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Influencing rural school teachers' use of mobile devices for teaching and learning

by

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Submitted in partial fulfilment of the requirements for the degree

PHILOSOPHIAE DOCTOR

in the Faculty of Education

at the

UNIVERSITY OF PRETORIA

Supervisor: Prof Linda van Ryneveld

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2022

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Declaration

I, Rannosi Francis Motene, student number 25354052, declare that the thesis**,** which I hereby submit for the degree Doctor of Philosophiae at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution. All sources cited or quoted in this research paper are indicated and acknowledged with a comprehensive list of references.

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Rannosi Francis Motene

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DEGREE AND PROJECT	PhD Influencing rural school teachers' use of mobile devices for teaching and learning
INVESTIGATOR	Mr Rannosi Francis Motene
DEPARTMENT	Science, Mathematics and Technology Education
APPROVAL TO COMMENCE STUDY	19 June 2018
DATE OF CLEARANCE CERTIFICATE	27 May 2021

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This thesis maintained high ethical standards as prescribed and guided by the University rules and regulations. After the participants gave written consent, data was collected electronically and during interviews and is currently stored on a password-protected device. The data can only be accessed with the permission of the Ethics Committee of the Faculty of Education at the University of Pretoria, South Africa.

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Dedication

I dedicate this research to the memory of my late wife Mapula Motene, my father Thomas Pule Makonotle Motene, and grandparents, Dipuo Tryphosa and Ezekiel Dikgopana Rampola.

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Acknowledgements

To have achieved this milestone in my life, I would like to express my sincere gratitude to the following people:

1. My Heavenly Father, who provided me with the strength, knowledge and perseverance to complete this study and for the healing, blessings and wisdom to seek Him during the storm.
2. Prof Linda van Ryneveld and Dr Mari van Wyk, research supervisors, for their invaluable advice, guidance and inspiring motivation during difficult times of the research;
3. Editor, Anetha de Wet;
4. Dr Neo Mothobi and Dr Phumza Makgatho-Khunou for instilling endurance through counsel and motivation;
5. My daughter, Kgaugelo, who had to endure the temporary abandonment to allow me to finish this project;
6. My partner and pillar, Lerato Legodi, for encouraging me even when energy levels were low and challenges prevailed; and
7. My family, my mother, Sishosa Tryphosa Motene, for her unwavering support as a cheer leader and my siblings for their support and encouragement.

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Abstract

The realisation that computers are formidable and adaptable tools that can augment teaching and learning led to governments dedicating funds to the implementation of Information and Communication Technology tools in education. Despite efforts by governments, partners, and other agencies to equip teachers with the necessary skills, several setbacks seemed to have been experienced, leading to ICT infrastructure not being optimally used. The research intended to explore the influence of the teacher professional development workshops and explain the continued use of mobile devices on the teachers' behavioural intent and actual use of mobile devices for teaching and learning.

A single case study design with multiple embedded units of analysis was employed in this study. In the first Unit of Analysis, the Technology Acceptance Model (TAM) was employed to gain insight into the aspects that influenced the teachers' behavioural intent and actual use of mobile devices in class. However, TAM was deemed unsuitable in providing sufficient insight into why only teachers from the observed school implemented and applied the knowledge gained from the workshop they attended, while the teachers from other schools did not. Therefore, the researcher explored various other models and ultimately employed Venkatesh's (2003) Unified Theory of Acceptance and Use of Technology (UTAUT). The research instruments, questionnaires and interviews, provided rich information about teachers' perceptions, attitudes, behavioural intent and actual use of mobile devices in class. The results revealed that teachers who did implement the technology found it both useful and easy to use, irrespective of the status and facilitating conditions, age, gender, or prior experience. Self-initiative and its influence on their attitudes and behavioural intent further determined their actual use of mobile devices in class.

Though lack of adequate mobile devices was seen as a challenge, self-initiative, encouragement and support from management led to an increased motivation to use the mobile devices in the observed school. Learners were actively involved in the learning activities on the mobile devices and collaborated in their use.

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Timely feedback to both learners and parents was another advantage realised when mobile devices were employed in teaching and learning in this school.

This study led to the realisation that continued technical and pedagogical support and having an ICT champion in the school contributed to the successful implementation of mobile devices for teaching and learning. Building and sustaining communities of practice for teachers to share ideas and support one another is also crucial.

Key Terms: educational technology, mobile devices, rural school teachers, TAM, UTAUT

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List of abbreviations and acronyms

DBE	Department of Basic Education
DCDT	The Department of Communications and Digital Technologies
DOT	Digital Opportunity Trust, USA's TeachUp! Program, that harnesses the power of youth and technology to accelerate student learning
DPME	Department of Planning, Monitoring and Evaluation
DTPS	Department of Telecommunications and Postal Services
EE	Effort Expectancy
ETDPSETA	Education, Training and Development Practices Sector Education and Training Authority
FC	Facilitating Conditions
GDE	Gauteng Department of Education
HOD	Head of Department
ICASA	Independent Communications Authority of South Africa
ICT	Information Communication and Technology
ICT4RED	Information Communication and Technology for Rural Education
IT	Information Technology
MMS	Multimedia Messaging Service

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NEPAD	New Partnership for Africa's Development
OERs	Open Educational Resources
PE	Performance Expectancy
PED	Provincial Education Department
PEU	Perceived Ease of Use
PU	Perceived Usefulness
RWD	Responsive Web Design
SI	Social Influence
SMS	Short Messaging Service
SVI	School Visit Interview
SVIF	School Visit Interview Female
SVIM	School Visit Interview Male
SVQ	School Visit Questionnaire
SVQF	School Visit Questionnaire Female
SVQM	School Visit Questionnaire Male
TAM	Technology Acceptance Model
TPD	Teacher Professional Development

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UAE	United Arab Emirates
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USAO	Universal Access and Service Obligations
UTAUT	The Unified Theory of Acceptance and Use of Technology
WI-FI	A family of wireless network protocols, based on the IEEE 802.11 family of standards, which are commonly used for local area networking of devices and Internet access (Chakraborty et al., 2016).

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1. CHAPTER ONE: GENERAL ORIENTATION

1.1 INTRODUCTION

Research has shown that many youths nowadays possess mobile computers or devices (Pimmer & Pachler, 2014; Sharples, 2006). North et al. (2014) acknowledge that access to mobile phones is particularly high for South Africa, whilst Sek et al. (2011) concede that these advanced mobile and wireless technologies have a distinct influence on educational situations. Furthermore, Sánchez-Prieto et al. (2014) admit that the impact of these advanced mobile and wireless technologies creates a need for a methodology targeted towards technology-enhanced learning and specifically mobile learning. Donner (2008, p. 147) indicates that most studies maintain that aspects of "portability, simplicity and affordability" make mobile devices appropriate for education.

1.2 BACKGROUND

Several South Asian, African and Latin American governments are financing specific educational projects that are augmented with information and communications technologies (Akhshabi et al., 2011). According to Jantjies and Joy (2015), handheld devices are becoming increasingly popular as a means of communication on the African continent. Cellular technology can play a crucial role in education, specifically in Africa, because it is a handheld device used for computer functions as well as providing access through the internet to many educational resources. Whilst Key et al. (2017) had predicted that the growth of smartphone ownership was expected to grow, year by year, with an average of 3.1 billion users from 2016 until 2021, O'Dea (2020) indicated that 6.95 billion people around the world use mobile devices in 2020. By 2021, this number is expected to rise to 7.1 billion, and by 2024, it is estimated that mobile users worldwide will reach 7.41 billion (O'Dea, 2020).

