procedures that optimise the validity of data for a given research problem. According to Mouton (2001), the research design serves to plan, structure and execute the research to maximise the validity of the findings. It gives directions from the underlying philosophical assumptions to research design, and data collection. The types of research design are explanatory, descriptive, exploratory, case study, comparative, hypotheses testing (Creswell, 2013). The researcher used the case study research design.

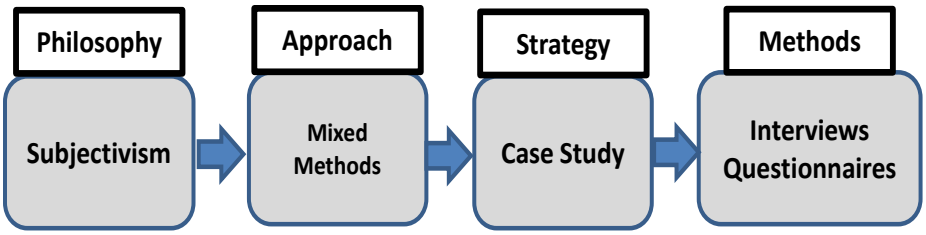

Figure 3.1: Research methodology

Figure 3.1 shows the research methodological thinking of this study which is briefly discussed in the subsequent subsections:

a. Research Philosophy

Our epistemological position is one of Subjectivism with an Interpretive Approach. Human beings change all the time and the environment in which they find themselves constantly influences them (Fullan, 2014). Interpretivists argue that human beings are always influenced by the things that are happening in their environment and therefore react accordingly (Huff, Milliken, Hodgkinson, Galavan and Sund, 2016). In this case study, there are specific factors in the environment that influence mobile devices' acceptance and usage and the researcher intend to tease out these specific factors through the study of knowledge in mobile devices' acceptance and usage. The aim of the interpretivist research is to gain an in-depth understanding of both students and lecturers' environment and how it influences the usage and adoption of mobile technologies to enhance teaching and learning.

b. Research Approach

The approach is inductive involving thick descriptive data. Mixed-methods research, where the aim is for qualitative and quantitative techniques to supplement each other, was used. This approach of using multiple sources of data collection increases the validity and reliability of the study (Creswell, 2013). The qualitative approach draws on interpretive outcomes from interviews and survey questionnaires. The blended approaches of qualitative and quantitative techniques confirm and solidify the results of the study. Therefore, this blended approach removes the guess work from the interpretation of data.

c. Research Strategy

A case study method was chosen to satisfy the needs of the research to address the practice-based problems where the experiences of the participants are important (Ellis, Levy and Lauderdale, 2008). Through case study research, the researcher becomes part of the real-life

world of practice. Given the types of research questions, the case study approach is deemed to be a suitable approach for this study because it will provide a methodical approach of gathering data, analysing the data and interpreting the data, therefore the research problem will be understood.

d. Research Methods

Interviews and survey questionnaires were used to collect information from both students and lecturers. Questionnaires are suitable for collecting data from a large sample. Interviews are more appropriate where data is collected from few respondents and addresses the qualitative components of a study (Padgett, 2016). However, where the sample is large questionnaires are best suited as they save time. In this study, a blended approach involving interviews and survey questionnaires was used in order to address the qualitative and quantitative elements of the study.

3.2.1 Case Study Design

Mayisela (2013: 6) defined a case study research as “aimed at gaining greater insight and understanding of the dynamics of a specific situation”. A case study was used as it provides a great amount of description and detail for a particular case that is the University. It is a good source of ideas about behaviour and a good method to challenge theoretical assumptions as it provides a good opportunity for innovation. A case study is a good method to study rare phenomenon, a great amount of description and detail, a good source of ideas about behavior and a good method to challenge theoretical assumptions (Kharabsheh, 2013).

However with a case study, it is hard to draw definite cause-effect conclusions, hard to generalize from a single case and possible biases from a single case and interpretation (Kharabsheh, 2013). This type of empirical study involves gathering in depth data from a wide variety of sources, such as group discussions, face-to-face interviews, participant observations, reports and documents.

A case study is suitable for this research project because the focus of the study is based on a single phenomenon in a real-life well-defined context; and the study involves “how” questions. The rationale for this method is to gain an in-depth understanding of the students and lecturers’ perceptions at a single University related to mobile learning.

3.3 MIXED METHODS RESEARCH METHODOLOGY

A research strategy is the overall plan that determines how to accomplish the research objectives by answering the research questions (Saunders et al. 2009). According to Kothari (2012), research methodology refers to the technique of obtaining, systematizing and examining data. The nomination of the research methodology depends on the type of research questions. The common research approaches are qualitative, quantitative and mixed methods.

As indicated on Figure 3.1, the study used the mixed methods research methodology. Mixed methods research has been defined as research used to describe a study that combines or integrates quantitative and qualitative research methods within a single project (Bryman and Bell 2014). The use of both quantitative and qualitative methods allowed the researcher to capitalize on the strengths and offset the weaknesses of each method in terms of information from respondents and size of respondents (Tustin *et al,* 2010).

This pragmatic research approach involves mixing qualitative and quantitative research methods to complement each other. Pragmatic research is not fixed to a specific approach. Pragmatic researchers are concerned with the research problem instead of the method to use, thus the researchers have the flexibility to mix and match any of the research approaches (Creswell, 2013). This approach employs both open-ended and close-ended questions, both qualitative and quantitative data analysis and both emerging and predetermined approaches (Creswell, 2013). The rationale for mixing qualitative and quantitative approaches is participant enrichment, instrument fidelity, treatment integrity and significance enhancement of the study. The following section discusses in detail, the qualitative and quantitative research methods that were used in this study.

3.3.1 Quantitative Research Methodology

According to Maree (2012), quantitative research has been defined as an objective measurement and statistical analysis of numeric data to understand and explain phenomena. It involves large samples examined through instruments that test a theory made prior to the study (Creswell, 2013). Quantitative research is accurate and more valid.

A quantitative research approach is one in which the person investigating primarily makes use of positivist claims to collect data and develop knowledge on predetermined instruments (Creswell 2013). The quantitative research strategy generally involves the collection and conversion of data

to produce statistical calculations in a numeric form through the use of surveys, experiments and prearranged instruments. The quantitative research method aims at quantifying the data to generalize the results and to measure the sample (Mark et al., 2005). This approach employs closed-ended questions, numeric data, pre-defined approaches and can involve measuring and may be automated (Creswell, 2013). The key strength of quantitative research is that data can be aggregated and summarized by statistical analysis.

3.3.2 Qualitative Research Methodology

On qualitative research, data will be generated frequently and it is difficult to quantify. Yin (2011) explains that qualitative research is a diversity of research approaches that study phenomena in their natural settings, without a predetermined hypothesis. Merriam and Tisdell (2015) define qualitative research as an inductive process primarily used for organizing data into a set of groups in order to identify the patterns among those categories. A qualitative research approach employs open-ended questions and image or text data (Creswell, 2013). Qualitative research often deals with social phenomena and explanations which answer questions that begin with “How” and “Why”. Qualitative research can also be purely descriptive.

Qualitative research was utilized in this research study to gather data in order to obtain a detailed understanding of how mobile learning was currently used in education. As noted by Merriam and Tisdell (2015), the qualitative approach is concerned with individual’s opinions, feelings and experiences to discover unanticipated occurrences. For that reason, the qualitative approach was deemed suitable to this study as it allowed the researcher to understand how students and lecturers were using mobile devices for teaching and learning purposes at UNIVEN.

Corbin and Strauss (2008) pointed out that the researcher using a qualitative approach should have good listening skills as the goal of the approach is to understand the personal meaning of the phenomenon studied. The qualitative method was appropriate for this research project because the intention of this study was to discover unanticipated occurrences and to understand the phenomenon of how mobile learning was used and adopted to promote learning.

3.4 POPULATION AND SAMPLING

The research population, sample, sampling techniques, sample size, sampling process and procedure were discussed.

3.4.1 Population

Tustin, Ligthelm, Martins and Wyk, (2010) define population as the entire group under the study as specified by the objectives of the research. Merriam and Tisdell (2015:37) refer to the population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. The population pertaining to this research was students, lecturers and an IT technician. Students and lecturers are the users of the mobile devices for teaching and learning. The IT technician helps students with the tablet PCs technical faults which informed this study on other problems students faced with the use of tablets PCs.

3.4.2 Sampling Approach

According to Tustin et al., (2010), a sample is the subset of the population. Sampling is a method of drawing the sample from the population. The sampling methods for obtaining representative samples consist of two broad categories which are probability and non-probability sampling methods (Wild and Diggins, 2013). Probability sampling allows estimation of confidence interval for parameter thus allowing generalisation of sample results to a larger population. It also permits measurment of errors or the significance of results obtained (Bryman and Bell, 2014). The common methods of random sampling are simple random, systematic random, cluster and stratified random sampling (Creswell, 2013). Non probability sampling focuses on indepth information and not making inferences and generalisations (Bryman and Bell, 2014). The probability of selecting any particular member is unknown and the common types are quota, snowball, convinience and judgemental (Creswell, 2013). This study used non probability sampling because it focuses on indepth information and does not wish to make inferences and generalisations (Bryman and Bell, 2014).

3.4.3 Sampling Techniques

The sampling techniques used in this study were convenience and judgmental sampling.

a. Convenience Sampling for quantitative

According to Wild and Diggins (2013), in convenience sampling, a sample is taken from a section of the population that is readily accessible or available to the researcher. Convenience sampling is fast, easy and readily available. This sampling technique was applied on students and lecturers. The students' representatives and lecturers were selected from all eight schools according to availability and willingness to participate. This enabled the researcher to determine the students

and lecturers' perceptions on the motivation and usefulness of the mobile devices in their educational experience.

b. Judgemental Sampling for qualitative

Due to the knowledge of the IT technician, we applied judgemental sampling. The IT technician was randomly selected from the IT department to participate as most of them have knowledge on the tablet PCs technical errors. This enabled the researcher to determine the status of tablet PCs' use at the University.

3.4.4 Sample size

The sample size helps the researcher to ensure a meaningful plan to determine the number he or she wishes to draw from the population and also that the sample must be representative of the whole population (Weirs, 2011). The quantitative research method sample size consisted of 370 students from all schools and for the qualitative, 8 students' school representatives, 8 lecturers, one from each school and an IT Technician.

3.4.4.1 Sampling Process for quantitative method

Table 3.1: Students Population From 2nd Level upto Masters Level

School	**Undergraduate Students**	**Postgraduate Students**	**Total**
Agriculture	440	94	534
Education	2175	41	2216
Environmental Sciences	1087	107	1194
Health Sciences	778	135	913
Human and Social Sciences	1738	143	1881
Law	902	13	915
Management Sciences	1598	53	1651
Mathematical and Natural Sciences	956	80	1036
TOTAL	**9674**	**666**	**10340**

Table 3.1 shows 2016 student population of the registered students at the University who received tablet PCs, from second year to masters level which was 10 340. Calculation of the sample size was performed using the Raosoft sample size calculator with a 95% confidence level and 5% margin of error.

The formula for calculating the sample size is:

$n = X^2 NP (1 – P) / d^2 (N - 1) + X^2 P (1 - P)$ (Krejcie and Morgan, 1970)

n = required sample size

X^2 = the table value for 1 degree of freedom at the desired confidence level, 3.841

N = the population size

P = the population proportion (assumed to be 0.50 since this provides the maximum sample size)

d^2 = the degree of accuracy expressed as a proportion of 0.05 (Krejcie and Morgan, 1970).

$n = X^2 NP (1 – P) / d^2 (N - 1) + X^2 P (1 - P)$

$= 3.841*10340*0.5(1- 0.5) / 0.05^2 (10340 - 1) + 3.841*0.5 (1 – 0.5)$

$= 3.841*5170 (0.5) / 0.0025 (10339) + 1.92 (0.5)$

$= 3.841*2585 / 25.85 + 0.96$

$= 9928.99 / 26.81$

n = 370

The formula for calculating the sample sizes from each school (nh) is:

nh= (Nh / N)*n (StatisticsTrek, 2010)

Where: nh = sample size from each stratum

Nh = population size from each stratum

N = total population

Calculating the sample size for each stratum

1. **School of Agriculture**

Undergraduate:	Postgraduate:
nh = 440 / 10340*370	nh = 94 / 10340*370
= 16	= 3

2. **School of Education**

Undergraduate:	Postgraduate:
nh = 2175 / 10340*370	nh = 41 / 10340*370
= 78	= 1

3. **School of Environmental Sciences**

Undergraduate:	Postgraduate:
nh = 1087 / 10340*370	nh = 107 / 10340*370
= 39	= 4

4. **School of Health Sciences**

   Undergraduate: Postgraduate:

   nh = 778 / 10340*370 nh = 135 / 10340*370

   = 28 = 5

5. **School of Human and Social Sciences**

   Undergraduate: Postgraduate:

   nh = 1738 / 10340*370 nh = 143 / 10340*370

   = 62 = 5

6. **School of Law**

   Undergraduate: Postgraduate:

   nh = 902 / 10340*370 nh = 13 / 10340*370

   = 32 = 0

7. **School of Management Sciences**

   Undergraduate: Postgraduate:

   nh = 1598 / 10340*370 nh = 53 / 10340*370

   = 57 = 2

8. **School of Mathematical and Natural Sciences**

   Undergraduate: Postgraduate:

   nh = 956 / 10340*370 nh = 80 / 10340*370

   = 23 = 3

Table 3.2: Sample Sizes of Students per School

School	**Undergraduate Students**	**Postgraduate Students**	**Total**
Agriculture	16	4	20
Education	78	8	86
Environmental Sciences	40	3	43
Health Sciences	31	5	36
Human and Social Sciences	67	7	74
Law	31	0	31
Management Sciences	58	3	61
Mathematical and Natural Sciences	43	6	49
TOTAL	**364**	**36**	**370**

Table 3.2 shows the sample size of students per level of study. Convenience sampling was used to distribute the questionnaires to students.

3.4.3.2 Sampling Process for qualitative method

The researcher used convenience and judgemental sampling for the qualitative method.

8 available lecturers from all schools were interviewed. 8 students' representatives, one from each school, who were easily available and an IT technician were also interviewed.

3.4.4 Sampling Procedure for quantitative

The sampling of the participants for quantitative was done as follows:

- The researcher sought assistance from the school administrators on the number of registered students of all the 8 schools.
- Calculations were made on the number of participants per school according to the criteria under section 3.4.4.1.
- The research project was explained to the participants. They were asked personally if they wanted to participate.

3.4.5 Sampling Procedure for qualitative

The sampling of the participants for qualitative was done as follows:

- The researcher selected the prospective participants for interviews.
- Possible participants were selected after the researcher pre-selected participants according to the criteria under section 3.4.3.2.
- The research project was explained to the participants. They were asked personally if they wanted to participate.

3.5 DATA COLLECTION

Questionnaires and semi-structured interviews were the data collection instruments which were used in this study. The quantitative method was in the form of a questionnaire because it can generate more baseline data as it can target a larger population of respondents. Questionnaires were issued to students from all schools in order to understand how mobile devices were being used at the University. The qualitative method was in the form of semi-structured interviews with few students and lecturers from all schools to provide deeper insights on the usefulness of the mobile devices in teaching and learning.

The interviews were intended to provide explanatory data from the questions which were designed to encourage students, lecturers and the IT technician to communicate their understanding of mobile devices. They provided information on mobile devices' use, their experiences of them, and their opinions about how effective they found them in their teaching and learning as well as providing an assessment of their engagement in comparison to their past learning and teaching experiences.

3.5.1 Qustionnaires

According to Tustin *et al,* (2010), a questionnaire is a simple data collection instrument that sets out the questions in a formal way to yield the desired information essential to achieve the study objectives.

3.5.1.1 Design of the Questionnaire

The structure of the questionnaire was informed by a number of design imperatives, including:

- Participants being able to complete the questions in the absence of the researcher.
- The length of the survey being in such a way that participants should feel motivated to complete the survey and not lose interest.
- The questionnaire being distributable to many people.
- The questions being based on a 5 point Likert scale. The scale ranges from: strongly agree, agree, neutral, disagree, and strongly disagree.

The researcher used questionnaires to gather data as they assist with easy access to the potential respondents. Questionnaires enable respondents to freely express their views and to complete the questionnaires at their own pace without any interruptions (Tustin et al, 2010). Questionnaires can be administered to a large number of respondents simultaneously. As a result, they have been proved to be cost effective compared to other forms of information gathering especially when dealing with large sample sizes (Bryman and Bell, 2014). They give all the respondents an opportunity to answer a set of questions anonymously and without any interference. Non-disclosure of one's identity gives confidence to the respondents and increases the chances of more honest answers.

3.5.1.2 Pre-testing questionnaire

Wiid and Diggines (2013) indicated that pre-testing enables the researcher to determine whether the instructions on the questionnaire are clear and whether there are any problems with the survey

design, layout, wording, and if it is necessary to clarify any uncertain measurement items. The participants were encouraged to deliver the feedback and comments found on the initially developed questionnaire. The questionnaires were administered to several colleagues as well as few lecturers and professors to iron out any ambiguity, to ensure that the length and layout were appropriate before distributing them to University students.

3.5.1.3 Administration of the Questionnaires

The researcher distributed the questionnaires to the available students from all schools from second year level upto Masters level over a period of two months. The researcher explained the aim of the study to the participants and asked if they wanted to paticipate.

3.5.2 Semi-structured Interviews

According to Creswell (2013), an interview is a technique that involves a face-to-face approach of gathering data from respondents. Wild and Diggins (2013) define interviews as relatively unstructured, extensive interviews in which the interviewer asks many questions and probes for in-depth answers. This interview aims to explore people's individual and collective understanding, reasoning processes and other significant factors which may impact upon mobile device use. Interview questions allow participants to express their views on the issue which is studied (Kumar, 2010 and Tustin et al, 2005). Semi-structured interviews assisted in bringing clarity on all the crucial matters of using mobile devices at the University.

An interview guide was developed and used during each interview and specific data collection questions were set out in the interview guide. The researcher had a list of questions on fairly specific topics to be covered but the interviewees had leeway on how to reply. Questions may not follow the exact order outlined on the schedule and the wording may be changed by the interviewer (Bryman and Bell, 2014). Some questions not included in the interview guide may be asked and the interviewer picks up on responses by interviewers (Bryman and Bell, 2014). This guideline was used during each interview to maintain the sequence of questions and the level of consistency of each interview.

3.5.2.1 Pretesting the Interview guide

Before conducting the interviews, the interview guide was pretested at the University of Venda with few senior lecturers and colleagues. The aim of this process was to see if the questions would be tapping into the same overall phenomenon and whether differences in the wording

elicited similar responses. Also this process ensured that the interview questions could be understood and measured validly. Based on the comments received from the pretest, modifications were made to the interview questions to improve their clarity before using it in the actual interview.

3.5.2.2 Administration of the Interview

The researcher conducted the interviews with 8 lecturers from all schools, 8 student school representatives and an IT Technician at the University of Venda. Emails were sent to the student schools chairpersons requesting for an interview date and time. The interviews for lecturers and the IT techinician were done to the ones who were available and willing to participate.

3.6 DATA ANALYSIS

Data analysis helps in interpreting and drawing conclusions from the collected data (Creswell 2013). Descriptive analysis was used on the quantitative method that is questionnaire responses, whilst thematic analysis was used on the qualitative method that is the semi-structured interview responses. According to Maree (2012), descriptive analysis focuses on the purpose of providing a summary of the sample in terms of the variable of interest. It includes frequency distribution, location measures (mode, mean, median), variability measures (index of diversity, range, variance, standard deviation) and skewness. Descriptive data analysis has the advantage of allowing the researcher to detect and erase errors that may be occur in coding as well as the data capturing process.

Thematic analysis was engaged to analyse the qualitative data. According to Yin (2011), thematic analysis is a technique used to analyse qualitative data and involves examination and recording patterns within data. It is a flexible method that is not tied to a specific philosophical orientation. The goal of thematic analysis is to identify, analyse and describe patterns or themes across a data set. It shares some of the features of content analysis but is more suited to investigating meaning in context. The informed judgement of the researcher using thematic analysis, is necessary to determine what counts as a theme. Determining a theme and the prominence of the theme relates to how it captures important meaning with reference to the research questions (Bryman and Bell, 2014).

Data collected through interviews was analysed using thematic analysis. The researcher's judgment is the main tool in determining themes which are more essential (Creswell, 2013). The

information will be presented in a narrative form. Data collected through questionnaires was analysed using the latest version of IBM SPSS Statistics and Microsoft office Excel softwares.

The information was presented in graphic and tabular form, showing frequencies and percentages.

3.7 VALIDITY AND RELIABILITY

It is important to measure the questionnaires' potential to achieve its own validity (Brynard and Hanekom, 2006). Reliability refers to the degree to which the measure is error-free and yields consistent results (Long, 2010). A pilot study was done such that the adopted questionnaire was refined in a way that respondents had no problems in answering the questions and there was no problem in recording as well. The pilot test enabled the researcher to obtain some assessment of the questions' validity and the likely reliability of the data collected. The questionnaire's internal consistency was assessed by calculations of Cronbach Alpha on the SPSS, such that responses of the questionnaire were correlated to each of the questions in the questionnaire.

The interview schedule was subjectively assessed for presentation and the relevance of the questions. The interview tool was given to colleagues to check whether the questions were relevant, unambiguous and clear. The supervisor and co-supervisors further critically evaluated the interview schedule, and suggestions made were implemented. In order to ensure reliability in this study the responses obtained through the interview schedule were recorded to check correlation. Table 3.3 shows the summary of research methodology.

Table 3.3: Summary of research methodology

Research Design	**Data Collection Methods**	**Respondents**	**Sampling Techniques**	**Data Analysis Methods**
Quantitative research	Questionnaire	Students	(Systematic sampling)	Descriptive analysis
Qualitative research	Semi-structured interviews	IT technician, Lecturers and students' representatives from UNIVEN	(convenience sampling)	Analytic and Thematic qualitative analysis

3.8 ETHICAL MEASURES

With regard to freedom from harm, there was no physical harm caused by participating in the study. The right to self-determination was followed by providing the participants with the right to refuse to participate in the study, the right to discontinue the study if they felt uncomfortable, the right not to answer specific questions if they did not want to disclose that information and the right to ask for clarification if they were not sure about any aspect of the use of smartphones or tablet PCs in general. Addressing the participants' right to full disclosure, the researcher described the nature of the study, the participants retained the right to refuse participation, the researcher's responsibilities and the risks/benefits involved, before participating.

The right to privacy was respected by guaranteeing each participant's privacy by interviewing the persons individually in a private area, self-administering questionnaires and by treating data collected with confidence. Anonymity was adhered to by ensuring that no completed structured interview schedule and questionnaire could be linked to any specific participant. The completed interview schedules and questionnaires were only accessible to the researcher and the statistician, and were kept locked up by the researcher.

Data collected was used for the purpose of this study only, and the completed interview schedules would be destroyed as soon as the research report had been accepted. The research report would provide facts, figures, graphs and tables but no names of individuals would appear in the report. The researcher would treat all information in the strictest confidence and not divulge any information shared with her to any other person nor institution. Consent to conduct the survey was obtained from the University Research and Ethics Committee(See Appendix C).

3.9 SUMMARY

This chapter dealt with the research design used in this study, addressing the population, sampling procedure, data collection instruments and data collection procedures. Measures were adhered to in order to enhance the validity and reliability of the research results. Ethical concerns which could have impacted on the survey were addressed. The following chapter presents the analysis and interpretation of the data obtained from conducting interviews and questionnaires.

CHAPTER 4: DATA INTERPRETATION AND ANALYSIS

4.1 INTRODUCTION

This chapter discussed the results on a question by question basis. The purpose of the study was to investigate the potential use of digital mobile devices in teaching and learning at the University of Venda. The information and knowledge gained will help to clarify questions and problems in order to help students and lecturers on how best to use mobile devices for teaching and learning. Data collected from students, the IT technician and lecturers was presented in this chapter. The chapter also examines the students' and lecturers' perceptions on the motivation and usefulness of the mobile devices in their educational experience.

The chapter commences with section A which presents quantitative analysis whereby data collected using questionnaires was analysed. The chapter proceeds with section B which is the interpretation of findings from qualitative data collected through interviews.

Section A: Quantitative data analysis

This section interpreted data collected using questionnaires. It includes the biographical analysis, prior knowledge of internet use and mobile learning, mobile learning usefulness, capabilities enhancing student learning and limitations of mobile learning. Statistical data presentation instruments were used to present the results. These instruments include pie charts, frequency tables and bar graphs.

4.2 REALISATION RATE

UNIVEN students, lecturers and an IT Technician made the sample frame for this study. 370 distributed questionnaires gave us the sample size for quantitative data and 17 interviewees gave us the sample size for qualitative data of the study. Of the 370 questionnaires distributed, 300 were returned. On the returned questionnaires, all questions were answered. All 17 interviews were conducted and all questions were answered.

4.3 DEMOGRAPHIC PRESENTATION

This consists of the information concerning the sample structure of the participants who participated in the study and is discussed in subsequent sub-sections. This includes the gender, age and marital status of the participants.

4.3.1 Gender Analysis

The gender question required respondents to indicate their gender according to the gender items presented. The results are illustrated in Figure 4.1.

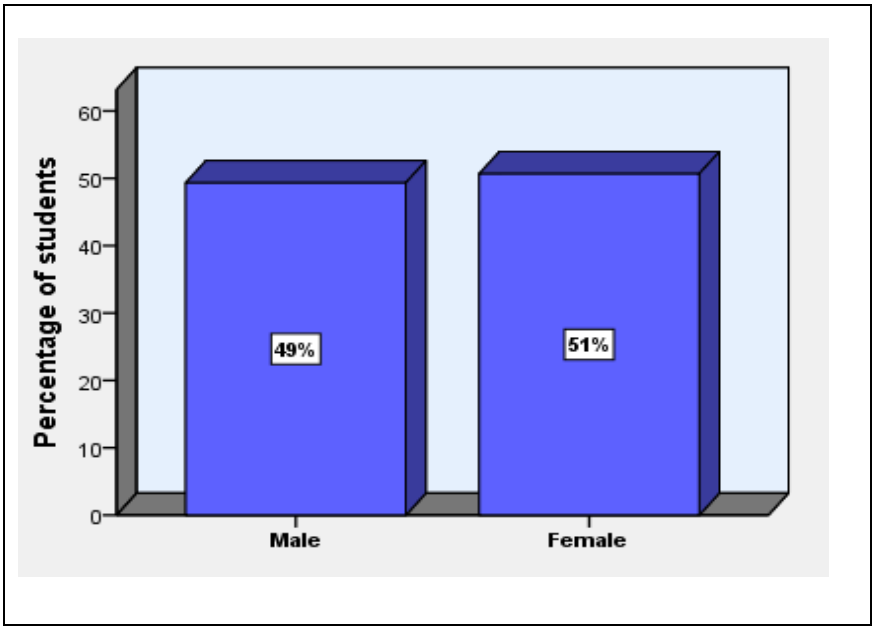

Figure 4.1: Percentage of Students' Participants

Of the 300 students who participated, 51 percent were female while 49 percent were male.

4.3.2 Participants' Age

Respondents were asked to indicate their age in years. The results are shown in Figure 4.2.

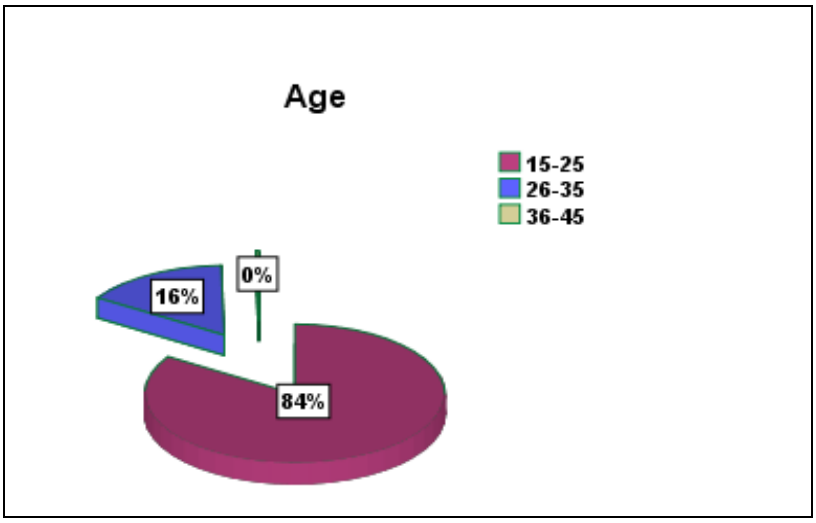

Figure 4.2: Percentage of the Participants' Age

The largest percentage of respondents (84%) fell in the 15-25 year age range, followed by the 16% who fell in the 26-35 year age range. There were no respondents in the 36-45 year range. The largest percentage (84%) was because most students who participated are undergraduates and falls within the range of 15-25 years of age. There were no participants from 36-45 as most students at that age would be doing their PhD studies. PhD students did not take part on the study.

4.3.3 School

Participants were asked to indicate their respective schools and the results are shown on Table 4.1.

Table 4.1: Percentages of Participants in Schools

	Frequency	Percent	Valid Percent	Cumulative Percent
Agriculture	15	5.0	5.0	5.0
Education	71	23.7	23.7	28.7
Environmental Science	33	11.0	11.0	39.7
Health Sciences	25	8.3	8.3	48.0
Human and Social Sciences	52	17.3	17.3	65.3
Mathematical and Natural Science	32	10.7	10.7	76.0
Law	20	6.7	6.7	82.7
Management Sciences	52	17.3	17.3	100.0
Total	**300**	**100.0**	**100.0**	345.4

Table 4.1 displays the students who took part on the survey according to their schools. There are eight schools at UNIVEN as shown in the Table 4.1. The calculated number of sample sizes per school are shown in Chapter 3. The shown frequencies on Table 4.1, are the respondents who completed the questionnaire. The highest percentage of 24%, is from the school of Education because the school has the highest number of registered students followed by the school of Human and Social Sciences together with the school of Management Sciences. The other schools with lesser percentages are due to the lesser number of the registered students.

4.3.4 Level of study

The last part of the biographical information required respondents to state their level of study from second year upto Masters level. Table 4.2 shows the outcome.

Table 4.2: Percentages of Study Levels

	Frequency	Percent	Valid Percent	Cumulative Percent
2nd Year	92	30.7	30.7	30.7
3rd Year	141	47.0	47.0	77.7
4th Year	49	16.3	16.3	94.0
Masters	18	6.0	6.0	100.0
Total	**300**	**100.0**	**100.0**	**302.4**

As the study objective is to determine the current usage of mobile devices which is smartphones and tablet PCs at UNIVEN, the researcher excluded the first year and PhD students. This is because the first year students were given their tablet PCs at the end of their first year while PhD students were not given tablet PCs. The highest percentage of 47% is from third year students followed by 30.7% for second year students. These results are in line with the number of undergraduates and postgraduates (Honours and Masters). Postgraduate students were few compared to undergraduates. This is because few students would want to further their education because they would want to look for employment to support their families and other reasons (Lyonette, Atfield, Behle, Gambin, 2015).

4.4 CURRENT MOBILE DEVICES' USE

This section answered the first objective whereby the researcher sought to determine the current use of mobile devices by students towards learning.

4.4.1 Prior Knowledge of internet use

This second part of the questionnaire required participants to indicate the internet activities they were able to perform from the ones which were listed.

Frequencies		
	Responses	
	Number	Percent
Access internet	289	16.5%
Download materials	260	14.9%
Download apps	225	12.9%
Type Notes	265	15.2%
Access social sites	238	13.6%
Send emails	251	14.4%
Post comments	220	12.6%
Total	**1748**	**100.0%**

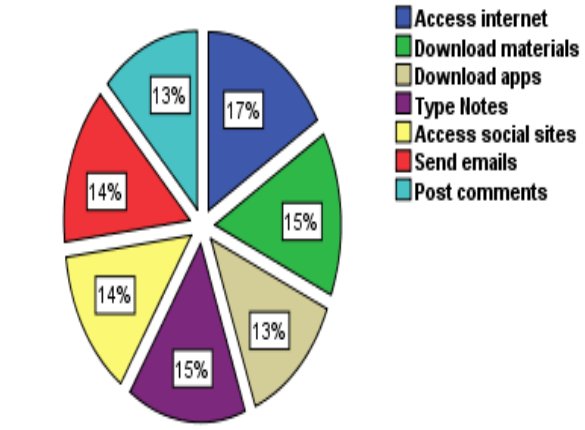

Figure 4.3: Percentages of Internet Use

The results in Figure 4.3 indicate that most students were aware of the stated internet activities. Of the 300 returned questionnaires, the responses showed that 289 can access the internet, 260 can download materials, 225 can download applications, 265 can type notes on their mobile devices, 238 know how to access social media sites, 251 send emails and 220 can post comments on blogs. These results are an indication that students can use their mobile devices for learning as the numbers show that the students do have access on internet using their mobile gadgets. As explained by Martin and Ertzberger (2013), smartphones and tablet PCs have many features that are relevant to mobile learning. The few students who indicated otherwise probably were those with phones that cannot connect to the internet. However, they have tablet PCs which were distributed by the University which might mean that they are not using those tablet PCs to do school work.