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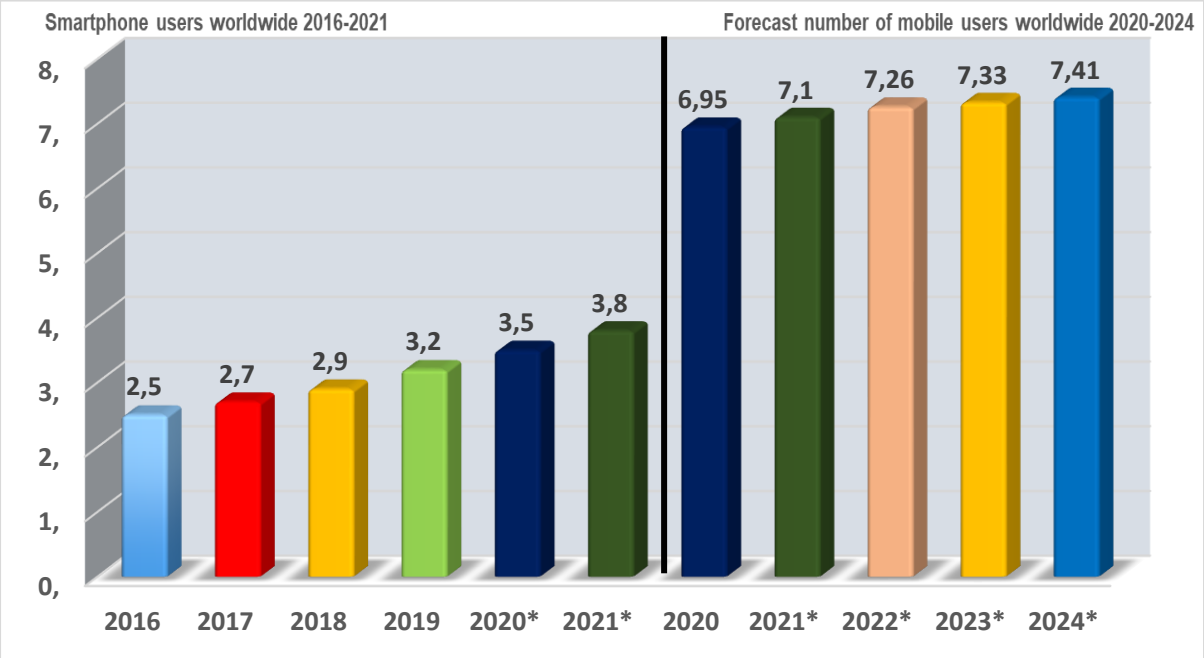
Figure 1.1

Number of worldwide smartphone users in billions



O'Dea (2020)

The published results imply that smartphones are becoming a huge part of people's lives globally, and the number increased more than predicted for 2020 and 2021, since 2016. According to Porter et al. (2016), South Africa's daily life has become increasingly dependent on mobile devices. Shohel and Power (2010) further indicate that, by 2009, students' use of mobile phones was typically not allowed in South African schools, even though most teachers and learners had access to these devices. Nonetheless, Dlodlo et al. (2012) indicate there are many schools that allow learners to use their own mobile devices at school, and many schools have begun implementing policies to facilitate this. In spite of policies coming into place, due to the concerns about their negative effects, mobile phones are still not allowed in many schools (Bere & Rambe, 2016).

In 2011, a Vodacom Mobile education programme (Vodacom, 2014) was launched by local and international ICT companies in partnership with the South African Department of Basic Education (DBE). The project aimed at assisting teachers in accessing resources using mobile technology. The ICT resource centres were created

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in each province, which focused on ICT literacy, effective use of and integration of digital content in the classroom.

The Gauteng Department of Basic Education (GDE) selected 375 schools to participate in “The paperless classroom” project in July 2015. The project entailed the implementation of interactive boards and mobile devices, such as tablets and laptops with complete internet connectivity (Mashile, 2016). However, Porter et al. (2016) posits that research has shown the technologies present in schools are not being optimally used and that the availability of technology infrastructure does not necessarily guarantee implementation in daily practice.

The Department of Basic Education (DBE) in South Africa promised to release a national ICT strategy on e-education during 2015. However, by 2021, the ICT strategy, which intended to guide provinces on the skilful use of ICTs in education and enhance the attainment of learning goals (Mouza & Barrett-Greenly, 2015), has not yet been released. Goal 16 of the Action Plan, which refers to improving “the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire careers” is connected to Goal 27, which refers to improving “the frequency and quality of the monitoring and support services provided to schools by district offices, partly through better use of e-Education” (DBE, 2015, p. 3).

Despite the failure by the South African government to release the ICT strategy, provincial departments have embarked on projects to equip schools with tablets. However, according to Potter and Rockinson-Szapkiw (2007), teachers are poorly trained to utilise the infrastructure and technology equipment given to their schools by the government and donors. Hennessy (2010) confirms that the lack of ICT implementation in African schools is mainly due to poorly trained teachers. The study by Ma et al. (2005) found learners in public schools always have their mobile devices with them. Therefore, De Kock and Futcher (2016) suggested looking at devices owned by learners, like mobile phones and tablets, and taking advantage of their existence in schools.

Studies relating to the teachers' professional development in the use of ICT, including mobile devices, are scarce, as noted by Ekanayake and Wishart (2015). Sánchez-

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Prieto et al. (2014) submit that whilst there are examples of positive educational practices involving mobile devices, they nevertheless regard them as “isolated experiences” or those that have less than expected influence.

The integration of new technologies mandates a change in the professional development of teachers’ content knowledge, practices, and attitudes (Vodacom, 2014). Likewise, Ekanayake and Wishart (2015) believe that teachers’ ability to use ICTs, is a solid foundation for their use in the classroom. This view raises concern on how teachers can be assisted to experience the technology themselves. It is recognised by Kukulska-Hulme et al. (2011) that once teachers can exploit the benefits of mobile learning, their return on investment will be huge. This study will attempt to influence the teachers’ perceptions regarding the usefulness and ease of use of mobile devices for teaching and learning through a hands-on professional development initiative.

1.3 PROBLEM STATEMENT

Studies have concluded that the South African e-Education policy’s implementation has not achieved what it set out to achieve (Ekanayake & Wishart, 2015; Ramorola, 2014). Failure to integrate ICTs into the curriculum is attributed to, among others, a lack of ICT literacy among teachers, the fixed structured form of teaching, inadequate infrastructure, and lack of adequate training for teachers (Mouza & Barrett-Greenly, 2015).

Other initiatives have seen national and provincial departments (Gauteng and Northwest) supplying schools with mobile devices like tablets and laptops, while restricting usage to school premises and, if taken home, to use with no internet connectivity. Suppliers like Intel started to train teachers through the Intel Teach Project (SchoolNetSA, 2003), but the project was limited to urban areas only, whilst the South African landscape is largely rural. Although using mobile devices as learning tools is not new, a gap exists between the initiatives by the government in the basic education sector and other institutions of learning. The attempt at addressing the gap by this study was strengthened by findings in the existing literature that argues that learners who own these mobile devices can usually connect to the Internet for various

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purposes, including research (Ford & Botha, 2010; Kreutzer, 2009). There may be challenges due to teachers' negative attitude towards learners' use of mobile devices in the classroom, and the restrictions placed upon teachers by school policies that regulate their use in class (Ekanayake & Wishart, 2015; Potter & Rockinson-Szapkiw, 2007).

Furthermore, connected schools in South Africa can only offer internet access within a 200m radius of a wireless access point (Liu et al., 2010) which is located at the school. This implies that learners can only use provided resources within the restricted radius, thus compromising the ubiquitous nature of their devices. Enabling teachers to take advantage of self-owned devices could allow learners to use their own devices to learn anytime, anywhere, thereby enhancing integration into teaching and learning.

According to Burns (2010), teachers' limited integration of technology in teaching and learning may be due to various reasons, like the inability to realise the value of instructional technology in their content areas. Another reason could, for example, be a school environment where the principal does not encourage the use of technology and thus refuses teachers access to the equipment (Watson, 2001).

Teachers may also not perceive the learning curve to introduce mobile learning into their classes as something they will manage. Many shy away from exploring the qualities that these technologies can bring to the classroom (Traxler, 2007). Teachers are unaware of the advantages of using mobile devices in education, which could be one of the reasons they refuse to use education technology in their classrooms (Lefoe et al., 2009).

Kukulska-Hulme et al. (2011) argue that teachers may not be able to integrate technology and equipment provided to their schools due to being poorly trained. The technologies present in South African schools are not being used optimally and the availability of technology infrastructure does not necessarily guarantee implementation in daily practice. Likewise, Selwyn (2010) indicates that technology is seldomly being used in the classroom, due to the teachers not possessing the expertise, or confidence, to use the technology effectively. The problem is that there

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seems to be evidence that teachers do not feel empowered enough to effectively use the new devices, despite initial training interventions.

The current study acknowledges the fact that in most cases, the once-off training provided by the district officials/providers, when the mobile devices were first delivered at schools, are not deemed to be efficient. As we observed that these technologies were not being used optimally in schools, we deducted that the strategy of once-off training is not working. We were, therefore, curious about what needs to be done to ensure that teachers are capacitated sufficiently to implement mobile devices into their classrooms. Furthermore, the study sought to explore the reasons for the actual continuous use of mobile devices for teaching and learning by certain teachers in their own classrooms, after attending a series of professional development workshops.

1.4 PURPOSE OF THE RESEARCH

The purpose of the study was to explore the extent to which it was possible to influence teachers' opinions on the usefulness and ease of use of mobile devices, and to further investigate how the actual and continuous use of mobile devices in a particular school could be explained. The purpose of this study was also to potentially influence future initiatives where technologies are made available to schools, to ensure their optimal and continued use in context. The purpose was, therefore, to gather evidence, and to contribute to the development of knowledge in this field.

In the current study, participants were encouraged to participate in a series of workshops aimed at empowering teachers to introduce mobile devices in their teaching and learning environment. Through a hands-on professional development initiative, the purpose of the study was to influence teachers' opinions on the usefulness, and ease of use, of mobile devices in class. Teachers were exposed to the benefits and ease of using mobile devices by participating in a number of authentic mobile learning activities. The study then also explored how the actual and continuous use of mobile devices in a particular school can be explained. The data collected was used to respond to the research questions, and to make recommendations for future good practices. The discoveries that were made may empower other individuals and officials of the Department of Basic Education in similar future endeavours.

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1.5 RESEARCH DESIGN AND APPROACH

This research is an interpretive study that lends itself to the phenomenological approach of qualitative methodology because the intention is to generate understanding about the personal experiences of the research participants (Willig, 2013; Yin, 2011). According to Wilson (2015), an interpretive position in phenomenological research can be undertaken when the practices embrace the idea that people are inseparable from their world, and that an investigator shares this same world to some degree. Furthermore, Merriam (2009) posits that qualitative research focuses on people's insights and considerations of their world. Similar to Mouza & Barrett-Greenly (2015), the exploration of personal experiences during the series of workshops, and the insights of the participants that were gained through the questionnaires and interviews, enabled the researcher to generate a rich understanding of the participants' attitudes, behavioural intent and actual use of mobile devices in class.

Creswell (2009) indicates that the purpose of a research design is to ensure that the research questions are answered and supported with evidence accumulated. Cohen et al. (2011) support this by indicating that a research design comprises the plan to be followed when undertaking the study, whilst Yin (2011, p. 75) call it "logical blueprints". This study chose a case study design as a logical blueprint to respond to the research questions.

In the same way as Bass et al., 2018, Ertmer et al., 2012 and Sangra & Gonzalez-Sanmamed, 2010, the study employed a qualitative single case study method, with two embedded units of analysis, namely, Unit of Analysis 1, and Unit of Analysis 2. Although the study was qualitative by nature, it was supported by some quantitative tools as elaborated upon further in the research design section of Chapter 3.

According to Burger (2006), embedded case studies begin and end with a conceptual understanding of the case as a whole within its real-world context. As the investigation progresses, however, embedded case studies are analysed from different perspectives, or from several sub-units. The current study sought to observe and understand teachers' behaviour in real-life interventions, thus linking programme

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implementation with its effects, to gain insight into how mobile devices were used and experienced by the teachers during and after a series of workshops (Yin, 2011). Case study research is "focused, beginning with a well-defined research question that guides data collection and analysis" (Willig, 2013, p. 307). The research questions linked to the two embedded units were as follows (See Table1.1):

Table 1-1:

Research questions

Embedded Unit	Research question
1. The series of workshops and the teachers' attitudes towards the use of mobile technology in their classrooms afterwards.	To what extent can a professional development programme influence the teachers' actual use of mobile devices in class?
2. The implementation and continued use of mobile devices for teaching and learning by teachers during their classes in a rural primary school.	How can the actual implementation of mobile devices in a rural school be explained?

1.6 TARGET POPULATION AND SAMPLING

1.6.1 Population

Polit and Beck (2006, p. 506) define a population as a group of individuals having the same qualities, whilst a sample is defined as "the section of the wider population that will be engaged in the survey". The population of both units of analysis in the study was teachers in the Bojanala District of the North-West province. These teachers were selected because their schools had access to technology equipment, as supplied by the National Department of Basic Education (DBE), that, with one exception, was not being used optimally, or in some cases, not used at all.

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1.6.2 Sampling

In research, the two most prominent sampling methods used are probability and non-probability sampling techniques (Greener, 2008). For this study, non-probability sampling techniques, including convenience sampling and purposive sampling, were used. Bhattacherjee (2012) defines convenience sampling as an approach that involves drawing a sample from the population component that is close to hand and readily accessible. At the same time, Saunders et al. (2009) posit that in a purposive sampling study, the researcher selects cases to allow him or her to answer the research question and meet the research objectives.

The Unit of Analysis 1 sample was convenient and purposive because the district official selected the sample of teachers from Wi-Fi-enabled schools in the Bojanala district. Moreover, to determine the likelihood of implementing what they learn from the workshops in their schools, schools were encouraged to nominate two teachers for the series of workshops. The selection criteria resulted in 14 teachers and one district official attending the district professional development workshops that focused on using mobile devices for teaching and learning purposes. The group included both primary and secondary school teachers, with three males and 11 females.

In Unit of Analysis 2, the sample was also convenient and purposive because the visited schools, and, ultimately the implementing school, had two teachers attending the series of teacher professional development workshops that were offered as part of Unit of Analysis 1. Furthermore, the implementing school was in a rural area, Wi-Fi-enabled, and it received mobile devices from the Department of Basic Education and were on the face of it, perceived to actually be implementing their mobile devices.

1.7 DATA COLLECTION

Data collection took place in both of the Units of Analysis, as summarised below.