4.4.2 Prior Knowledge of mobile learning

Respondents were expected to specify the mobile learning activities that they have been engaging in. The prior knowledge assisted in knowing how the students have been using their smartphones and tablet PCs towards learning.

Table 4.3: Mobile Learning Engagement

	Responses		
	Number	Percent	Percent of Cases
Learn New staff	211	15.3%	73.0%
Searching	205	14.9%	70.9%
Social Networking	191	13.8%	66.1%
Text classmates in class	112	8.1%	38.8%
Take videos and photos	186	13.5%	64.4%
Reading	237	17.2%	82.0%
Study Tool	238	17.2%	82.4%
Total	**1380**	**100.0%**	**477.5%**

Table 4.3 displays the number of respondents and their percentages. The greatest number of respondents (17.2%) were using their mobile gadgets as study tools, reading articles and notes. Of the 300 respondents, 205 students were using the mobile devices for searching for information they didn't know or understand during classes. 211 students had downloaded applications that help them to learn new things. 13.5% of the students are utilising mobile devices to take videos and photos for assignments or class use. 13.8% were engaging on social networking. The least category of respondents (8.1%), indicated that they use the mobile devices to communicate with each other during class. Mobile learning is "learning that happens when the learner is not stationed, at a predetermined location, or where handheld devices such as mobile phones, PDAs and palmtops and tablet PCs are dominant technologies" (Mokoena, 2012). It can be seen that students are able to use their mobile devices both in class and out of class.

4.5 MOBILE LEARNING USEFULNESS

This part of the questionnaire required participants to indicate the extent to which students agreed with the mobile learning usefulness statements. The results follow.

4.5.1 How mobile devices affect students in class

Participants were asked to indicate if learning is now fun through mobile devices' use and if mobile devices are not a distraction in class. Figure 4.4 shows the results.

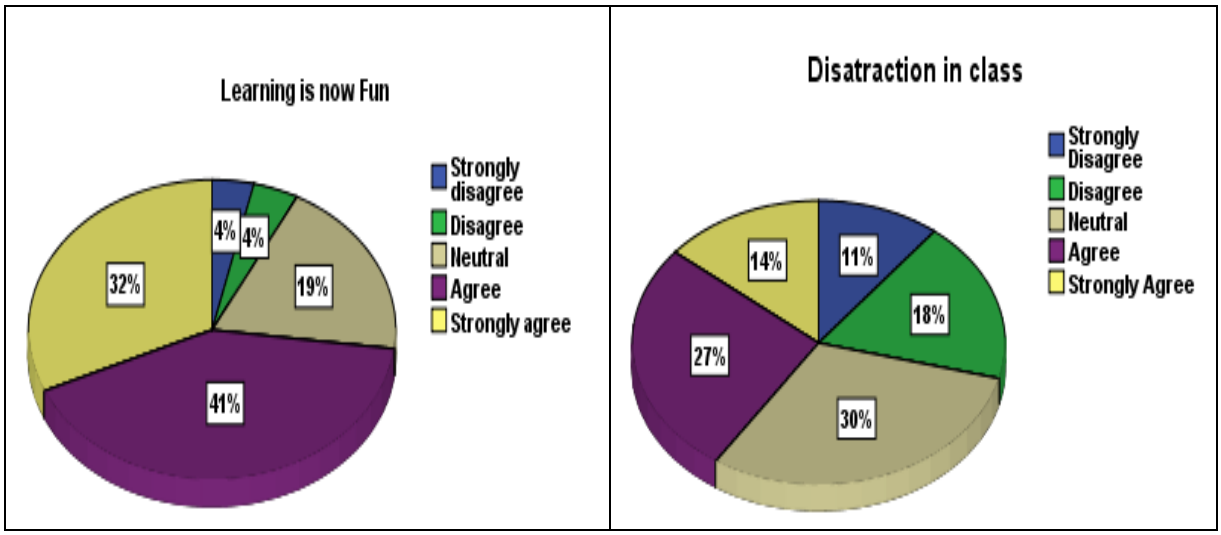

Figure 4.4: Use of M-learning In Class

The first pie chart on Figure 4.4 shows that 73% of the respondents were enjoying learning using their mobile devices. Only 4% do not agree with the idea due to reasons such as 'tablet PC is nolonger working' or 'not in possession of a smartphone'. 19% of the respondents were neutral which implies that this small group might be those students who are resistant to change and not decisive of the better learning method from the traditional one. This pie chart shows that the students agree that learning is now fun. The second pie chart displays the results on whether mobile devices' use would not be a distraction in class. 41% of the respondents said that mobile gadgets would not distract students in class whereas 25% said the devices would distract them in class. This implies that some students are not aware of how they can utilise their devices in class whereas some have knowledge on how to put their devices to good use. Basset and Kelly (2013) explained that lack of detailed educational plans or guidance both for teachers and students on how to use their personal devices for educational purposes may also prohibit mobile learning activities. It is therefore clear that students need to be educated on using mobile devices for learning.

4.5.2 Communication Improvement

The participants were asked to indicate whether the use of mobile devices improves communication between students and between students and lecturers. Figure 4.5 displays the outcome.

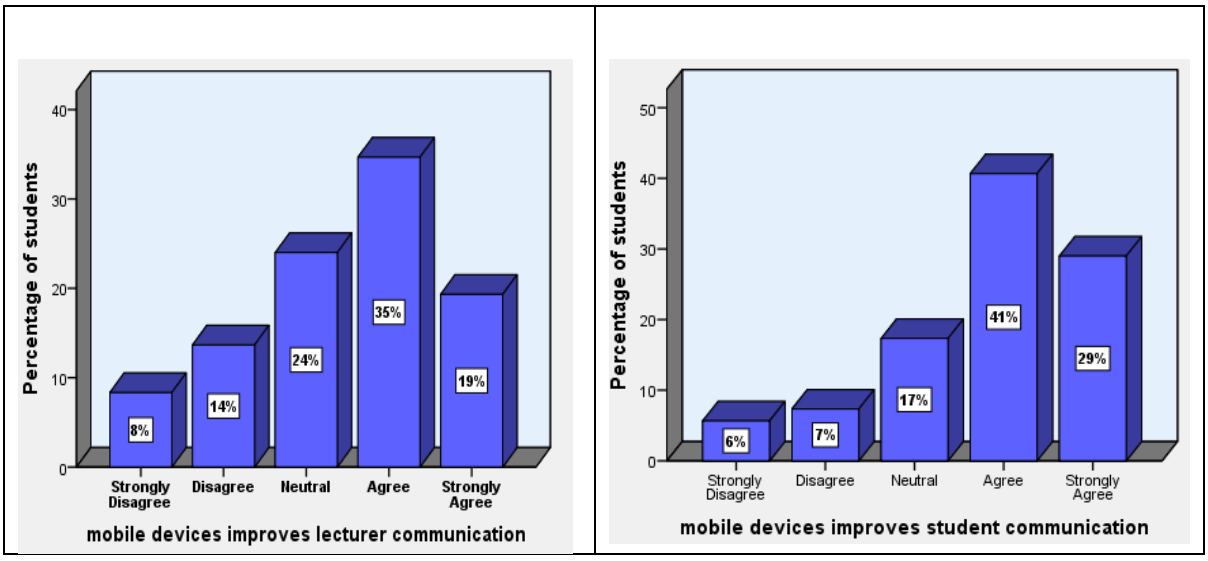

Figure 4.5: Communication Improvement

Figure 4.5 shows that a greater percentage of 54% agreed that mobile devises' use improves student to lecturer communication. Only 22% of the respondents disagreed with this statement. 70% of the respondents agreed that the use of mobile gadgets improves student to student communication whereas 13% disagreed. These results imply that mobile devices effectively improve both student to student and student to lecturer communication. This makes learning easy as students can directly communicate with their lecturers/peers concerning course related issues.

4.5.3 Learning anywhere with mobile devices

On the question of whether participants agreed on the statement that they can learn and study anywhere with the help of mobile devices, the results are displayed in Table 4.4.

Table 4.4: Mobility of Mobile Devices

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	13	4.3	4.3	4.3
Disagree	21	7.0	7.0	11.3
Neutral	70	23.3	23.3	34.7
Agree	110	36.7	36.7	71.3
Strongly Agree	86	28.7	28.7	100.0
Total	300	100.0	100.0	221.6

As seen in Table 4.4, a greater number of respondents (65.4%) agreed with the statement that they can learn and study in places they could not normally learn or study through the use of mobile devices. With the internet, students can be able to access study materials which enables them to learn anywhere anytime. The results correlate with findings from a study by Cheon, Lee, Crooks, and Song (2012) who indicated that mobile learning provide chances for individualized, situated, concerted, and informal learning without being restricted to classroom contexts. However, 11.3% did not agree with this statement. Knowledge on how to use the mobile devices anywhere is needed to assist that small number of students who are not aware that mobile devices can enable them to learn from anywhere.

4.5.3 Traditional Learning vs mobile learning

Mobile learning has its advantages on teaching and learning. There was need to investigate whether some students still think traditional learning is just as effective as mobile learning. Figure 4.6 shows what respondents think about traditional learning.

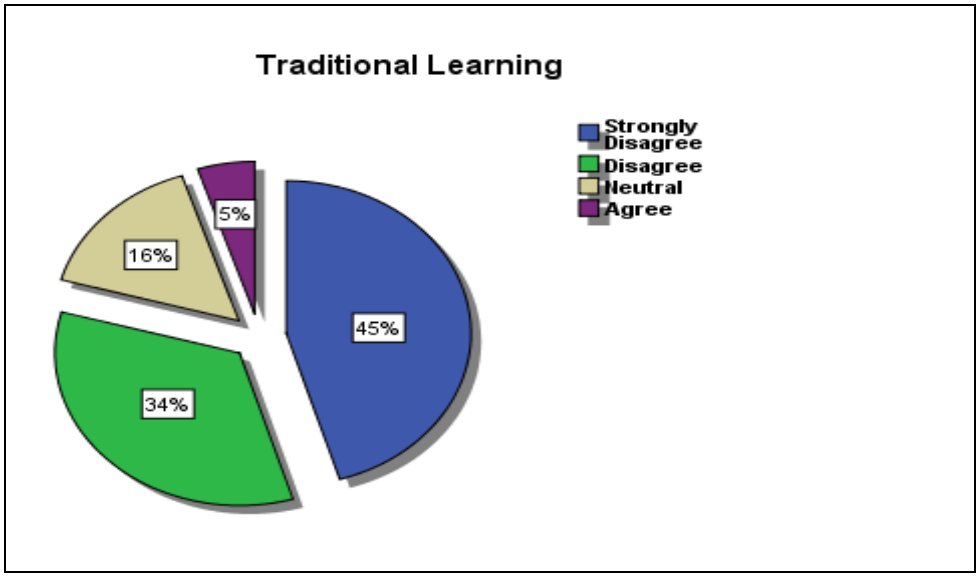

Figure 4.6: Traditional Learning vs Mobile Learning

45 % and 34% of the students who participated in the study indicated that traditional learning is not as effective as mobile learning. This is because with traditional learning, communication is made easy, learning can be done anywhere, study materials can be accessed anywhere, and discussions can be done as well as recording lectures. Only 5% of the respondents were on the view that traditional learning has the same effect with mobile learning. Traditional learning produces good grades. It can be improved when incorporating mobile devices in and out of

classrooms.

4.5.4 Time spent on different Internet activities

There are different internet activities which students spent their time on. It was necessary to have knowledge on what they do and how much time they spend on such activities using their mobile devices.

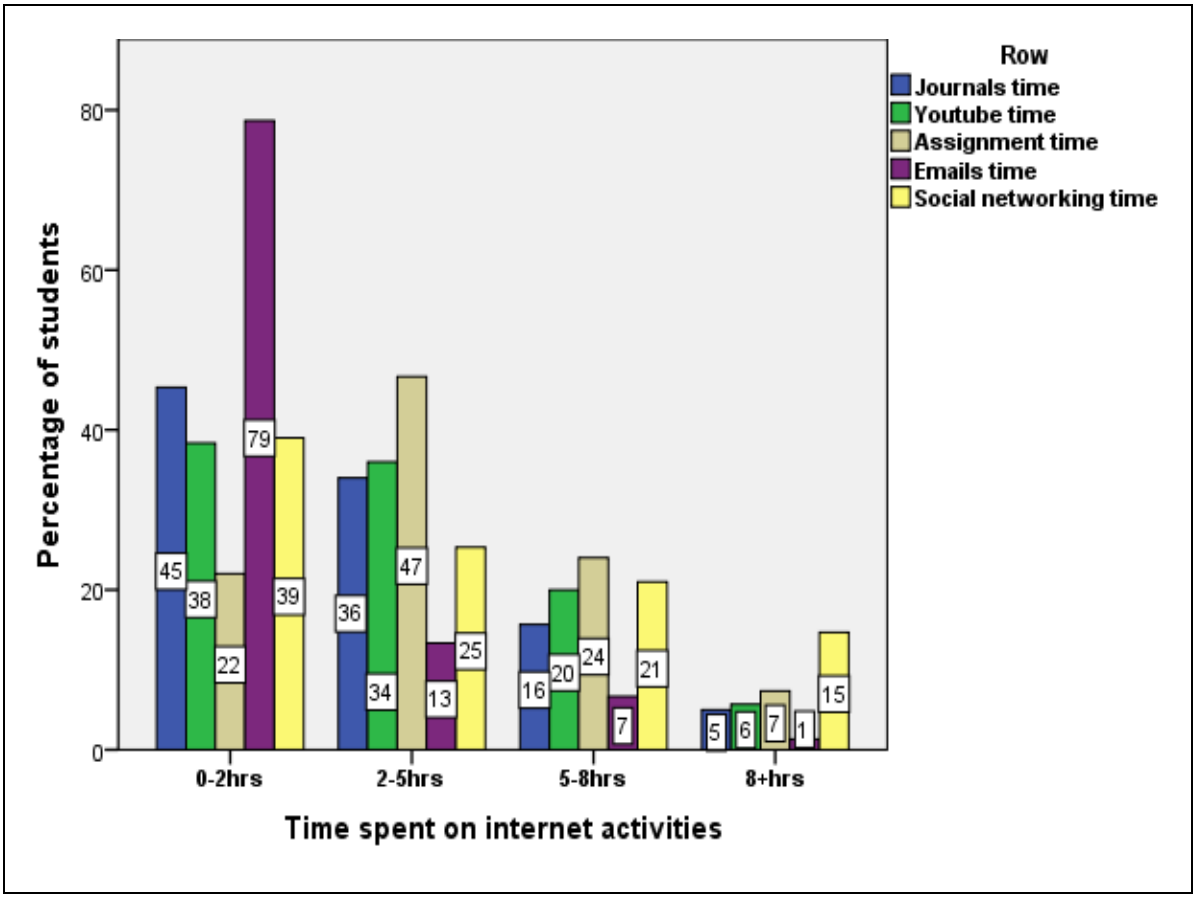

Figure 4.7: Time Spent on Internet Activities

Figure 4.7 displays percentages of internet activities per case. It is shown that on searching for journals and articles, most respondents use 0-2 hours which is 45%. Another 36% spends 2-5 hours and 16% spend 5-8 hours and lastly 5% spend 8+ hours. This is because most students who work with articles are postgraduates who will be doing research and article writing. In this study, postgraduates were few compared to the undergraduates who register in great numbers and also focus less on articles and journals. On YouTube time, the highest percentage is 38% spending 0-2 hours followed by 36% who spend 2-5 hours, 20% who spend 5-8 hours and 6% 8+ hours. YouTube is a great platform for learning because it educates most students practically. It

motivates students in the sense that they can learn new staff without attending classes for school work they do not know.

As shown in Figure 4.7, 47% of respondents spend 2-5 hours on assignments followed by 24% on 5-8 hours. 22% of the respondents spend 0-2 hours and 7% spend 8+ hours on assignments. These results show that it is indeed necessary to have mobile devices as most students are using them to work on their assignments. 79% use 0-2 hours per day on reading and replying their emails. Emails do not require much time per day. 13% spend 2-5 hours whilst 7% spend 5-8 hours and 1% spend 8+ hours. Those who spend more time might those who have study groups and communicate via email, storing their folders on cloud like google drive so that all members of the group have access to the work. Of all the internet activities, social networking time consumes the greates time with 15% of the students spending 8+ hours on social networking. Communicating using social networks is easy as students will be using Wi-Fi and data bundles. 39% spend 0-2 hours on social networking. These could be the group of older students who spend less time on social networks because they will be concentrating on other platforms. 25% spend 2-5 hours and 21% spend 5-8 hours. This could be a group of students ranging from 15-25 years who are likely to be on social networks most of their time.

Social networks have a long history in higher education. Sams and Bergmann (2013) explained that there are different social networking platforms such as Facebook, Wikis, WhatsApp, and YouTube. These social networks constitute the managed learning environments which were transformed into virtual learning environments, later to be known as teaching and learning platforms.

4.6 CAPABILITIES ENHANCING STUDENTS' LEARNING

It was important to consider the perceptions of the students on mobile learning. Therefore, this sub-section incorporates the expectations of students and their capabilities towards learning.

4.6.1 Promoting mobile learning in class

Participates were asked whether they would want to see mobile learning in class. Figure 4.8 displays the results.

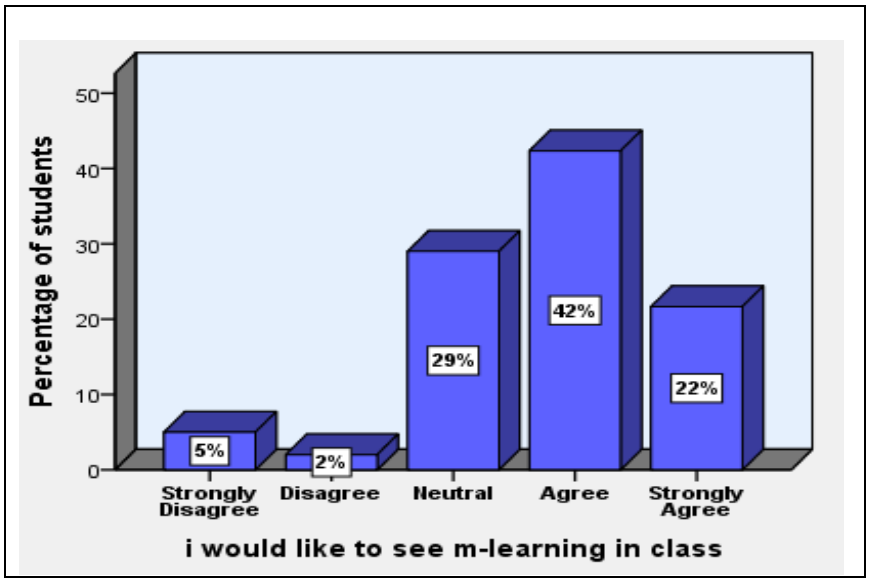

Figure 4.8: Promoting Mobile Devices in Class

As shown in Figure 4.8, 64% of the respondents agreed that they would want mobile learning in classes. This would help them in catching up with lectures which they did not understand. 7% do not agree with this statement. This could be a group of students who did not fully understand the question or those who resist change. Although it can be argued that mobile devices can distract student in class, to a greater extent, interactive classroom activities simplify teaching and learning (Wallace, 2014).

4.6.2 Downloading Applications using mobile devices

Results on whether participants would want to download applications on their mobile devices which would help them on their school work are shown on Figure 4.9.

Table 4.5: Percentages of Downloading Applications

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	7	2.3	2.3	2.3
Disagree	10	3.3	3.3	5.7
Neutral	48	16.0	16.0	21.7
Agree	93	31.0	31.0	52.7
Strongly Agree	142	47.3	47.3	100.0
Total	300	100.0	100.0	

74% of the respondents agreed that they downloaded mobile applications on their tablets PCs and smartphones which would help them with their school work. These applications include the Acrobat reader and Microsoft Office whereby they would be able to read the study materials in a pdf format or Ms Word format.

4.6.3 Ways of using mobile devices

Participants were asked to indicate how they want smartphones and tablet PCs to be used in learning. Figure 4.9 shows the outcome.

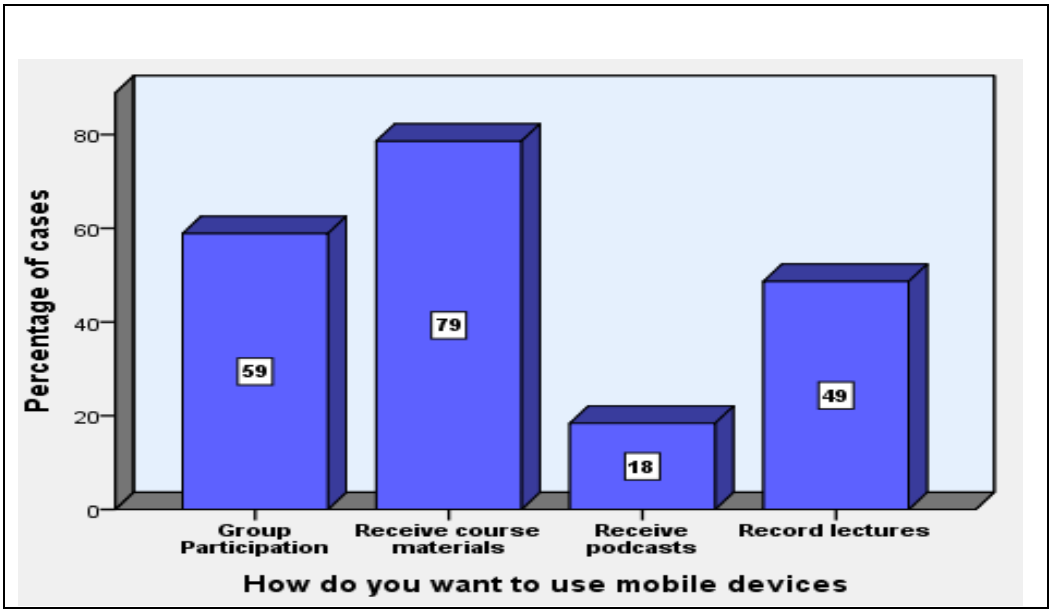

Figure 4.9: Ways of Using Mobile Devices

79% of the respondents indicated that they would want to receive course materials. This is very helpful to students. If course materials are sent to students early, it would assist them in understanding the lecturer more in class as they would be having questions to ask already. Moreover, 59% would also want group participation. This is also helpful when the class has a group whereby anyone who needs assistance will be assisted through the class group anytime anywhere. 49% would want to record lectures. This is also important in the sense that students would be able to go through the recorded lecture in their own free time and they would gain clarity on the topic. 18% would want to receive podcasts. Podcasts are helpful as students will listen to the study material wherever they are. The smaller percentage might be because those students do not know what podcasts are and have never used them.

4.6.4 Mobile Devices for learning

A Yes or No question section required students to respond to whether they use their mobile devices to visit social media in class and if they are able to manage study time. The responses are shown on Figure 4.10.

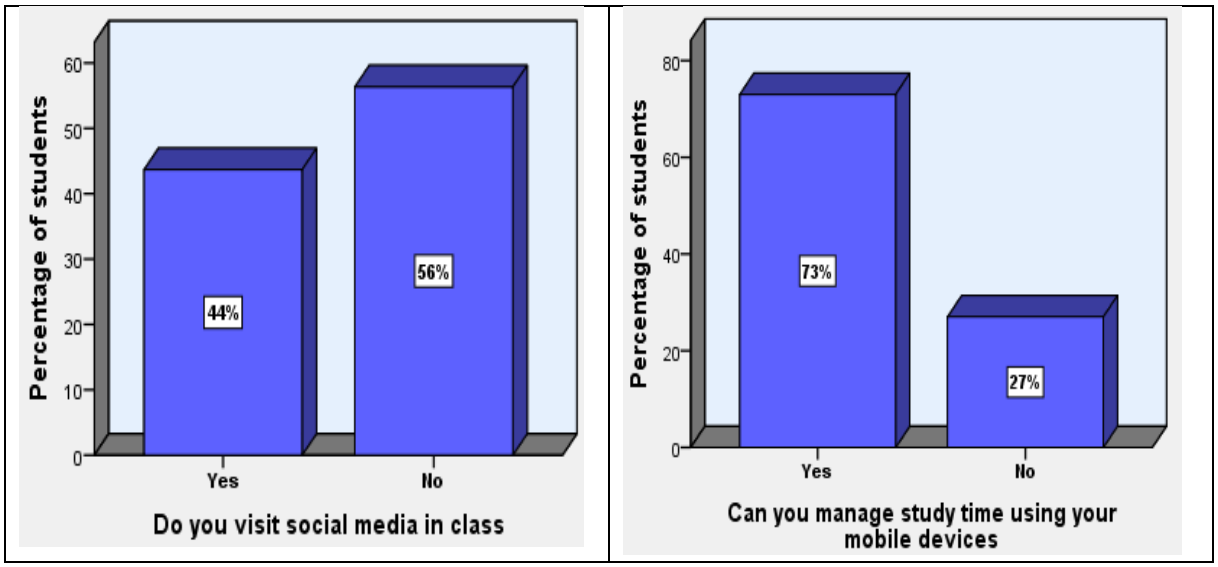

Figure 4.10: Managing Study Time Using Mobile Devices

56% of the respondents visit social media in class whereas 44% of the respondents do not. This can be seen as a setback of mobile devices as some students will not pay attention but rather be on social networks such as WhatsApp and Facebook. Students should be able to manage their time effectively and efficiently. 73% of the respondents indicated that they can handle their study time which is great considering that social network takes much attention and time. Poon (2013) indicated that students might fail to control the risk of distraction in lectures' time by chatting to friends during lecture time and not paying attention. Nevertheless, lectures can assist students on using their mobile devices for educational purposes in class.

4.6.5 Tablet PC as a learning tool

It is crucial to know if the distribution of tablet PCs should be an ongoing project at the University. Therefore, a question was asked on whether the participants think that tablets PCs are a worthy investment as a learning tool. 86% of the respondents indicated that tablet PCs are a worthy investment. However, 14% did not think it is a good idea. This could be the group of students who still think mobile learning is just as effective as traditional learning.

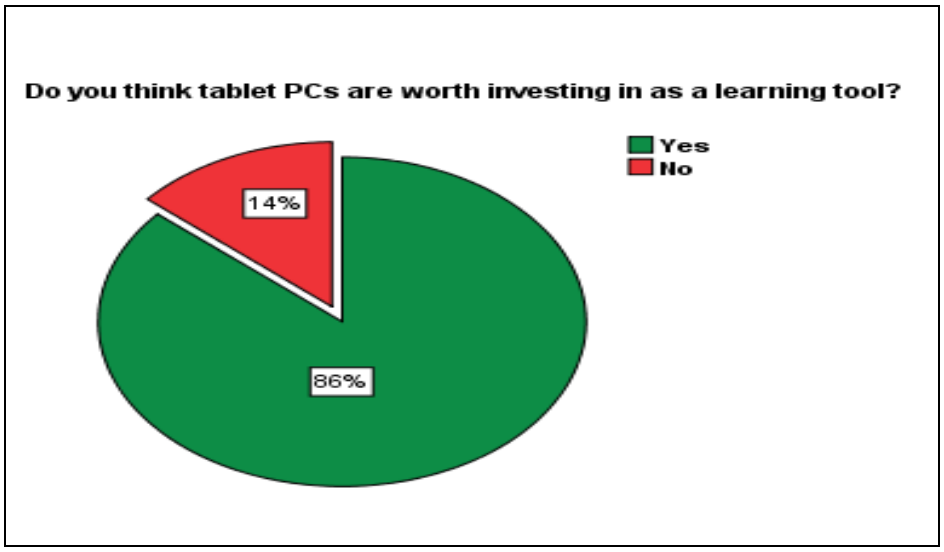

Figure 4.11: Tablet PC as a Learning Tool

The tablet PCs in education projects aim to increase student access to educationally relevant content and enable communication with teachers and peers through online tools and resources for 24/7 learning" (Fritschi and Wolf, 2012). Investing in tablet PCs is enhancing teaching and learning at the University.

4.7 STUDENTS LIMITATIONS IN USE OF MOBILE DEVICES

There are factors which hinder students from using the mobile devices for learning. Table 4.6 shows the responses of the participants in this regard.

Table 4.6: Students' Limitations in Using Mobile Devices

	Responses		Percent of Cases
	Number	Percent	
Cannot download	30	7.9%	10.2%
Connection speed	97	25.5%	33.1%
Tablet PC not working	127	33.4%	43.3%
Do not know how to use	9	2.4%	3.1%
None	117	30.8%	39.9%
Total	**380**	**100.0%**	**129.7%**

As shown in Table 4.6, the highest percentage of 33.4% indicated that their tablet PCs are no longer working which is a limitation to mobile learning. 7.9% of the respondents cannot download study materials on their devices. This could be the group of students who are using their smartphones and not the tablet PC due to many reasons like tablet PC not working or small smartphone size. 25.5% are not using their mobile devices because of connection problems. Some students cannot connect to Wi-Fi on campus due to low bandwidth. The University is still improving the Wi-Fi issues so that students can access the internet anywhere. 2.4% of the students did not know how to use mobile devices for school work while 30.8% did not have any limitation of using their mobile devices towards learning.

4.8 CHI-SQUARE TEST FOR ASSOCIATION

The chi-square test for independence is used to discover if there is a relationship between two categorical variables (Sharpe, 2015). The following sections interpret the relationship between level of study and mobile learning and the relationship between students' access to the internet and their perceptions towards the usage of tablet PCs at UNIVEN.

4.8.1 Chi-Square Tests: Relationship between level of study and mobile learning at UNIVEN

Question 3.1, Section B and Section A of the questionnaire sought to solicit responses on the frequency of the usefulness of mobile devices in enhancing communication between students and frequencies pertaining to the level of study of the survey participants. Cross tabulation of the two variables was done to understand the relationship between level of study and mobile learning. The null and simple hypotheses were set as follows:

H_o There is a relationship between level of study and mobile learning at UNIVEN.

H1 There is no relationship between level of study and mobile learning at UNIVEN.

The cross tabulation assisted in performance of the chi-squared test which yielded the results as depicted in the Table 4.7.

Table 4.7: Chi-Square Tests on Study Level and M-Learning

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.532[a]	12	.168
Likelihood Ratio	19.130	12	.085
Linear-by-Linear Association	.429	1	.513
Number of Valid Cases	300		

From the 300 respondents at University of Venda, the researcher evaluated whether there was a relationship between level of study and mobile learning. From Table 4.4, more than half of the students were 2nd and 3rd year group (78%), 4th year and Masters students who constituted 22% of the study. As shown on Figure 4.5, 70% of these students agreed that mobile learning enhances communication between students with only 17% being neutral and the remaining 13% against this notion. The data was analysed using X^2(chi-square) test. The simple hypothesis was accepted X^2(12) =16.53, p≥0.05. Therefore, at UNIVEN there is a relationship between level of study and mobile learning. In Africa, slow adoption is caused by the fact that many students usually possess their own mobile phones when they are older thereby missing the opportunity to benefit from them whilst they are young (Adkins, 2013). It can be seen that possessing tablet PCs and smartphones when students are first entering students is a great opportunity to enhance learning. With the use of social networks, emails, blackboard, teaching and learning will be enhanced.

4.8.2 Chi-Square Tests: Relationship between use of mobile devices and communication improvement

The Chi-square test was used to find out whether mobile learning improves the communication between students and lecturers. It was found out from the study that some student can understand better if they can be able to communicate with their lecturers on social networking platforms. The simple and null hypotheses were set as follows:

> H_o Use of mobile devices improves communication between students and lecturers at UNIVEN.
>
> H1 Use of mobile devices does not improve communication between students and lecturers at UNIVEN.