1.7.1 Unit of Analysis 1

In Unit of Analysis 1, the study collected and analysed mainly qualitative data. The study used pre- (See Annexure C: Participant Questionnaire) and post-test (See

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Annexure D: TAM Questionnaire) questionnaires that were adapted from Davis (1989), and observations (See Annexure E: Participant observation checklist) that were made during the series of workshops. These pre- and post-test questionnaires adapted from Davis' instrument were developed and validated for the constructs' *perceived usefulness* and *perceived ease of use* to determine user acceptance of the technology (Ramayah et al., 2002, p. 09). To measure how respondents perceived these constructs, a Likert scale was used. According to McLeod (2019), Likert scales allow participants to offer degrees of opinion, or even no opinion at all, as opposed to a simple yes or no response.

The use of Likert scales resulted in data that could be represented as frequencies and percentages. Ansah (2017) argues that an analysis that is based on frequencies and percentages can be regarded as qualitative and may only be classified as quantitative when inferential and robust statistical tools, such as ANOVA, MANOVA, COVAS, regressions, path analysis, SEM and others are applied. As such, the current study was still regarded to be qualitative by nature.

The questionnaires were developed using Google Forms and administered electronically through a WhatsApp group called "Mobile Learning", created specifically for the research. Similarly, Nikolopoulou (2021) in a qualitative study about mobile devices in early childhood education, utilised a paper-based questionnaire to collect data. The respondents were asked to rate their opinion of *perceived usefulness* and *perceived ease of use* using a 5-point Likert scale ranging from 1=Strongly disagree, 2=Disagree, 3=Neither disagree nor agree, 4=Agree to 5=Strongly agree. For the intention to use mobile devices in teaching and learning, opinions were rated using a 5-point Likert scale ranging from 1=Very Unlikely, 2=Unlikely, 3=Neither unlikely nor likely, 4=Likely to 5=Very Likely.

A participant observation checklist (Annexure E) was used to document and collect data during the hands-on series of workshops on using mobile devices in teaching and learning.

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1.7.2 Unit of Analysis 2

In Unit of Analysis 2, a questionnaire (See Annexure F: UTAUT Participant Questionnaire) and semi-structured interviews (See Annexure G: Interview protocol) were administered. In order to facilitate comparison, the questionnaire captured qualitative data that were quantified, whilst the interview protocol entailed semi-structured questions based on the UTAUT model (Venkatesh et al., 2003). These instruments sought to gather information on UTAUT model variables relating to *Performance Expectancy, Effort Expectancy*, *Social Influence*, *Facilitating Conditions* and the *Moderating Factors* of gender, age, experience, and voluntariness of use (Venkatesh et al., 2003).

1.8 DATA ANALYSIS

Data was analysed in both Units of Analysis based on the nature of the data collected.

1.8.1 Unit of Analysis 1

In this unit of analysis data was collected using Likert scale questionnaires. The questionnaires focused on respondents' characteristics and opinions based on the TAM variables of *perceived usefulness* and *perceived ease of use,* and the data was analysed by means of descriptive statistics and graphical representation of the data to assist the reader. The researcher, furthermore, deployed a content analysis strategy, whereby data was probed for predetermined concepts linked to the TAM.

1.8.2 Unit of Analysis 2

In Unit of Analysis 2, the data from the collection instruments was transcribed, where necessary, and analysed using the method of natural language analysis, namely, content analysis (Cohen et al., 2011). Data from the questionnaires, the observation checklist notes, and the interview transcripts were extensively analysed by interpreting the participants' responses and the observation notes, in accordance with the UTAUT model variables, and by reading and grouping the responses according to the research questions. The questionnaires data was analysed by means of descriptive statistics

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and graphical representation of the data to assist the reader. Chapter 3 elaborates further on data analysis techniques, whilst the findings are discussed in Chapter 4.

1.9 THEORETICAL FRAMEWORK

In their study to measure the perceptions of individuals when using ICT, Moore and Benbasat (1991) regard Information Technology implementation as a process of change and conclude that there is limited research that proposes generic theories to deal with various new Information Technologies (IT). According to Bhattacherjee (2012), a theory is an interdependent collection of concepts meant to clarify an occurrence of interest within stipulated margins and expectations, whilst a model is a portrayal of components of a system composed to study that system.

According to Bernacki et al., (2020), teachers are being urged to consider how technology integrates with their curriculum through frameworks that have emerged over time. The TPACK model was developed by Mishra & Koehler (2006) to illustrate the necessity for educators to possess knowledge and skills spanning the technology, pedagogy, and content knowledge sectors. According to Bernacki et al., (2020), Mishra and Koehler argue that technology should be used to combine knowledge and instructional skills. As the purpose of the study was to influence teachers' opinions on the usefulness, and ease of use, of mobile devices, and to explore how the actual and continuous use of mobile devices in a particular school could be explained, it was found that the TPACK model was going to be fit for purpose. The TPACK model focus on the relations and intersections between pedagogical, content and technology knowledge, and would not have enabled the researcher to answer the research questions that closely relate to the acceptance of mobile technologies.

Whilst it is important to always keep the interplay between technological, pedagogical, and content knowledge in mind, the current study focused specifically on the influence of a series of professional development workshops on teachers' actual use of mobile devices in their classrooms. It also explored the reasons for the acceptance and use of these devices in one particular school. As such, the Technology Acceptance Model (TAM) (Davis, 1989) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) models were deemed appropriate. As suggested

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by Ammenwerth (2019), it was felt that the study would gain a better understanding of why users accepted or rejected a given technology if these models were used in the study.

TAM uses the variables of Perceived Usefulness (U) and Perceived Ease of Use (E) (Davis, 1989) in the professional development of teachers to enable them to take advantage of learners' own mobile devices, thereby capacitating them to integrate mobile phones in their teaching and learning practices. In his study about technology acceptance in the healthcare industry, Abu-Dalbouh (2013) defined perceived usefulness as the belief that a certain system will assist in improving a person's workplace performance. An individual's belief concerning how easy it will be to use a particular system is known as perceived ease of use (Abu-Dalbouh, 2013). The two variables of Perceived Usefulness (U) and Perceived Ease of Use (E) were also of interest to this study as influenced by external variables, such as user training and technology use.

For Unit of Analysis 2, TAM was found unfit for the purpose of the study and was therefore deemed unsuitable for providing insight into what enables the teachers from the observed school to implement and apply the knowledge gained from the workshop they attended as described in Unit of Analysis 1. UTAUT added more variables, which provided a better and deeper understanding of how factors such as performance expectancy (*perceived usefulness*, *extrinsic motivation*, *job-fit*, *relative advantage* and *outcome expectations)*, effort expectancy (*perceived ease of use* and *complexity)*, social influence (*subjective norm*, *social factors* and *image)*, facilitating conditions (*perceived behavioural control* and c*ompatibility*,) and moderating factors (*gender*, *age*, *experience and voluntariness of use*) influenced teachers' use of technology (Venkatesh et al., 2003).

1.10 KEY THEORETICAL CONCEPTS

Table 1.2 illustrates the key theoretical concepts that guided this study. Both TAM (Davis, 1989) and UTAUT (Venkatesh & Davis, 2000) will be unpacked in more detail in Chapter 3.

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Table 1-2

Key theoretical concepts

Concept	Definition
Perceived Usefulness (U)	The degree to which a person believes that using a particular system would enhance his or her job performance.
Perceived Ease-of-Use (E)	The degree to which a person believes that using a particular system would be free from effort.
Performance Expectancy (PE)	The degree to which an individual believes that using the system will help him or her to attain gains in job performance.
Effort Expectancy (EE)	The degree of ease associated with the use of the system.
Social Influence (SI)	The degree to which an individual perceives those important others believe he or she should use the new system.
Facilitating Conditions (FC)	The degree to which an individual believes that an organisational and technical infrastructure supports the use of the system.

Davis, (1989, p. 319), Venkatesh et al. (2003, pp. 447–453)

1.11 TRUSTWORTHINESS

In qualitative research, trustworthiness is meticulously entwined with the paradigmatic foundation of the study's discipline (Morrow, 2005). Since this study is conducted in the interpretivism paradigm, the criteria of credibility, dependability, confirmability, and transferability were the underpinning criteria for the study's trustworthiness (Guba, 1981). Table 1.3 illustrates the definitions of the criteria.

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Table 1-3

Qualitative research trustworthiness

Criteria/Strategy	Definition
Credibility	Evidence of the fair portrayal of the phenomenon under scrutiny.
Transferability	A detailed description of the fieldwork setting should be provided so that readers can decide if the present environment is similar to another situation, they are familiar with and whether the findings may be justified to apply to that situation.
Dependability	Strive to make the study repeatable by future investigators.
Conformability	Demonstrating that the data-driven findings and not the researcher's biases are the source of the findings.

Guba (1981)

In this study, credibility was ensured by the researcher's use of multiple data collection instruments, as well as being a participant observer during Unit of Analysis 1 and the interviewer during Unit of Analysis 2 (Bassey, 2007; Bitsch, 2005; Shenton, 2004). This level of participation enabled the researcher to give an authentic account of the phenomenon under study. A thick description of the milieu was given, enabling association with other settings to achieve transferability (Bitsch, 2005). Data was collected with instruments that could be used in other settings. Clear descriptions are provided, and the instruments are added as annexures to ensure dependability. For confirmability, the researcher used different forms of data and analysis within the interpretive paradigm (Ellingson, 2008). Chapter 3, Section 3.7 will elaborate more on the measures taken to ensure the credibility of this study.

1.12 ETHICAL CONSIDERATIONS

The University of Pretoria's ethics requirements and protocols were adhered to, and the ethical clearance certificate from the Faculty of Education, University of Pretoria is

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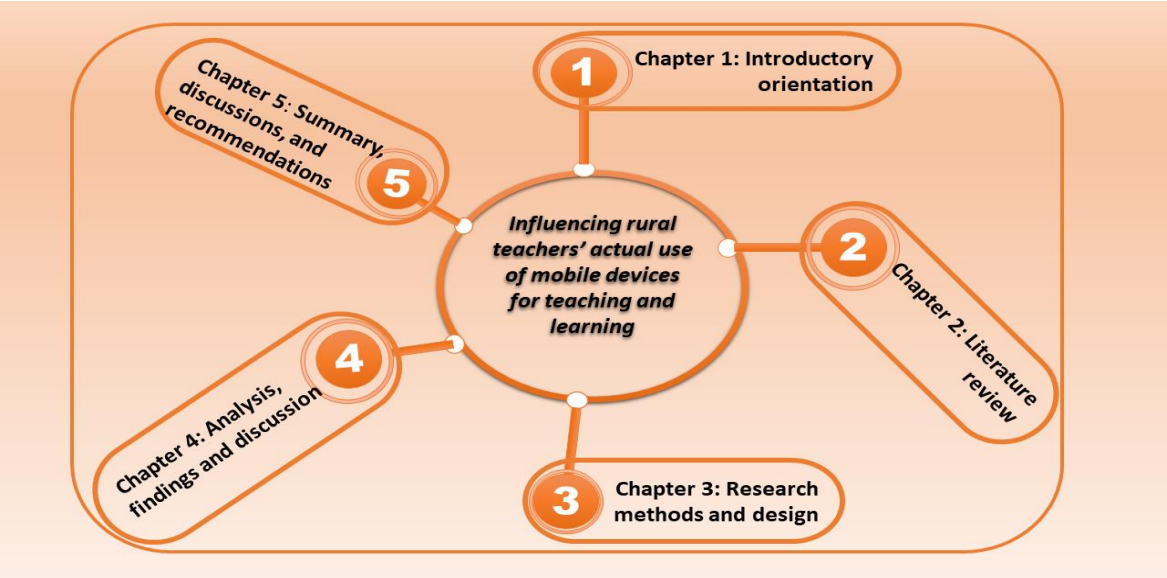
attached on page (ii). According to Noaks and Wincup (2004), the researcher should consider ethical issues such as subject approval and informed consent, privacy, confidentiality and anonymity to protect participants from exploitation and harm. The study sought permission from relevant authorities within the Department of Basic Education to comply with the recommendations in the literature (Noaks & Wincup, 2004). Furthermore, the participants were issued with consent forms that indicated that their participation was voluntary. It was also explained to them that their answers would remain anonymous, and their identities, and the identity of their schools, would not be revealed. All material, notes, recordings and transcripts would be kept safely by the University, with only the supervisor, the researcher and the examination panel having access to them.

1.13 RESEARCH STRUCTURE

Figure 1.2 illustrates the subsequent chapters of the study through which the logical content flow is ensured, and research questions are addressed.

Figure 1.2

Research structure



The rest of the study consists of the following chapters:

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Chapter two examines global trends in ICT in education and mobile learning by conducting an in-depth literature review. In addition, studies relating to the benefits of mobile learning, barriers to technology integration, teachers' perceptions, and professional development will be discussed. The models that form the conceptual framework, specifically the relevance of the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) to the study, are elaborated upon.

Chapter three elaborates on the research methods and unpacks the interpretive research paradigm and qualitative data collection methods and analysis used in this study. The sampling methods and data collection methods for both Unit of Analysis 1 and 2, which include the use of questionnaires, are outlined.

Chapter four is a detailed analysis of the questionnaires and interview transcripts for both Unit of Analysis 1 and 2. Unit of Analysis 1 unpacks findings from the pre-workshop and post-workshop questionnaires. Unit of Analysis 2 reveals the teachers' perceptions concerning their performance expectancy, effort expectancy, social influence status and facilitating conditions. Moderating factors of age, gender, experience and voluntariness are also discussed.

Lastly, **Chapter five** summarises the research study and reflects on the lessons learned from the research. Included is the methodological reflection, substantive reflection and scientific reflection. Furthermore, recommendations both for further research, policymaking and practice are made.

1.14 CONCLUSION

Whilst a number of challenges have been raised, the issue is that there seems to be the lack of sufficient training that results in teachers feeling sufficiently empowered to use the new devices. The study acknowledges the fact that in most cases, once-off training was indeed provided by the district officials/providers when the mobile devices were first delivered. However, because we saw that they were not being used optimally, we knew that the strategy was not working as it was intended.

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The study thus focused on the extent to which a series of workshops that focused on the usefulness of mobile devices and demonstrated how easy it was to introduce mobile technologies in class, could influence teachers' willingness to incorporate mobile devices in their classrooms. The study further attempted to illuminate how the actual use of mobile technologies in a specific rural school could be explained.

The purpose of this chapter was to introduce the research study. Taking a closer look at the literature relating to this study, and the theoretical framework that was selected, will be the focus of the next chapter.

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2. CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

A sound literature review does not just summarise sources but attempts to synthesise, analyse, and critically assess available information in order to ensure clarity of the state of knowledge on the subject. A literature review is, furthermore, undertaken to situate the research within the existing body of knowledge (Creswell & Creswell, 2017). Therefore, this chapter reviews previous studies relating to the key concepts addressed in this study, including the diffusion and adoption of mobile technologies in education. This chapter focuses, among others, on the influence of learning innovations in education. This chapter will discuss studies on the introduction of ICT into education, followed by a review of mobile learning, the devices used in class and their associated benefits and barriers. The importance of teacher perceptions and professional development will be explored. An assessment of the theoretical framework and its relevance to the study concludes the chapter.