A cross tabulation was also performed for the data of level of study and whether the use of tablet

improves communication between lecturers and students at UNIVEN. The cross tabulation assisted in performance of the chi-squared test which yielded the results that are depicted in Table 4.5. However, 54% of the students agreed that mobile learning enhances communication between lecturers and students while 24% were neutral and only 22% against this notion. The cross tabulation assisted in performance of the chi-squared test which yielded the results as depicted in the Table 4.8.

Table 4.8: Chi-Square Tests on Communication Improvement

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.474[a]	12	.574
Likelihood Ratio	10.570	12	.566
Linear-by-Linear Association	.053	1	.818
Number of Valid Cases	300		

The data was analyzed using X^2(chi-square) test. The simple hypothesis was accepted again X^2(12) =10.47, p≥0.05. Therefore, at the University of Venda there is a relationship on the level of study and communication improvement between lecturers and student. Many students usually own mobile phones when they are older, thereby missing the opportunity to benefit from them whilst they are still young (Adkins, 2013). Undergraduates are using their mobile devices for learning which is improving their communication with lecturers and peers.

4.8.3 Chi-Square Tests: Relationship between students' access to the internet and their perceptions towards the usage of PC tablets at UNIVEN.

The Chi-square was used to find out whether with good internet access, students will fully embrace mobile learning at UNIVEN. This was measured by the accessibility of internet at UNIVEN and perceptions by students with regard to the usage of smartphones and tablet PCs to facilitate mobile learning. The simple and null hypotheses were set as follows:

H_o There is a relationship between students' access to the internet and their perceptions towards the use of mobile devices at UNIVEN.

H1 There is no relationship between students' access to the internet and their perceptions towards the use of mobile devices at UNIVEN.

Cross tabulation of the two variables (access to the internet and spending more time on classwork if I could access materials anytime anywhere on my mobile device) was done and the chi-square results are shown in Table 4.9:

Table 4.9: Chi-Square Tests on Internet Access and Perceptions on M-Learning

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.789[a]	4	.067
Likelihood Ratio	11.193	4	.024
Linear-by-Linear Association	7.369	1	.007
Number of Valid Cases	300		

The majority of respondents showed that they have access to the internet from their tablet PCs and smartphones and can perform different learning activities on their devices as depicted on Figure 4.3. Of the 300 participants, 289 agreed that they can access the internet and 260 indicated that they may access learning materials anytime anywhere on their mobile devices. This would help students spend more time on their classwork. The data was analyzed using X^2(chi square) test. The simple hypothesis was accepted $X^2(4) = 8.78$, $p \geq 0.05$. Therefore, at UNIVEN, access to the internet among students will affect their perceptions towards the usage of devices. El-Hussein and Cronje (2010) explained that we can only conclude that the technology being used for learning can be considered fully mobile when there is use of wireless digital device technologies and when students are using it for self-management in higher education. Students can access the internet anytime anywhere. As a result, the interviews confirmed that the students are progressing with the use of mobile devices for learning.

Section B: Qualitative data Analysis

This section analyses data collected using interviews. There were 3 interview guides, one for lecturers, another one for students and another for the IT technician. Data was sourced from 16 participants in order to determine the current use, expectations and perceptions about mobile devices in teaching and learning.

Biographical Information

Information was sourced from both students and lecturers in order to get views of both groups and compliment data collected using questionnaires. In terms of gender 50% were females while 50% were males. This was done to ensure an equal representation of both genders. Table 4.7 shows the gender and nationality of the respondents.

Table 4.10: Respondents' Gender and Nationality

Lecturers Respondents

Lecturer	Gender	Nationality
A	F	Zimbabwean
B	M	South African
C	F	South African
D	M	South African
E	F	Nigerian
F	M	South African
G	M	South African
H	F	Zimbabwean

Students Respondents

Student	Gender	Nationality
A	M	South African
B	M	South African
C	F	Zimbabwean
D	M	South African
E	F	South African
F	F	Zimbabwean
G	M	South African
H	F	South African

4.9 LECTURERS INTERVIEW ANALYSIS

The researcher was interested in exploring lecturers' perceptions on the motivation and usefulness of the mobile devices in their educational experience. The study is a framework of how mobile devices can be a vital tool that will assist them in their teaching, interactions between instructor and students, and provide possible applications that would be easy to implement, yet provide value and relevance to students. Below is the analysis of data from lecturer interviews.

4.9.1 Technology Experience in Teaching

On the question of describing the experience of technology use in teaching, all the interviewees admitted that they all used technology in teaching. 80% of the respondents explained it this way:

> "*I use lot of technology especially the internet. I want students to search information on the internet. I communicate with them through emails with attachments which students do*

not like. They don't like emails, they prefer Facebook and WhatsApp. The first meeting, I ask for email addresses."

The results showed that most lecturers are making use of technology for teaching. All the respondents were using emails for communication. They were also using social media as a means of communication. This makes the University a good environment for mobile learning.

It is easy for lecturers to communicate with students using email since students have phones and tablet PCs. Another lecturer explained using technology for teaching this way:

"I use technology in almost everything. I use social media, internet, blackboard which is available for the school and other things which are related to teaching and learning"

This response means that lecturers are aware that using technology in teaching enhances teaching and learning. Mobile devices' use therefore, makes the experience of technology use viable because students are able to access information from anywhere anytime. However, 20% of the lecturers indicated that they did not use much technology in teaching. They pointed out that they mainly use applications such as Microsoft PowerPoint. They prepare slides and use the projector to conduct their lecturers.

"*I don't depend much on technology, sometimes I just lecture. I use technology such as PowerPoint, projector when I have some picture or slides and some kind of graphics that I would like to show students*"

In the light of the above, it can be deduced that these few lecturers prefer traditional teaching methods rather than moving with technology. This is probably because they do not have knowledge of what technology can do to their teaching.

4.9.2 Mobile learning Activities

Interactive classroom activities also simplify teaching and learning (Wallace, 2014). On the question of whether lecturers have explored mobile learning activities in class, 85% of the respondents had the same response. They admitted that they incorporate mobile learning activities in class. Lecturers are excited with the introduction of tablet PCs as they can help many students in accessing learning materials. They had been using phones to communicate with students for years:

"*Yes, a lot. Before tablet PCs were distributed, I was using Facebook. Most of my students were interacting with me using their mobile phones since 2011*"

Facebook groups were created and lecturers were posting learning materials and discussing school related issues with students via Facebook. The disadvantage was for those students who come from rural areas who may not have smartphones which can be used to access the internet. Another response supporting mobile learning activities was the following:

"Yes, on my module we look at how products are marketed using phones. I had an activity where I allowed my students to switch on their phones in class and send please call messages to their friends to see the marketing adverts. This shows that mobile devices can be used for marketing products as well as in teaching and learning."

Mobile learning helps in practicals as highlighted above. According to Baran (2014), mobile devices were found to have the potential to help teachers with understanding and development of new literacies, engaging in rich language learning contexts and exploring physical education. Never the less, 15% indicated that they do not allow the use of mobile gadgets in class. There is lack of effective initiatives and research projects that could provide evidence on the usefulness of mobile learning, hence the importance of this study.

4.9.3 Tablet PCs in Class

Participants were asked if they still see their students with the distributed tablet PCs in class and what students will be doing with them. 70% of the respondents agreed that they still see their students with the tablet PCs. They said they see students using these tablet PCs in class as the students will be recording them while lecturing. One of the respondents said:

"Yes, most of the time, they record me when I am lecturing"

In addition to this, another respondend explained this way:

"*Yes, I have to push them to use them, I forced them to bring them to class and they started using them for class purposes*"

It is a good thing that some lecturers encouraged their students to use mobile devices in class and use them for class purposes as some students may not know how important mobile devices are to student learning cycle. However, 25% of the respondents indicated that they nolonger see students with the tablet PCs:

"*The very first year when the tablet PCs were distributed, we used to see them a lot but recently we don't see them. I don't see many of the students walking around with them anymore but when I want something downloaded, the work is done whether by smartphone or tablet PC*"

From the above statements, it can be inferred that some students are no longer in posession of the tablet PCs they were given at beginning of 2015. This could be because the tablets are no longer working as indicated in students interview.

4.9.4 Communicating with Mobile devices

On the question of how the participants feel about tablet PCs technology for communication with the students, a significant number of respondents (35%) stated that they encourage students to make use of their mobile devices in class for class purposes. This assists students in that they will revise their work at home while listening to the recorded audio from the lecturer which helps them understand the module better.

"*I do not have problems with students operating their phones in class. I even encourage them to record me when I am lecturing, take pictures of the slides on the wall. I just do not want their phones to ring in class*"

However, distraction is the main limitation of using mobile devices in class. 45% of the respondents speculated that students might be chatting to their friends during class:

"They can use it for class if they are asked to, but some do use them for social networks in class which distracts them"

This was indicated on section A, Figure 4.11 that 44% of the questionnaire respondents agreed that they visit social media whilst in class. According to Adkins (2013), developing an appropriate theory of learning maybe a challenge to students due to other distractions such using their tablet PCs for watching movies. There is need for disciplinary actions from lecturers inorder for students to fully concentrate in class. Furthermore, 20% of the respondents indicated that they do not like to use of mobile devices in class. This is probably due to the distractions caused by mobile devices in class.

4.9.5 Incorporating mobile learning in Class

Participants were asked about any ideas for incorporating mobile learning in the classroom. It appears that all the respondents grasped the mobile learning concept well. They supported it and recommended that other lecturers should also make use of mobile devices as long as students are using them for school work.

> *"Mobile devices are here to stay. As lecturers, we need to accommodate them and encourage students to use them especially, the older lecturers who were born before technology tend to become sensitive with these devices. I want students to use them for school work"*

Other respondents gave suggestions on ways of making online assessments, use of Facebook groups, emailing or posting notes on a folder on google drive and using WhatsApp groups. They said that the use of blackboard is a good idea for lecturers. In addition to this, other respondents indicated that recording lecturers when they are explaining would benefit students:

> *"Students should use mobile devices to record lecturers when they are teaching and go home listen and study. Online assessment can be used. Notifications can be made on Facebook, email, WhatsApp as students are always having their smartphones and tablet PCs. Lecturers should use blackboard for tests"*

From the above, it can be seen that if the above ideas can be put to good use by all lecturers, teaching and learning will be enhanced. According to Baran (2014), mobile devices were found with the potential to help teachers with understanding and development of new literacies, engaging in rich language learning contexts and exploring physical education.

4.9.6 Applications

This question required participants to state if they were aware of the applications that could be applicable to their profession as lecturers. All the participants indicated that they were aware of Microsoft office that is Word, Excel, PowerPoint and 50% of the respondents were using the blackboard. However, 50% of the respondents were not using the Blackboard. They did not know how to apply it in their teaching. It has been reported that the University offers training programmes for Blackboard yet the results indicated that only 50% were using it in their teaching. Below is a response from a respondent who does not use the Blackboard:

"The University is encouraging us to attend the Blackboard training, I haven't attended. It is good idea where you can have all your lessons programmed on the Blackboard and we can communicate better with the students."

From the above, it is evident that the University is making efforts to encourage mobile learning which will enhance teaching and learning at UNIVEN.

4.9.7 Lecturers' perceptions of mobile learning in education

There were different perceptions about the effectiveness of mobile devices for student learning in education among the respondents. All the respondents shared a common view that there is need to educate teachers and students to use mobile devices in order to improve their teaching and learning. 60% stated that mobile devices could be used for more than just communication:

"I have seen that sometimes students still have that perception to say if I come with my phone, i will be reprimanded, I should have it hidden somewhere. They do not think it is acceptable in class. Some always have them in their hands. My perception is that I want to encourage my students to have these devices, not only for communication purposes, the mobile devices must be used beyond just communication"

In support of the above, another respondent reported that:

"Mobile devices are very effective but they have a disadvantages such as students chatting in class, downloading movies and videos instead of school related materials. I think there is need to inform people on how to use the devices for teaching and learning because some do not know"

Social networks permit students to form in groups forming which will enable them to distribute and add together their knowledge and share information with ease (Ericson, 2013). As mentioned above, Tablet PCs and smartphones are one of the pillar tools which can be used as a platform for social networking at the University. It is therefore crucial to convert the social networking platform into an edu-networking platform so that students can network using these tools as there is Wi-Fi on campus.

4.9.8 Tablet PC as a learning tool

Interaction with the respondents also has led to an understanding that the distributed tablet PCs play a positive role in enhancing teaching and learning at UNIVEN. All the respondents expressed their views on whether tablet PCs are a worthy investment. They explained that tablet PCs are assisting many students as some students come from poor backgrounds and could not afford tablet PCs themselves.

> "*They are especially for the needy students. They are students who cannot afford smartphones and the tablet PCs will help them access the internet and download school materials as the University has Wi-Fi around campus"*

In support of the above point, another respondent pointed out that:

> *"They are a good investment as students can download books here on campus and go home and study the materials they would have downloaded"*

Participants further highlighted the issue of time. They pointed out that there is need to distribute the tablet PCs at the beginning of year so that new students can use them to access study materials and improve their performances.

"I believe in that and I would be happy if they distribute them in time"

4.10 STUDENTS INTERVIEW ANALYSIS

In order to compliment data collected from questionnaires, interviews with student representatives were conducted. Different perspectives were expressed on mobile learning by the students. Below is the analysis of data from student interviews.

4.10.1 Mobile devices' use

Students were asked a question about what they use their smartphone and tablet PCs for in general. 60% of the respondents reported that they were using smartphones and tablet PCs and 40% of the respondents said they are no longer in possession of their tablet PCs.

> *"I use my smartphone for communication purposes, accessing the internet and my tablet PC mainly for drafting documents related to my academic staff"*

Some of the respondents reported that their tablet PCs were no longer functioning well so they were using their smartphones more and computers from computer centres. An interview with the IT technician was conducted at UNIVEN. Issues concerning tablet PCs were discussed. 60% of the respondents still have their tablet PCs and they responded this way:

> *"I use my smartphone to download pdfs and use my tablet PC to type"*

Smartphones were being used to download study materials probably because they will be using data when Wi-Fi is not working and when the students do not stay on campus. Smartphones have the disadvantage of a small screen that causes difficulties when reading texts and even when web browsing (Brodkin, 2013). Students tend to use tablet PCs for typing and reading notes. In support of this, one respondent explained this way:

> *"I use my tablet PC for typing and saving my documents. I will then read later on"*

In the light of the above, the study found out that students are making use of their mobile devices to conduct school work.

4.10.2 Students' views on communications with mobile devices

Participants were also asked to explain if they communicate with their lecturers or classmates and how they feel about using mobile devices for communicating with lecturers or classmates.
All the respondents stated that they were communicating using their devices. 40% of the respondents used the blackboard for communication.

> *"We do, we have a page on the UNIVEN called blackboard so we communicate with our lecturers there. It is so convenient"*

However, 60% of the respondents said they do not know about the Blackboard and how they can make use of it. These respondents however pointed out that they use social network platforms for communication. They have groups where they communicate as a class.

> *"We communicate with the lecturers and classmates. We do have groups for the whole class and subgroups of 10. We post information then we meet and discuss"*

In addition, another respondend said:

"Communication is effective. There are times when the lecturer cancels the class, the lecturer will inform us on groups which saves time"

The above statement shows that communication using smartphones and tablet PCs is cheaper and faster. Mobile devices increase student access to educationally relevant content and enable communication with teachers and peers through online tools and resources for 24/7 learning (Fritschi and Wolf, 2012).

4.10.3 Students' views on Applications and Convenience of mobile learning

Using a tablet PC/smartphone for information seeking or learning maybe difficult for other students who might find it difficult to use mobile applications for learning, Internet searching. 80% indicated that they got training on how to search information online and how to use the University databases. All the respondents indicated that it is easy to use mobile devices for learning as they can access information anywhere anytime.

"Tablet PCs came with Microsoft office and for other applications we search online. It is easy using mobile devices because we can log in to the University databases and search for information. We got training when we were in our first year on a module called introduction to computer literacy"

In light of the above, the study found out that those students who had done computer literacy modules during their first and second year, have an upper hand when it comes to using mobile devices for learning. It is a good thing that the tablet PCs have Microsoft office applications installed already and these applications are the most used ones by students for typing assignments.