2.2 ICT IN EDUCATION

There is no denying that we live in a digital age and that technology continues to be an integral part of today's society. Therefore, it is necessary to review what literature has to say about the influence of technology on education. As the world evolves technologically, the basic education sector has not been immune to the challenges relating to traditional teaching and learning methods (Willemse et al., 2014). Much of the literature lobbies for the utilisation of information and communication technology (ICT) in education (Gudmundsdottir, 2010; Sangra & Gonzalez-Sanmamed, 2010). Kleiman (2001) claims computers are formidable, but adaptable tools that can augment teaching and learning in countless ways. For example, technology enables teachers to simulate real-life situations when equipping learners with 21st century skills (Campbell, 2014), and plays a pivotal role in enhancing throughput as a critical element of successful teaching and learning in the education sector (Wajszczyk, 2014). In other words, educational innovations have now become a foundation for all countries as they strive to improve educational outcomes (Orhun, 2003).

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The number of scholars conducting research to understand the influence of technology on education better has increased over the years whilst technological advancements and their importance to education are becoming increasingly evident due to the growing awareness of their significance (Abbitt & Klett, 2008; Jung, 2005; Liu et al., 2016; Mundy et al., 2012; Raphael & Mtebe, 2017). The opportunities and challenges that ICT has created for teacher training and professional development are being explored (Jung, 2005). According to Mundy et al.'s (2012) study, teachers who participated in the Digital Opportunity Trust (DOT) USA's TeachUp! Programme realised substantial growth in students' ability to use computer technologies, student engagement and accelerated learning. Research into the perceptions of language teachers towards the internal and external barriers of instructional technology found that the ambition of designing and implementing future professional development ought to entail improving the practical use of technology in teaching for language teachers (Liu et al., 2016). Elements such as support, perceived ease of use, performance expectancy and social influence have been seen to determine self-efficacy among teachers in integrating ICT into the teaching situation to embrace the opportunities and overcome the challenges (Abbitt & Klett, 2008; Raphael & Mtebe, 2017).

Numerous scholars buttressed technology as a "change agent" for improving teaching, learning, and consequently, the pass rate, with research into the incorporation of technology into schools growing in a significant way (Ilomäki & Lakkala, 2018; Potter & Rockinson-Szapkiw, 2007). Technology is an efficient tool to use to involve learners in learning activities as it enables learners to learn more whilst allowing schools to concentrate on global learning environments (Almekhlafi, 2006). Although the types of technology have changed, this sentiment is still true today, as most researchers concur about the importance of using technological tools in various education systems (Shaid et al., 2019; Tarling & Ng'ambi, 2016). In addition, technology-based tools are able to aid teachers in adhering to the international standards for utilising technology-based tools for instruction and learning (Shaid et al., 2019).

The importance of technology in education is visible, both from a teacher's and a learner's perspective. While technology supports teachers, Lam and Lawrence (2002) observed that learners are empowered by technology to take control of their own

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learning and have access to an array of educational resources. Therefore, the integration of technology to enhance teaching and learning, is critical (Kopcha, 2012).

As far back as the turn of the century, governments globally demonstrated their confidence in the capability of technology by committing funds to find and stimulate ways to present or augment instruction with the use of technology (Kleiman, 2001; Pelgrum, 2001). Likewise, Selwyn (2010) agrees that digital technologies have now become a significant part of education systems around the world, both in terms of funding and resources.

There is plenty of evidence of the contributions by governments around the world to supply technological devices to schools (Gumbo & Mawire, 2013; Wozney et al., 2006). However, incorporating technology as a learning tool demands a well-defined educational rationale (Ng, 2012). Therefore, countries are looking for ways to integrate technology into education systems to keep up with the fast and changing pace of the world (Aviram & Talmi, 2005). First world countries, like the US and the UK, have provided incentives to teachers in schools to implement ICT in the education sector (Sangra & Gonzalez-Sanmamed, 2010). A global investment program in ICTs to improve education has also been announced by African governments (Buabeng-Andoh, 2012). Even developing countries, like Rwanda and South Africa, are striving to implement ICT into their education sectors, due to the many advantages (Wachiuri, 2015).

Many countries in Africa are currently developing ways through which ICT can be used in their education sectors. The New Partnership for Africa's Development (NEPAD) requires countries in Africa to articulate policies for the utilisation and support of ICT infrastructure to facilitate citizen access to, and use of, technology (Gumbo & Mawire, 2013). It is the responsibility of policymakers in Africa to transform secondary education and existing schooling systems in order to adjust to the pressures of globalisation and the technology-driven world (UNESCO, 2016). There seems to be a need for ICTs to be fully utilised to support education systems, distribute knowledge, provide access to information, and support valuable and efficient learning (UNESCO, 2016).

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However, the use of technology in a learning environment may have both benefits and risks associated with it. Alhumaid (2019) cautions that technology can have a negative impact on education through four paths: diminishing students' abilities to read and write, dehumanising their learning environments, distorting social interactions between teachers and learners, and isolating them.

Despite the global support for integrating ICT into education, reality demonstrates that the picture is not yet a brilliant success. Tarling and Ng'ambi (2016) note that policy decrees and professional development plans for using evolving technologies intended to stimulate change in teaching methods, seem to have a propensity to fail. This phenomenon is clear in that despite the funding efforts by the South African government; there is slow progress in the use of computer technology in schools (Ramorola, 2014). One of the intentions of the South African Department of Communications in establishing the e-Skills plan of 2010, was to be a leader in the use of ICTs for educational inclusion (Audenhove et al., 2018). However, initiatives such as "One Laptop per Child" and "Teacher Laptop" have not taken off, to the detriment of education (Mzekandaba, 2015).

The South African government is still trying to bridge the digital divide through various endeavours, including partnerships between the Department of Education, public sector agents, and the private sector. The then South African Department of Telecommunication and Postal services gazetted the Universal Access and Service Obligations (USAO) through the Electronic Communications Act no 36 of 2005 (Department of Communications, 2014). Notice 807 of 2010, regulated by the Independent Communications Authority of South Africa (ICASA), required mobile network operators to supply connectivity and ICT equipment to public schools in the Country (ICASA, 2010). The appeal by mobile network operators resulted in an amendment of the Obligations in Notice 403 of 2014, which was published in Government Gazette number 37718 (ICASA, 2010). The amendments reduced the number of schools to be connected by mobile network operators and removed the provision of sim cards and handsets. Mobile network operators were to be allocated specific schools to which to connect and provide internet. Recent unpublished audits by the Department of Basic Education (DBE) indicate that the intentions of the obligations set out in the act were not fully addressed. Four thousand six hundred

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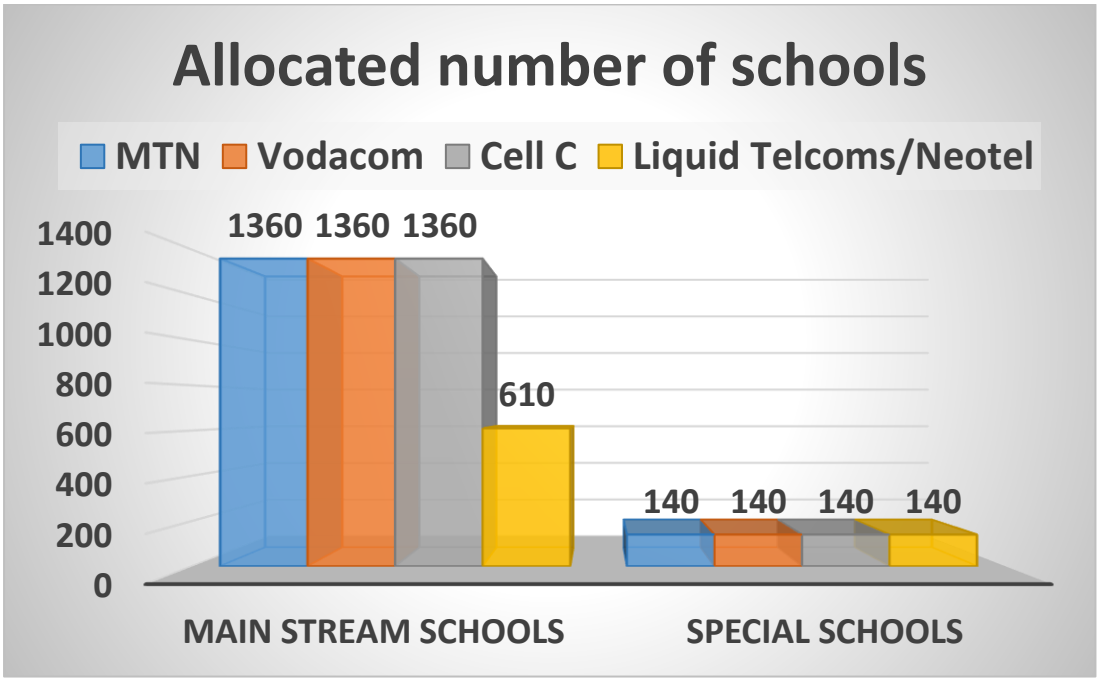
and ninety (4 690) mainstream schools out of 25 109 schools and 560 schools for learners with special educational needs (special schools) were allocated to the mobile network operators as illustrated by Figure 2.1. This allocation represents 18,68% of all schools in South Africa.

Figure 2.1

Number of schools allocated



ICASA (2014)

Similar to the question Cuban (2001, p176) asked in his research, namely "Are Computers in schools worth the investment?", this study has shown how government has invested funds in equipping schools, but that this equipment ended up not being optimally used. The mobile network operators supplied 4860 (19,36%) mainstream schools with a connectivity speed of 1 megabyte per second and 2 gigabytes of data in Phase 1 of the project (Vodacom supplied an extra 141 schools). No special schools had been connected by 2019 or during the write up of this study in 2021. No progress report was issued by the Department of Basic Education or the Department of Communications and Digital Technologies. Mobile network operators claimed that the cost of importing the equipment was prohibitive. Security for the devices and teachers not trained in using the devices, were reported as challenges in the audit. Furthermore,

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the data allocated to schools was limited to administration use and was insufficient for teaching, learning and teacher training.

While the inclusion of ICT in education is vital, the focus must not be solely on technologically advanced programmes and equipment. The emphasis should also be on skilling up teachers and developing professional competencies. According to Martin and Roodt (2008), if we focus only on the latest programmes or devices instead of creating powerful learning experiences aligned with the type of skills and character traits, we want students to develop, we will perpetuate the same education, albeit with more expensive tools. Teachers are cited as a key component of creating the twenty-first century classroom by the Professional Development Framework for Digital Learning by DBE, instead of technology and access to information (DBE, 2016).

Selwyn (2010) indicate that while schools don't completely fail to take advantage of digital technology, many commentators would argue that they don't use it to its full potential all the time. The most effective users of learning technologies are those teachers who believe ICTs can enhance teaching and learning. Implementing ICTs in education depends heavily on the teachers' eagerness, proficiency, and high levels of confidence (Ghavifekr & Rosdy, 2015). A teacher's familiarity with technological devices will play a role in having learners access and understanding of digital content (Mzekandaba, 2015). The erstwhile Deputy Minister in the Department of Communications and Digital Technologies (DCDT), Dr Hlengiwe Mkhize, urged the DBE to emphasise teachers' professional and skills development to improve capabilities and technology competency (Mzekandaba, 2015). This guidance implies that unless teachers are skilled, they will be unsettled by technology and resort back to traditional teaching methods, instead of implementing the latest technologies into their daily teaching and learning activities. Compared to worldwide scenarios, in order to assist school children in using technological resources in innovative ways, further training and development are needed for teachers in South Africa (Stols et al., 2015).

Since technology is fundamental to education, mobile devices should be introduced as one component of ICTs for enhanced teaching and learning.

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2.3 MOBILE LEARNING IN EDUCATION

“The rapid development of emerging technologies has attracted the attention of teachers to the integration of ICT into education” (Wang, 2008, p. 411). The introduction of these emerging technologies can raise schools' standards by promoting and improving the quality of instruction, learning, and management (Livingstone, 2012) and by augmenting the learning process (Gumbo & Mawire, 2013). As technology slips into every aspect of people’s lives, education will eventually also be inundated by technology, especially by the utilisation of mobile devices to improve and aid the teaching and learning process (Oye et al., 2012). The global growth in the use and ownership of mobile devices is a valuable aspect of ICT and has led to a new potential for their integration into learning contexts (Lawrence, 2016). Mobile devices can be used to access educational resources, augment online interactions, and impart knowledge through synchronous and asynchronous communication methods (Chaka & Govender, 2017), making them a valuable tool for mobile learning. Sophonhiranrak (2021) furthermore suggests that the use of mobile learning as a conduit for learning, requires proper infrastructure and basic instructional skills on the part of the educators.

One of the most significant aspects of mobile devices as technologies of learning is the storage capability that allows individuals to access previously downloaded information sources at any given time (Wagner & Wilson, 2005). However, effective delivery of study material to mobile devices requires the competence of teachers, learners, and system administrators to be able to store and download the material when needed (Wang et al., 2009). The importance of devices such as cell phones, personal digital assistants, tablet computers, and laptops have the benefit of making information available from anywhere and at any time and allowing stored information to be retrieved immediately (Kukulska-Hulme, 2009).

According to Al-Hunaiyyan et al. (2018), researchers and education specialists are investigating the potential of mobile devices to reinforce learning. Thus, mobile devices serve as a means of modifying current learning policies to afford learners opportunities to adapt their ability to learn and increase their knowledge (Al-Hunaiyyan et al., 2018). Furthermore, the integration of mobile technologies into the classroom has added quite a number of benefits to the way teachers teach, and the learners learn (Fulantelli

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et al., 2015). Consequently, mobile technology can present innovative prospects for learning that can continue outside the traditional teacher-led classroom setting (Sharples et al., 2013). Because of mobile devices' flexibility, new forms of learning are possible that change the physical relationship between teachers, learners, and the objects of learning like content items, practise items and assessment items. Distance learning does not even come close to offering these types of flexible interactions, so mobile learning appeals to people on many levels (Keskin & Metcalf, 2011). Mobile devices can be utilised for real-life learning, reinforce interactive, cooperative learning through collaboration among learners, and affords learning opportunities in the comfort of the learner's own space (Gumbo & Mawire, 2013).

Mobile learning (also known as m-learning) is a term coined relatively recently and is regarded by researchers and teachers as an indication of the future of learning (Caudill, 2007; Dias & Victor, 2017; Kukulska-Hulme et al., 2011). Throughout history, mobile and wireless technologies have had a significant effect on academic settings, leading to the development of new methodologies for technology-enhanced learning, now known as mobile learning or m-learning (Sharples et al., 2007). For example, wireless mobile devices enable individuals to interact and engage through online discussions to assist one another and solve real problems (Wang, 2008). This information network allows teachers to form a community of practice where they can support each other in integrating mobile devices and mobile learning (Masrom & Ismail, 2010).