"I got training first year to search information at the library. I am only aware of Microsoft office applications and no idea about the dashboard. It is easy and effective to use mobile devices because they are mobile which means accessing information wherever you are"

From the above, it can be seen that library computer training is very useful in educating students about how to search information. The group of students which does not know about the dashboard, are to a greater extent those whose lecturers do not use it to communicate with them in support of the computer training. One of the respondents said:

"We attended training as a class in third year on how to search information. Using the

mobile devices is easy and convenient when the Wi-Fi is working, especially with the tablet PC"

An understanding was reached with the respondents that Wi-Fi is a necessity when it comes to tablet PCs' use. There are issues with tablets in terms of regularity in the sense that some are not like regular phones which have sim cards and other added functions, (Baran 2014). The distributed tablet PCs do not use sim cards which means they work with Wi-Fi in order to access the internet.

4.10.4 Study time management

Participants were asked to explain if they were able to manage their study time effectively and complete their work on time using mobile devices. All the respondents mentioned that it is not easy to manage study time because of the social networks. They said that social networks were a big distraction to their learning but were trying their best to put their school work first and complete their assignments on time.

"Social networks always come as a distraction but knowing how to prioritise helps in time management"

In support of the above, another respondend said:

"It is difficult to fully concentrate because whilst doing assignments, notifications and texts may come and your attention will be divided but we try our best to manage"

Social networks take a lot of time for students. Mobile devices such as Tablet PCs and smartphones are one of the essential tools which can be used as a platform for social networking at the University. It is crucial to convert the social networking platforms into edu-networking platforms so that students can edu-network using these tool as there is Wi-Fi on campus.

4.10.5 Importance of mobile devices

On the question about the importance of mobile devices, participants identified the importance of mobile devices in their learning lifecycle. All the respondents stated that mobile devices are very important. They indicated that it is easy to use smartphones and tablet PCs in terms of mobility (60%) whereby they can travel with them anywhere.

"Some students come from far and would not want to travel with laptops so by using

smartphones and tablet PCs, it will be portable"

One of the respondents said:

> *"Most of the work we do is on softcopy, communicating with the lecturer usually is by email and Blackboard"*

The above response shows that education is moving with the times. Most lecturers are using softcopy notes and they send attachments to their students.

Assignments are being submitted as soft copy although some still require hard copies. 80% of the respondents mentioned that they were using their mobile devices to do their work at home rather than using computers at the computer centres to do the work.

> *"They are good. They help because most lecturers do not accept handwritten assignments, so with the devices especially tablet PCs, we can work from home and submit than look for a computer lab to type that assignment during school days"*

This indicates that smartphones and tablet PCs are crucial in a student learning cycle.

4.10.6 Perceptions of mobile learning in education

Respondents gave their perspectives on the effectiveness of tablet Pcs and smartphones in their learning. All the respondents expressed their gratitude to the University for the distribution of tablet PCs to the students and the Wi-Fi on campus. 80% of the respondents complemented the University for encouraging mobile learning.

> *"The University is doing a great job towards mobile learning. Many students are coming from disadvantaged backgrounds that they cannot afford these devices yet they are very important"*

In addition, one of the respondents had this to say:

> *"I think we are going somewhere technologically, I support mobile learning and with the Wi-Fi around campus, learning is now very comfortable. We should move on with the times. This is the modern times so mobile devices in class is a good thing"*

Mokoena (2012) states that the advances in mobile technologies brought additional opportunities in the era of mobile learning, which makes it possible and not difficult to enrich the learning

experiences of students.

4.10.7 Tablet PC as a leaning tool

A question was asked on whether the University should keep distributing tablet PCs to students. All the respondents explained that the University should keep distributing the tablet PCs as they are helping many students who could not afford these devices yet they are needed in the learning experience. All the respondents recommended that the University should keep distributing tablet PCs. The advent of a global economy and advancement in technology are major key drivers towards the transformation of the South African education sector (Mokoena, 2012). It is therefore good that UNIVEN is moving with the technology. Students can use their smartphones but typing the assignments on the small screens would be difficult. Screens of the mobile devices, or their use by students with disabilities is a potential drawback (Basset and Kelly, 2013).

4.11 IT TECHNICIAN

To get insights on the reasons why some students no longer have their tablets PCs, an interview with an IT technician was conducted. Below is the analysis of data collected from the IT technician.

4.11.1 Tablet PC assistance

The technician was asked whether he was helping UNIVEN students with tablets PC on a daily basis. The respondent agreed that he was assisting students with different tablet PC problems daily.

> *"I come to work to help student with tablet PCs' issues"*

From the above, it can be seen that the University is playing a big role in promoting mobile learning. The tablets PCs have one year guarantee so the students are getting help from IT technicians if they are facing difficulties with their tablet PCs.

4.11.2 Number of returned tablet PCs

The IT technician was asked how many tablet PCs the IT desk receives per day. He respondend that there were approximately 15 tablets that students brought to their attention.

> "*The problems have been arising since the day we started distributing. We receive about 15 tablet PCs per day"*

Tablet PCs were distributed again in October 2016 to the first year students. They were distributed October 2016. The above statement shows that some students are failing to manage their devices. This might be due to the fact that they have never used such devices so maintaining them is difficult. It might also be because of poor quality of the tablet PCs.

4.11.3 Tablet PCs' Problems

The technician was also asked the kind of problems the distributed tablet PCs were having. He sited common problems which they are facing on a daily basis.

> "*There are common problems with the tablet PCs. The first one is the tablets not switching on. Students use it until the battery dies. When the students try to charge it, it will not show that it is switching on. The second one is the issue of when the keyboard does not connect with the upper screen. The third one is the touch screen. There are cases we find out that the touch screen function of most tablets is not functioning.*"

From the above, it can be seen that students need to be educated on how to use their tablet PCs to avoid issues such as using them till the battery dies as this will make them not to switch on after being charged. If students are educated on using these tablet PCs, there will be a decreased number of tablet PCs with faults.

4.11.4 Fixing Tablet PCs' Problems

The technician answered the question of whether they were able to fix all the tablet PCs issues as IT technicians. The respondent had this to say:

> *"Most of them but for the other ones which needs us to open the whole device, we contact the supplier and give them the number of tablets with faults. They will either come pick them up or fix them here. The suppliers will bring back the ones they manage to fix."*

It is clear that the University is moving towards mobile learning. Interaction with the respondent led to the understanding that the tablet PCs have one year guarantee. Students can get assistance even after the one year guarantee. The IT technicians still assist students with tablet PCs' problems.

4.12 SUMMARY

This chapter presented findings on the use of digital mobile devices in teaching and learning at the UNIVEN. The major findings from the study indicated that students and lecturers consider mobile devices as useful tools for teaching and learning. It was also revealed that mobile devices improve communication between lecturers and students, which meant that the environment where they are useful for learning is not in the classroom only, but both in and out of classroom. These major findings supported the main objectives of study which establishes that mobile devices' use enhance teaching and learning at UNIVEN. The findings clearly showed that mobile devices have a positive impact on the academic experience. The results also indicate that there is a gradual acceptance of the LMS by both academics and students if training on its usage is given to academics and students respectively.. The next chapter provides a brief summary on discussions on the major findings, objectives of the study and recommendations for future research.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter revisits the research objectives to assess if they were accomplished or not based on the findings and results of the study. Recommendations for future research are also presented in this chapter. The results presented in chapter 4 enabled the researcher to draw conclusions on the data which was collected quantitatively and qualitatively. This chapter makes conclusions for this study and recommendations for future studies. This chapter is organized into four sections namely; 1) discussion and summary of findings, 2) conclusions, 3) recommendations and 4) limitations of the study.

5.2 DISCUSSION AND SUMMARY OF FINDINGS

The aim of this study was to investigate the potential use of digital mobile devices in teaching and learning at UNIVEN. The study assessed the level of mobile devices' usage on teaching and learning at UNIVEN. It also explored University students and lecturers' perceptions on the motivation and usefulness of the mobile devices in their educational experience. Lastly, the study determined how mobile devices can be effectively used for teaching and learning at UNIVEN. Quantitative and qualitative methods were utilized in this study in order to extract comprehensive data that could thoroughly answer all research questions as discussed below.

Research Question 1: What is the level of mobile devices' usage at UNIVEN?

The quantitative results of this study found that students were using their mobile devices to perform a variety of educational tasks. Students are using their mobile devices to access course materials and information via the Internet. Students were performing similar activities outside the classroom, but are also using devices as study tools and downloading applications to learn concepts related to current courses they are taking or other subjects they are interested in. This could be attributed to the availability of WiFi on campus. The results showed that prior knowledge of internet and mobile devices use is a necessary requirement for mobile learning. It was shown that many students are active and spending much time on the different internet activities. They are using social media to advance their studies. They create discussion groups where they post information and get help from other students and from the lecturers. Using mobile devices to communicate would enable students to be more comfortable to ask for help.

The qualitative findings agree with the quantitative results as the majority of interviewees agreed to be using their mobile devices for educational purposes. Both students and lecturers are finding it easy to communicate via social media platforms where educational materials are exchanged using their smartphones and tablet PCs. Although the use of LMS (Blackboard) is still at its infancy, there is also some evidence that some students and lecturers are using it for teaching and learning, thus there is student-lecturer work collaboration by posting lectures, assignments and effectively managing course administration. The study also showed that some students are no longer in possession of their tablet PCs which they were given in 2015 because the tablet PCs were no longer working. The IT technician explained that from the 2015 distributed tablet PCs, about 15 tablet PCs were being returned per day due to technical faults on the tablets (not switching on, keyboard not connecting to the monitor and touch screen not working). He explained that some of these problems are caused by students who lack basic training on how to use tablet PCs. To be abreast with the use of mobile technologies, students require basic training.

The findings of this study concur with findings of a study done by (Fritschi and Wolf, 2012; Long et al., 2013) on tertiary students in America and Africa.. Tablets are a major distribution channel for educational content suppliers competing in Africa. In October 2012, Microsoft announced an agreement with the Kenyan government and Indigo Telecom to supply 2,000 tablets preloaded with educational content to rural Kenyan schools. In the South African context, the government also supports the findings of this research by having educational projects aimed at increasing student access to educationally relevant content and enable communication with teachers and peers through online tools and resources for 24/7 learning.

Research Question 2: What are the perceptions of University students and lecturers on mobile devices as tools for teaching and learning?

The quantitative results indicated that students are getting much help from the utilasation of their mobile technologies. Accessing school related materials and easily viewing course materials have contributed mainly to students believing that they should use mobile devices in and out of the classroom, for example, recording lectures and listening to them. However, few students reported that they do not want mobile devices in class and that they prefer traditional learning methods due to the potential that mobile devices could be a source of distraction. To support this fear, the results showed that some students visit social networks in class, which leads to divided attention. The results also indicated that students' participation inside and outside the classroom would

increase if students are using mobile devices.. The results further revealed that students would be more engaged in class discussions inside the classroom if using mobile devices. They would be more engaged both inside and outside the classroom posting responses and comments on the given school work via social media media platforms. Students also indicated that use of mobile devices would allow them to spend more time on classwork and that they would be more likely to ask for help if they could communicate through their mobile devices.

In agreement with the quantitative results, the dominant group of participants expressed that they would be able to incorporate mobile learning through Blackboard if training is offered. From the interviews, most interviewees recommended that the University should keep distributing tablet PCs to enhance learning expierence. Most of the interviewees reported that they would not afford mobile devices due to their disadvantaged financial backgrounds. Majority of lecturers indicated that they would want their students to use mobile devices to enhance study activities. Lecturers further stated that they would keep encouraging students to make use of their mobile devices for school work as their use can be extended beyond communication.

The results also indicated that there were some students who do not want mobile learning. This may be due to lack of knowledge about the capabilities of mobile devices or lack of experience in using mobile devices “productively.” The findings established that the lecturers would like to encourage their students to use their mobile devices in class under their supervision. Lecturers would also like to encourage students to record them when they are lecturing and to take photos of slides presentations whenever necessary.

The above results agree with findings from a study done by (Jantjies and Joy, 2015) in South Africa on mobile learning. It was revealed that all 90 learners believe that mobile learning resources would effectively support them in the learning process. It can be argued that using mobile devices in class will increase chances of students using social networks for non study purposes. Students’ exposure to risk environments of having inappropriate materials, and to hostile behaviors such as negative sexual activities, cyber bullying, or potential cheating during school’s examinations are some drawbacks towards the adoption of mobile learning (Adkins, 2013). However, with adequate and proper knowledge of the utilisation of mobile devices, teaching and learning can be enhanced.

Research Question 3: How can mobile devices be effectively used for teaching and learning at UNIVEN?

It was found that, without being prompted by instructors, students have sought out applications that help them learn course content, study or acquire other non-course related knowledge. Students have also used their devices to access course materials and organize educational tasks. Although students were currently performing educational tasks informally, the data reveals that students need to be educated more on how to properly use their tablet PCs and smartphones for learning which would be beneficial and effortless. Therefore, recommendations were given on how best can mobile devices be used to enhance teaching and learning.

The qualitative results agree with the quantitative results. They show that there were some students and lecturers who do not want mobile learning. This may be due to lack of knowledge about the capabilities of mobile devices or lack of experience with students using mobile devices "productively." Mobile devices can be effectively used for teaching and learning by effective awareness programs where students and lecturers will be taught on how to use the learning management systems such as Blackboard, as it comprises of many functions which are beneficial and relevant to the academic experience. Such training will shade light on the benefits of mobile devices in education.

These results agree with the results from a study done by (Roberts and Vanska, 2011) in South Africa on ways of effectively using mobile devices to enhance teaching and learning, which established that some students and lecturers resist to adopt mobile learning. A mobile learning project for mathematics called MoMath was designed to help students. Findings of this project indicate that learners who used MoMath frequently improved in their studies and they developed a positive attitude towards mathematics than those who did not use MoMath service. Another mobile application called PSU mobile was developed so that students can easily access the educational content on the portal (Tsinakos and Ally, 2013). Therefore, applications to use and other ways to enhance teaching and learning were recommended.

5.3 RECOMMENDATIONS

Based on the results of this study, the following recommendations to management, lecturers, students and further studies are offered to support the effective use of mobile technology in learning:

5.3.1 Recommendations to the Management

i. Inorder to reduce the number of tablet PCs which are taken to the IT officies for repair per day, it is recommended that the management do more background check on the brand of the devices so that they can purchase quality tablet PCs as students use them intensively.

ii. Training on mobile technologies' use is highly recommended.
   a. Students should have one or two days training on how to use mobile devices for learning before being given tablet PCs.
   b. Both students and lecturers should have training on how to use the learning management system, i.e. Blackboard. From the study, it was found that the use of Blackboard is more of an individual choice than an obligation because many academics do not know about its existence.
   c. The IT technicians should be people who have knowledge on the technical functions of tablet PCs on offer to students.

iii. Modern learning is now based on mobile technologies, it is recommended that the University management should persue distributing tablet PCs to students to enhance teaching and learning.

iv. It is recommended that the management make updates on the University website and learning management system that allows compatibility of content viewing via mobile devices. This will assist students to view updates anywhere anytime when they have internet access.

v. It is recommended that a resource page be developed on the University website with recommendations for mobile applications that may be applicable to students and lecturers.

vi. There should be collaboration between the University and the computer science department, business information systems department and outside service providers that can develop course-specific mobile applications that could be used for general education courses.

5.3.2 Recommendations to Lecturers

i. From the study, it was found that some students do not use their mobile devices in class. It is recommended that lecturers should encourage their students to use their mobile devices for school work such as recording lectures and taking pictures of important information.

ii. It is through mutual conversation that one comes to a shared understanding of an issue or topic. Lecturers are recommended to use different mobile platforms to communicate with their students so that students feel comfortable to ask any school related question and get help. The use of email, social networks can assist in this regard.

iii. From the study, it was observed that recording lectures helps in understanding the module. It is therefore recommended that lecturers should allow students to use their mobile devices in class and not see the devices as hindrances to education.

iv. Lecturers should attend training on the capabilities of mobile technology and its potential use in and outside of the classroom including applications that are available that is the blackboard. The Blackboard is a great teaching platform where the course outlines, assignments, topics and test dates are shown. It will improve mobile learning if training programmes are developed so that all lecturers have the necessary knowledge of using the blackboard.

5.3.3 Recommendations to Students

i. It is recommended that students should view their mobile devices beyond just communication tools but mostly for learning.

ii. Due to portability of theses gadgets, it is recommended that students should bring their mobile devices to classes and use them accordingly than use them out of classes only.

iii. Conversation theory describes learning in terms of communication with teachers, as well as with other students. Students should communicate with their lecturers and peers using their devices to get more understanding of the module or topic.

5.3.4 Recommendations for further studies

Future research may want to include multiple institutions. Furthermore, future research should develop mobile learning theory as it relates to current technology and best practices so that mobile learning may be able to acquire its own identity separate from e-learning. New studies could focus on the capabilities of newer technology and the investigation of how the use of a personal mobile device could affect learning. In collaboration with researchers from other fields, future researchers may also want to develop a program that could enable instructors to easily develop content specific applications without software development knowledge. It would also be beneficial for future researchers to analyze how the use of specific mobile applications could be used in a classroom or could be used by students and faculty to promote informal learning.

5.4 LIMITATIONS OF THE STUDY

One of the limitations of the study was that it only focused on undergraduate students from second years and excluded PhD students. The study was also limited in that it was done at one rural University. The study focused only on two mobile devices, tablet PC and smartphone. Other mobile devices could have been included such as PDAs, iPads but the researcher chose to focus on tablet PC and smartphone.

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5.5 CONCLUSION

The study focused on the use of digital mobile devices in teaching and learning. Digital mobile devices are mostly used by students and teachers as communication and multimedia access tools (i.e. accessing multimedia resources such as e-books, databases, web pages, PowerPoint presentations). The widespread use of mobile devices as a communication tool is intuitively reasonable since these devices were originally designed and created for people to exchange information with one another. The reviewed literature showed that learners' interaction with technology on a daily basis is rapidly increasing as learners are well aware of the evolution of technology. The data gathered using mixed methods was sufficient to answer all three research questions. This study helped to identify the current use and perceptions of mobile learning at UNIVEN. Current uses of mobile devices have been considered.

Perceptions of students and lecturers were discussed. It was shown that students and lecturers accepted mobile devices as tools for teaching and learning and that the use of mobile devices is improving their educational experiences. Some students only have vague knowledge of how mobile devices can support learning. They simply perceive the tablet PC as an electronic version of their text books, convenient for chatting with their peers and for looking up information on the internet. In conclusion, a conducive platform for mobile learning at UNIVEN such as training for both students and lecturers should have been put in place before issuing tablet PCs. The IT technicians might have not been able to repair tablet PCs as they lack technical knowledge on how to maintain and repair such gadgets. Students and lecturers should have been informed about the incorporation of mobile learning before being given the devices. This could have helped them to know that the tablet PCs were there for educational purposes. Therefore, recommendations on using mobile devices for teaching and learning were given. Limitations of the study were reported on b areas of future research were also emphasized.

REFERENCES

Adkins, S. (2013). "*The Global Mobile Learning Market is in a Boom Phase: Consumers and Academic Buyers Dominate the Market",* Ambient Insight Premium Report. Retrieved September 17, 2015, from http://www.ambientinsight.com/resources/documents/Ambient-insight-2012-2017-worldwide-mobile-learning-market-executive-overview.pdf

Adkins, S. (2015). Mobile learning market. Ambient Insight's 2014-2019 China Mobile Learning Market. Retrieved January 03, 2017, from http://www.ambientinsight.com/Resources/Documents/AmbientInsight-2014-2019-China-Mobile-Learning-Market-Abstract.pdf.

Ally, M. & Prieto-Blázquez, J. (2014). What is the future of mobile learning in education? Mobile Learning Applications in Higher Education [Special Section]. Revista de Universidad y Sociedad del Conocimiento (RUSC). Vol. 11, No 1. pp. 142-151. doi. Retrieved September 17, 2015, from http://doi.dx.org/10.7238/rusc.v11i1.2033

Ally, M., & Palalas, A. (2011). State of mobile learning in Canada and future directions. *Athabasca University*, 3-52. Retrieved March 20, 2016, from http://s3.amazonaws.com/zanran_storage/www.rogersbizresources.com/ContentPages/2543269200.pdf

Ayala Foundation. (2011). Text2Teach goes nationwide, 15 August 2011. Retrieved September 17, 2015, from http://www.ayalafoundation.org/news.php?i=102

Baran, E. (2014). A Review of Research on Mobile Learning in Teacher Education. *Educational Technology & Society*, 17 (4), 17–32.

Bassett, M., & Kelly, O. (2013). Mobile realities and dreams: Are students and teachers dreaming alone or together?. ASCILITE. Retrieved September 17, 2015, from http://www.ascilite.org/conferences/sydney13/program/papers/Bassett.pdf

Bhalla, M. R., & Bhalla, A.V. (2010). Generations of Mobile Wireless Technology: A Survey. International Journal of Computer Applications (0975 – 8887), *Vol 5, No.4*.

Broadkin, J. (2013). IBM Watson on smartphones to make customer service bots less annoying. Retrieved September 17, 2015, from http://arstechnica.com/information-technology/2013/05/ibm-

watson-on-smartphones-to-make-customer-service-bots-less-annoying/

Bryman, A. & Bell, E. (2014). *Research Methodology: Business and Management Contexts*. Cape Town: Oxford University Press.

Brynard, P.A. & Hanekom, S.X. (2006). Introduction to research in management-related fields. 2nd ed. Pretoria: Van Schaick.

Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. John Wiley & Sons.

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

Cohen, B. (2012). The Effects of Excessive Cell Phone Use eHow Contributor. *Consumers and Academic Buyers Dominate the Market",* Ambient Insight Premium Report. Retrieved October 05, 2015, from http://www.ehow.com/list_6073511_effects-excessive-cell-phone-use.html

Creswell, J.W. (2013). Research design: *Qualitative, quantitative, and mixed methods approaches.* 4th Edition. Sage publications.

Department of higher education and training (2008). *Green paper for basic school education and training*. Pretoria, Government Printers. Retrieved October 05, 2015, from http://www.saqa.org.za/docs/papers/2012/greenpaper.pdf

El-Hussein, M. O. M., & Cronje, J. C. (2010). Defining Mobile Learning in the Higher Education Landscape. *Educational Technology & Society*, 13 (3), 12–21.

Ellis, T. J., & Levy, Y. (2008). Framework of problem-based research: A guide for novice researchers on the development of a research-worthy problem. *Informing Science: International Journal of an Emerging Transdiscipline*, *11*, 17-33.

Elzarka, S. (2012). Technology Use in Higher Education Instruction. *CGU Theses & Dissertations.* Paper 39. Retrieved October 05, 2015, from http://scholarship.claremont.edu/cgi/viewcontent.cgi?article=1039&context=cgu_etd

Ericsson. (2013). *Ericsson mobility report: On the pulse of the networked society.* Retrieved June

24, 2016, from http://www.ericsson.com/res/docs/2013/ericsson-mobility-report-june-2013.pdf

Escolar. (2011). El MEC pretende evaluar a los alumnos a través de celulares, Escolar, Ultimahora.com, Jan 14, 2011. Retrieved October 30, 2015, from http://www.ultimahora.com/notas/394740-El-MEC-pretende-evaluar-a-losalumnos-a-traves-de-celulares

Etoekleous, N. & Ktoridou, D. (2009). Investigating Mobile Devices Integration in Higher Education in Cyprus: *Faculty Perspective. Frederick University Cyprus, School of Education, Nicosia, Cyprus and University of Nicosia, School of Business, Nicosia, Cyprus.* (online). 3(1) 38-40. Retrieved August 24, 2015, from http:// www.i-jim.org.

Evans-Cowley, J. (2010). Planning in the Real-Time City: The Future of Mobile Technology. *Journal of Planning Literature, 25*(2), 136-149.

Fritschi, J & Wolf, M.A. (2012). Turning on Mobile Learning in North America: Illustrative Initiatives and Policy Implications, by the United Nations Educational, Scientific and Cultural Organization 7, place de Fontenoy, 75352 Paris 07 SP, UNESCO 2012, France. Retrieved August 24, 2015, from http://www.unesco.org/new/en/unesco/themes/icts/m4ed/mobile-learning-resources/unescomobilelearningseries/

Fullan, M. (2014). *Leading in a culture of change personal action guide and workbook*. John Wiley & Sons.

Hanson, J. (2016). *The Social Media Revolution: An Economic Encyclopedia of Friending, Following, Texting, and Connecting: An Economic Encyclopedia of Friending, Following, Texting, and Connecting*. ABC-CLIO.

Hlagala, A.R. (2015). Mobile educational technologies currently used as a means to enhance teaching and learning in a privileged high school. MTech. Retrieved October 10, 2016, from http://uir.unisa.ac.za/bitstream/handle/10500/19206/dissertation_Hlagala_AR.pdf?sequence=1

Houghton Mifflin Harcourt. (2012). Houghton Mifflin Harcourt and SK Telecom Partner to Create Education Platform for Korean and Global Markets. PRESS RELEASES, Boston, May 31, 2016. Retrieved September 17, 2015, from http://www.hmhco.com/content/houghton-mifflin-harcourtand-sk-telecom-partner-create-education-platform-korean-and-global.

Huff, A. S., Milliken, F. J., Hodgkinson, G. P., Galavan, R. J., & Sund, K. J. (2016). A Conversation on Uncertainty in Managerial and Organizational Cognition. In *Uncertainty and Strategic Decision Making*. Emerald Group Publishing Limited.

Hylén, J. (2012). Turning on Mobile Learning in Europe. Illustrative Initiatives and Policy Implications, by the United Nations Educational, Scientific and Cultural Organization 7, place de Fontenoy, 75352 Paris 07 SP, UNESCO 39 2012, France, ISSN 2227-5029. Retrieved August 10, 2015, from http://unesdoc.unesco.org/images/0021/002161/216165E.pdf

Jantjies, M., & Joy, M. (2015). Mobile enhanced learning in a South African context. *Journal of Educational Technology & Society*, (Vol 18(1), 308-320.

Johnson, L., Adams Becker, S., Cummins, M., Estrada, V., Freeman, A., & Ludgate, H. (2013). *NMC horizon report: 2013 higher education edition*. Austin, TX: The New Media Consortium.

Johnson, L., Brown, M., & Becker, S. (2013). The NMC horizon report: 2013 higher education edition. Austin, Texas: The New Media Consortium.

Kafyulilo, A. (2014). Access, use and perceptions of teachers and students towards mobile phones as a tool for teaching and learning in Tanzania. Education and Information Technologies March 2014, Volume 19(1), 115–127.

Kearney, M., & Maher, D. (2013). Mobile learning in math teacher education: Using iPads to support pre-service teachers' professional development. *Australian Educational Computing,* 27(3), 76–84.

Kharabsheh, P. A. (2013). ICIE2013- international conference on innovation and entrepreneurship: ICIE 2013. Academic conferences limited.

Komado, K. (2013). 10 smartphone must have features. USA today. Retrieved January 30, 2017 from http://www.usatoday.com/story/tech/columnist/komando/2013/12/13/smartphone-battery-processing-display-camera/3921399/

Kothari, C. R., (2007), *Research Methodology: Methods and Techniques***,** New Delhi: New Age International.

Krejcie, R.V., & Morgan, D.W. (1970). Determining the Sample Size for Research Activities. *Educational Psychological Measurements* (online). 30(1). 607-610. Retrieved June 15, 2015, from http://opa.uprrp.edu/InvinsDocs/KrejcieandMorgan.pdf.

Kumar, R. (2010). *Research methodology: a step by step guide for beginners*. 3nd ed. London: Sage publishers.

Lee, J. H. (2016). Future of the smartphone for patients and healthcare providers. *Healthcare informatics research*, *22*(1), 1-2.

Lewin, C., Savage, J., Haldane, M. and Whitton, N. (2011). The Knowledge Map: Innovative Classroom Practice with Digital Technologies. iTEC Project Evaluation Plan, Deliverable D5.1. February 2011. Brussels, European Schoolnet. Library Technology Reports (9). Retrieved October 18, 2015 from http://web.ebscohost.com.ezproxy.stockton.edu:2048/ehost/pdfviewer/pdfviewer?sid=78fc5fe4-4a07-4ff9-a11cc7516f6087c5%40sessionmgr115&vid=4&hid=127

Lipscomb, T.J. Totten, J.W. Cook, R.A. and Lesch, W. (2005). Cellular Phone Etiquette Among College Students. *International journal of consumer studies* (online), Summer: 46- 56. Retrieved June 12, 2015, from http://search.ebscohost.com

Long, T., Liang, W., & Yu, S. (2013). A study of the tablet computer's application in K-12 schools in China. *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* 9(3), 61-70.

Long, V. (2010). "A theoretical extension of the technology acceptance model: four longitudinal field studies", Management Science. 46 (2). 186-204.

Looi, C., Sun, D., Seow, P., & Chia, G. (2014). Enacting a technology-based science curriculum across a grade level: The journey of teachers' appropriation. *Computers & Education,* 71, 222–236.

Lyonette, C., Atfield, G., Behle, H. & Gambin, L. (2015). Tracking student mothers' higher education participation and early career outcomes over time: initial choices and aspirations, HE experiences and career destinations. Institute for Employment Research University of Warwick Coventry, CV4 7AL.

Maree, K. (ed). (2012). Complete your thesis or dissertation successfully: practical guidelines. Claremont: Juta.

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education, 68*(1), 76–85.

Mayisela, T. (2013). The potential use of mobile technology: enhancing accessibility and communication in a blended learning course. *South African Journal of Education*, *33*(1), 1-18.

MELaS. (2012). Mobiles Enhancing Learning and Support (MELaS). Retrieved November 15, 2015, from http://www.wlv.ac.uk/default.aspx?page=15227

Merchant, G. (2012). Mobile practices in everyday life: Popular digital technologies and schooling revisited. *British Journal of Educational Technology, 43*(5), 770-782.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.

Miller, W. (2012). iTeaching and learning. *Library Technology Reports*, *48*(8), 54.

Mokoena, S. (2012). *Smartphones and regular cellular phones: assessing their impact on students' education at the University of Zululand* (Doctoral dissertation, University of Zululand). Retrieved August 02, 2015 from http://uzspace.uzulu.ac.za/bitstream/handle/10530/1049/SMARTPHONES%20AND%20REGULAR%20CELLULAR%20PHONES.pdf?sequence=4

Mouton, J. & Marais, H. C. (2001), *Basic Concepts in Methodology of the Social Sciences,* Pretoria: Human Sciences Research Council.

Nagel, D. (2013). 6 Technology Challenges Facing Education. The Journal. Retrieved November 30, 2016, from https://thejournal.com/articles/2013/06/04/6-technology-challenges-facing-education.aspx

Nendila. (2015, April). *Newsletter of the University of Venda*, p.1.

Nosrati, M., Karimi, R., & Hasanvand, A.H. (2012). Mobile Computing: Principles, Devices and Operating Systems. World Applied Programming, Vol (2), Issue (7), July 20, 2016. 399-408. waprogramming.com/download.php?download=50af86017bbd71.70174069.pdf

Padgett, D. K. (2016). *Qualitative methods in social work research.* Vol (36), Sage Publications.

Paul, S. (2005). Long term evolution (lte) & ultra-mobile broadband (umb) technologies for broadband wireless access. Retrieved October 05, 2015, from http://www.cse.wustl.edu/~jain/cse574-08/ftp/lte/

Poon, J. (2013). Blended learning: An institutional approach for enhancing students' learning experiences. *Journal of online learning and teaching*, *9*(2), 271.

Raosoft Sample Size Calculator; Raosoft, Inc.: Seattle, WA, USA, 2004. Retrieved January 20, 2017, from http://www.raosoft.com/samplesize.html

Roberts, N., & Vanska, R. (2011). Challenging assumptions: Mobile learning for mathematics project in South Africa. Distance Education, 32(2), 243-259.

Roberts, N., Rees, M. (2014). Student use of mobile devices in University lectures. *Australasian Journal of Educational Technology, 30*(4), 415-426.6

Saavedra, A. R., & Opfer, V. D. (2012). Learning 21st-century skills requires 21st-century teaching. *Phi Delta Kappan*, *94*(2), 8-13. Retrieved October 05, 2015, from http://journals.sagepub.com/doi/full/10.1177/003172171209400203

SAMEO. (2012). SAMEO Gears up for Greater Online Collaboration, Southeast Asian Ministers of Education Organization. Retrieved October 05, 2015, from http://www.seameo.org/

Sams, A., & Bergmann, J. (2013). Flip your students' learning. *Educational Leadership, 70*(6), 16-20.

Sanders, L., Rodrigues, L., & Li, K. (2016). Enhanced Student Engagement and Culturally Responsive Pedagogy: Innovations in the SAGITTARIUS–ORION–Shaw Literature Digitizing Pilot Project. *Shaw,36*(2), 272-289. doi:10.5325/shaw.36.2.0272

Service, R. W. (2009). Book Review: Corbin, J., & Strauss, A.(2008). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory . Thousand Oaks, CA: Sage. *Organizational Research Methods*, *12*(3), 614-617.

Sevillano-García, M.ª L., & Vázquez-Cano, E. (2015). The Impact of Digital Mobile Devices in Higher Education. *Educational Technology & Society, 18* (1), 106–118.

Sharpe, D. (2015). Your Chi-Square Test is Statistically Significant: Now What? Practical Assessment, Research & Evaluation, 20(8). Retrieved October 30, 2015, from http://pareonline.net/getvn.asp?v=20&n=8

Simon, M. K. (2011). Dissertation and scholarly research: Recipes for success (2011 Ed.). Seattle, WA, Dissertation Success, LLC.

Specout (2016). [Image]. Retrieved July 15, 2016, from http://tablets.specout.com/l/40/Motorola-Xoom-4G

TelecomTiger. (2012). SKTelecom in pact with HMH to jointly promote smart learning, TT Correspondent, June 1, 2012. Retrieved August 31, 2012, from http://www.telecomtiger.com/Corporate_fullstory.aspx?storyid=14463&flag=1&passfrom=topstory&section=S162

Tsinakos, A., & Ally, M. (2013). Global mobile learning implementation and trends. *China Central Radio & TV University Press, Beijing*.

Tustin, D.H. Ligthelm, A.A., Martins, J.H. & Van Wyk, H.D.J. (2010). *Marketing research: in practice*. 1st ed. Pretoria: Business Print.

Wallace, A. (2013, September). Social learning platforms and the flipped classroom. In *e-Learning and e-Technologies in Education (ICEEE), 2013 Second International Conference on* (pp. 198-200). IEEE.

Weirs, R.M. (2011). *Marketing Research*. Englewood Cliffs: Prentice Hall.

Wiid, J & Diggins, C. (2013). *Marketing Research.* 2 ed. Cape Town: Juta and Company Ltd.

Wong, L. H., & Looi, C. K. (2011). What seams do we remove in mobile-assisted seamless learning? A critical review of the literature. *Computers & Education, 57*(4), 2364–2381.

Woodcock, B., Middleton, A. & Nortcliffe, A. (2012) Considering the Smartphone Learner: an investigation into student interest in the use of personal technology to enhance their learning. *Student Engagement and Experience Journal*, 1(1). Retrieved June 10, 2016, from http://research.shu.ac.uk/SEEJ/index.php/seej/article/view/38/Woodcock

Wright, C. R. (2014). 5 key barriers to educational technology adoption in the developing world. 2014 ICT4Edu Trends. Retrieved June 10, 2016, from http://edutechdebate.org/2014-ict4edu-trends/5-key-barriers-to-educational-technology-adoption-in-the-developing-world/

Yin, R.K. (2011). Qualitative research from start to finish. New York: Guilford Press.

Zikmund, W.G. (2011) Business Research Methods, 9th Edition, Thomson, South-Western Australia.

ANNEXTURE A: ESTIMATED BUDGET FOR THE RESEARCH

ITEM	QUANTITY	UNITS	AMOUNT
LANGUAGE EDITING			
Proof reading for proposal	40 pages	25	1000
Proof reading for finished research	200 pages	25	5000
Proof reading subtotal			**6000**
STATIONERY AND CONSUMABLES			
Stapler	1	100	100
Staple pins	1 box	100	100
Pens	10	10	100
Highlighters	5	20	100
Note pads	5	16	80
Memory stick	1	150	150
Digital tape recorder	1	800	800
Events Diary	1	70	70
External hard drive for data storage	1	1000	1000
File for storage of 400 questionnaires	4	100	400
Puncher	1	100	100
Stationery subtotal			**3000**

SUBSISTANCE AND TRAVELLING EXPENSES			
Trip to Monarsh by bus for Benchmarking			600
Trip to Pretoria by bus for Benchmarking			500
Trip to Johannesburg by bus for Benchmarking			500
Trip to NorthWest by bus for Benchmarking			600
Accommodation: Researcher	8 days	500	4000
Subsistence and Travelling subtotal			**6200**
ASSISTANCE			
Data collection with 5 research assistants	15 days	160	12000
Data analysis	400 questionnaires	25	10000
Assistance subtotal			**22000**
BINDING			
Spiral binding	5	100	500
Hard copy binding	6	250	1500
Binding Subtotal			**2000**
PRINTING			
Printing of questionnaires	400 copies of 6 pages	3	7200

Printing of final research	6 copies of 200 pages each	3	3600
Printing subtotal			**10800**
GRANT TOTAL			**50000**

ANNEXTURE B: PROPOSED WORK PLAN FOR THE RESEARCH

Activity	Responsible person	Completed by	Evidence of completion
1. Scanning the business environment for research topic and research area	Student	May 2015	Approved research topic
2. Proposal development	Student	July 2015	Approved proposal for seminar presentation
3.Seminar presentation	Student	September 2015	Approved proposal at seminar presentation
4. Proposal presentation to the school of Management Higher Degrees Board	Student	November 2015	Presented and given corrections
5. Submission of research proposal to the University Higher Degrees Committee (UHDC)	Student	November 2015	Approved research proposal
6. Detailed literature review	Student	March 2016	Completed literature review
7. Data collection	Student	May 2016	Collected data
8. Data analysis and presentation	Student	July 2016	Analysed data
9. Submission of first draft dissertation	Student	September 2016	Draft of dissertation
10. Submission of second draft dissertation	Student	November 2016	Draft of dissertation
11. Proof reading	Qualified proof reader	January 2017	Complete dissertation
12. Submission of final draft dissertation	student	January 2017	Complete dissertation

ANNEXTURE C: ETHICS LETTER

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms R Chikurunhe
Student No: 11613045

PROJECT TITLE: **The use of digital mobile devices in teaching and learning at University of Venda**

PROJECT NO: SMS/16/BMA/01/2804

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Prof A Kadyamatimba	University of Venda	Supervisor
Mr W Munyoka	University of Venda	Co-Supervisor
Dr T Runhare	University of Venda	Investigator - Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: April 2016
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2016 -05- 03
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950λ LIMPOPO PROVINCEλ SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 **FAX** (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

ANNEXTURE D: CONSENT LETTER

I,……., hereby agree to participate in the research study, titled "**The use of Digital Mobile Devices: Tablet PCs in teaching and learning at University of Venda**". By signing this consent form, you indicate that you understand the information provided to you by the researcher regarding the study, your question about the research has been answered to your satisfaction, and you voluntarily agree to participate in this study. A copy of this signed consent form can be provided upon request.

- The study aims to investigate the potential use of Tablet PCs in teaching and learning at the University of Venda.
- The information that the respondents will provide will be solely used for the purpose of the study.
- Participation is voluntary and that I can withdraw anytime without any penalty if I feel like doing so.
- All questionnaire and interview data will be handled with confidentiality
- Participants can refuse to answer certain questions if they feel uncomfortable during the process of collecting data.

I understand that the information I give may not be used for any other purpose except to help the researcher to meet the scholastic expectations. For more information, respondents can contact Prof. A Kadyamatimba, my Supervisor at 082 803 9015 and also at (Armstrong.Kadyamatimba@UNIVEN.ac.za).

…… **……..**
SIGNATURE **DATE**

ANNEXTURE E: STUDENTS QUESTIONNAIRE

University of Venda

TABLET PERSONAL COMPUTER IN LEARNING QUESTIONAAIRE

You are invited to participate in an academic research by Chikurunhe Ratchel, a masters student from the department of business management. The topic is: **The use of digital mobile devices in teaching and learning at a one rural University.**

This questionnaire is to help me collect valuable information on the use of tablet PCs in enhancing learning. Please answer the questions below and provide as much detail as possible. Information obtained will only be used for the purpose of this research.

NB: NO IDENTIFICATION REQUIRED

Your co-operation is appreciated

For Researcher's Use
Questionnaire number Date Start time Finish time

Section A – Biographical Information

Please answer the following questions by putting a cross (×) in the relevant block

1. Gender

- ○ Male
- ○ Female

2. Age

- ○ 15-25
- ○ 26-35
- ○ 36-45
- ○ 46 and above

3. School

- ○ School of Agriculture
- ○ School of Education
- ○ School of Environmental Sciences
- ○ School of Health Sciences
- ○ School of Human and Social Sciences
- ○ School of Mathematical and Natural Sciences
- ○ School of law
- ○ School of Management Sciences

4. Level of Study

- ○ 2nd Year
- ○ 3rd Year
- ○ 4th Year
- ○ Masters

Prior Knowledge

1. I know how to…
check all that apply

- ○ access the internet from my tablet PC/smartphone
- ○ download materials on my tablet PC/smartphone
- ○ download a mobile application on my device
- ○ type notes on my tablet PC/smartphone
- ○ access a social networking site on my tablet PC/smartphone
- ○ send an email on my tablet PC/smartphone
- ○ post a comment to a blog or respond to a post on my tablet PC/smartphone

2. Have you ever…
check all that apply

- ○ Downloaded an application that helped you learn something new?
- ○ Used your tablet PC to look up something you didn't know or didn't understand during class?
- ○ Engaged in social networking on your Tablet PC/smartphone?
- ○ Wrote notes on your tablet PC/smartphone to remind yourself of an assignment?
- ○ Texted a classmate during class?
- ○ Texted a classmate about the content of the class?
- ○ Texted a classmate about the teacher's ability?
- ○ Texted a classmate about the level of engagement in the class (I'm bored, this is cool)
- ○ Taken pictures or video with your tablet PC/smartphone that you used for an assignment/class?
- ○ Read an article or notes on your tablet PC?
- ○ Used your tablet PC/smartphone as a study tool?

Section B – Mobile Learning Usefulness

To what extent do you agree with each of the following statements? Please indicate your answer by placing an (X) in the appropriate column.

SD - Strongly Disagree; D - Disagree; N - Neutral; A - Agree; SA - Strongly Agree

3. Questions	SD	D	N	A	SA
Using a tablet PC/smartphone makes learning fun					
Mobile devices would not be a distraction in the classroom					
Mobile devices improve communication between students					
Mobile devices improve communication between the student and lecturer					
Learning is easy because I'm already familiar with my tablet functions					
I can learn and study in places I couldn't normally learn or study					
It is easier to complete classwork and assignments using my tablet PC/smartphone					
Traditional learning is just as effective as mobile learning					
I use social media to communicate with classmates about course related issues using my tablet PC/smartphone					

4. **Tick the time you spent on these Different Internet Activities per day using mobile devices**

Activities	0-2hrs	2-5hrs	5-8hrs	8+pphrs
Preparing presentations				
Searching for journals and articles				
YouTube				
Preparing assignments				
Reading e-mails				
Social networking				
Collaborative working				

Section C - Perceptions

To what extent do you agree with each of the following statements? Please indicate your answer by placing an (X) in the appropriate column.

5. Student perceptions towards mobile learning	**SD**	**D**	**N**	**A**	**SA**
I would be more likely to participate in class if I could use my mobile devices					
I would spend more time on classwork if I could access materials anytime, anyway on my mobile devices					
I would be more likely to participate in class activities outside of class time if I could do so through my mobile devices					
I would be more likely to engage in class discussions inside class if I could post my thoughts from my tablet PC					
I would be more likely to ask for help if I could communicate through my tablet PC					
I would like to see m-learning incorporated in my classes					
I would like to be able to easily view course materials (notes, assignments) on my tablet PC					
I would like to be able to download mobile applications that could help me study					

Section D – Tablet PC: Capabilities Enhancing Students' Learning

6. How do you want mobile devices to be used in learning?

- ○ Participating on discussion groups on social networking sites
- ○ Receiving course apps (materials and tasks)
- ○ Podcasts
- ○ Recording lectures

Please answer the following questions by putting a cross (×) in the relevant block

7. Questions	YES	NO
Do you use your mobile devices for learning?		
Do you know how to use a mobile devices for information seeking or learning?		
Are you aware of the applications that may be used for learning?		
Do you communicate with your lecturer on social media?		
Do you visit social media sites when in class?		
Are you able to manage your study time effectively using your mobile devices?		
Do you think tablet PCs are worth investing in as a new learning tool?		

Section E - Limitations

8. Which of the following (if any) would deter you from using tablet PC as a learning tool?

Check all that apply

- ○ I cannot download applications (apps) on my mobile devices
- ○ I would have trouble learning on my devices device because of its connection speed
- ○ My tablet PC has technical problems/ is nolonger working
- ○ I do not know how to use my mobile devices for school work
- ○ None of the above

Thank you for your cooperation

ANNEXTURE F: LECTURERS' INTERVIEW GUIDE

Questions

1. Describe your experience as a lecturer when it comes to use of technology in teaching.
2. Do you know about "mobile learning?" Have you ever explored any mobile learning activities?
3. Do you see students using mobile devices in your class? How often? What do you think they are doing with them?
4. How do you feel about smartphones and tablet PCs technology for communication with your students?
5. Do you have any ideas for incorporating mobile learning in the classroom?
6. Are you aware of the applications that may be applicable to your profession?
7. From your own observation, what is your perception of the effectiveness of mobile devices for student learning in education?
8. Do you think tablet PCs are worth investing in as a new learning tool?

ANNEXTURE G: STUDENTS INTERVIEW GUIDE

Questions

1. What do you use your tablet PC/smartphone for in general?
2. How do you feel about using your tablet PC for communicating with your lecturer or classmates?
3. How easy or difficult would you find learning to use a tablet PC/smartphone for information seeking or learning? For example, learning how to use mobile applications for learning, Internet searching, or other uses you might have?
4. Do you feel you are able to manage your study time effectively and easily complete assignments on time?
5. What is the importance of mobile devices in your learning lifecycle?
6. What is your perception of the effectiveness of tablet PCs/ smartphone for your learning?
7. Do you think tablet PCs are worth investing in as a new learning tool?

ANNEXTURE H: IT TECHNICIAN INTERVIEW GUIDE

Questions

1. Are you helping UNIVEN students with tablets PC daily?
2. How many tablet PCs do you receive per day?
3. What kind of problems are the tablet PCs having?
4. Are you able to fix all the tablet PCs issues students are bringing?

ANNEXTURE I: PROOF READING LETTER

16 February 2017

TO WHOM IT MAY CONCERN

RE:EDITING OF MS RATCHEL CHIKURUNHE's MASTERS DISSERTATION (STUDENT NUMBER 11613045)

This letter serves to confirm that I have edited **Ms RATCHEL CHIKURUNHE'S MASTERS DISSERTATION** whose title is **"THE USE OF DIGITAL MOBILE DEVICES IN ENHANCING TEACHING AND LEARNING AT UNIVERSITY OF VENDA"**

My work entailed identifying and correcting grammatical, typographical, formatting and related editorial errors in the document.

I have recommended a number of corrections related to grammar, typographical errors and sentence construction.

Should there be any queries regarding the editorial aspects of the document please do not hesitate to contact me.

Yours sincerely

Dr T. Chari, Lecturer, Department of Communication and Applied Language Studies, University of Venda (BA, DMCS, MA)

Cell: 0838626747

ANNEXTURE J: PLAGARISM REPORT

Chikurunhe Ratchel - The use of Digital Mobile Devices in enhancing teaching and learning at University of Venda.

ORIGINALITY REPORT

%16	%13	%5	%8
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.crtvup.com.cn Internet Source	%2
2	uir.unisa.ac.za Internet Source	%2
3	Submitted to University of Venda Student Paper	%1
4	etd.lsu.edu Internet Source	%1
5	Handbook of Mobile Teaching and Learning, 2015. Publication	%1
6	www.ifets.info Internet Source	<%1
7	www.scielo.org.za Internet Source	<%1
8	www.questia.com Internet Source	<%1