While mobile learning has been defined historically as "any educational provision where the sole or dominant technologies are handheld or palmtop devices" (Traxler, 2005:262), mobile learning refers to more than studying by means of mobile devices. A mobile form of education also refers to using a mobile device to supplement education (Mostakhdemin-Hosseini & Mustajarvi, 2003). It can be described as a ubiquitous learning activity grounded on an appropriate pedagogical approach and sustained by an applicable mobile technology (Petrova & Li, 2009), and involves the adoption of digital tools, mostly connected to the internet, to support and enhance access to learning (Pachler et al., 2014). There are numerous definitions of mobile learning, and scholars often find it difficult to reach an agreement on what exactly constitutes educational mobile learning.

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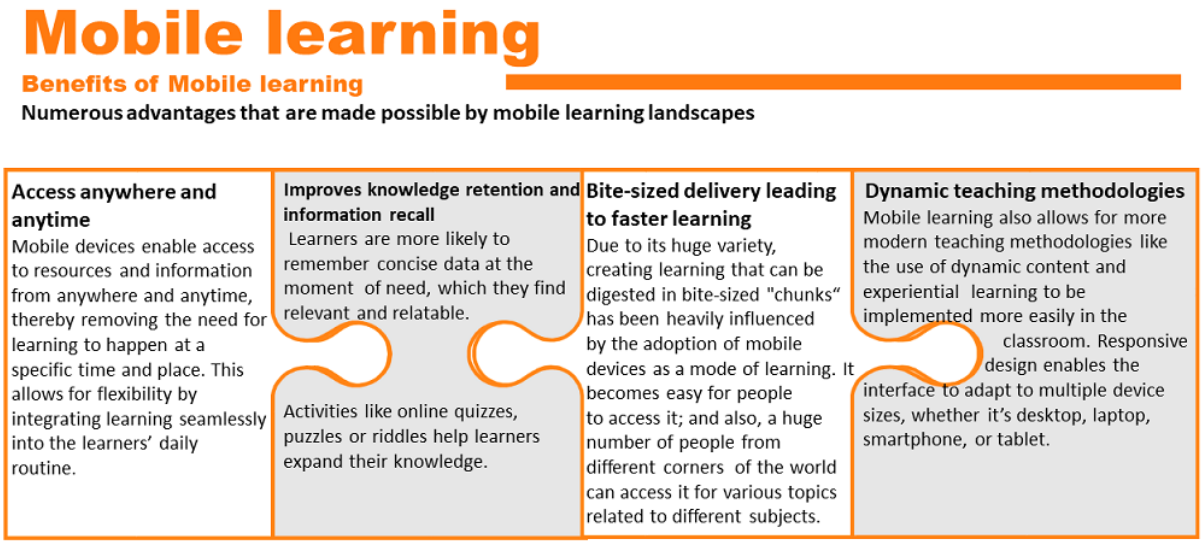
Mobile learning is often regarded as an offspring of e-learning. It is often described as electronic learning that makes use of mobile devices and wireless transmission (Laouris, 2005; Pinkwart et al., 2003), or as any teaching and learning process that can be done through mobile technologies, or in a setup or environment where mobile tools are accessible (Guerrero et al., 2006). Mobile learning could also be described as a system or setting whereby mobile technologies and electronic learning interconnect to create an anywhere, anytime teaching and learning practice (Kambourakis et al., 2004). This definition of Kambourakis et al. (2004), among the abundance of descriptions available, is considered most appropriate for this study.

One of the primary advantages of mobile learning is that students can learn anywhere and anytime, making the classroom more flexible and allowing learners to learn whenever and wherever they choose (Thongsri et al., 2018b). Mobile learning landscapes make numerous advantages, that may not be realised in other forms of electronic learning, possible (See Figure 2.2).

Figure 2.2

Advantages of mobile learning



Adapted from Gautram (2018), Mishra, (2013) and Thomes (2019).

Mobile learning enhances collaboration among individuals irrespective of their physical geographical location and time (Geddes, 2004). While mobile learning

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enables learners and teachers to collapse the transactional distance (Mbatha, 2016), it can be implemented in the school as a "tool for anytime and anywhere learning to differentiate and individualise learning to improve education results" (Uvarov & Varlamova, 2019, p. 21).

An advantage of mobile learning is its freedom from the confinement to a single physical space. Another benefit of mobile devices is that they encourage the use of mobile learning by strengthening individual learning through their various multimedia features (Cheon et al., 2012). The advantages of wireless mobile technology for education are self-evident. Nevertheless, there are also challenges in integrating technology into education as expanded on in the section below.

2.4 BARRIERS TO MOBILE INTEGRATION

Impediments to the effective incorporation of ICTs into education need to be understood to enable pedagogy to keep abreast of the increasingly broadening gap between available technology and that which is assimilated into pedagogical practice (Shimasaki, 2015). These impediments can be classified as an amalgamation of technical and educational challenges (Guy, 2010).

Barriers such as restricted access to wireless infrastructure, the incompatibility of educational software with mobile devices, the inflexible structure of traditional education and assessment systems, unsuitable teacher training, unmotivated teachers and lack of teacher self-confidence in using mobile devices, have been identified (Bingimlas, 2009; Khan et al., 2012). The difficulty of setting up a mobile learning system, teachers' lack of knowledge about technology, end-user cost barriers, and the lack of time to learn, among others, have also been reported as hindrances to mobile integration (Masrom & Ismail, 2010).

Undeniably, every new technology has implementation issues, and mobile technology is no exception. A study by Van Praag and Sanchez (2014) on the adoption of digital tools by three experienced second language teachers, found that teachers tend to resist integrating mobile technology into the classroom in an effort to prevent classroom disruptions. Strangely, this occurred even though the teachers were

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thoroughly acquainted with the benefits of mobile technology in supporting and promoting instruction and learning processes.

Security seems to be one of the most serious barriers to the full adoption of online services (Padayachee, 2017). Mobile devices are more susceptible to theft, damage, or misplacement, than desktop computers. The other aspect of security is the protection of information, including personal information, contained within mobile devices. The protection of personal information has been the main concern with any digital technology that operates via the internet (Keengwe et al., 2008). The concern about protecting personal and other information may lead to some learners and teachers being sceptical and reluctant to integrate mobile technology into their teaching and learning processes.

Solutions to some of the barriers may not be entirely technological. In their study, Dexter et al. (2006) state that teachers lack the skills necessary to implement mobile technologies fully in the classroom, however, technology can be successfully integrated into the classroom if teachers are provided with the skills to use specific technologies. Similarly, Christensen & Knezek (2018) emphasise that to teach with mobile devices, teachers need computer skills and appropriate methods to use them in traditional classroom settings.

Mobile learning continues to grow and become an important aspect of education. Therefore, it will be necessary for teachers to become competent to fully integrate mobile technologies in their classes (Liu et al., 2016). They should also participate in the development process of mobile learning platforms or systems (Kafyulilo, 2014). It has been found that where teachers were involved in designing mobile learning environments, they ensured the integration of technology in the classroom (Kuşkonmaz, 2011), and had positive insights of mobile learning (Uzunboylu & Ozdamli, 2011).

In order to understand the various extraneous variables that influence the implementation of mobile technologies in the classroom, one needs to know the current obstacles to educational technology integration (Shimasaki, 2015). The current study explored situations where there was an attempt to remove, or minimise, these

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barriers through the offering of a series of workshops aimed at improving understanding regarding classroom mobile technology implementation. Furthermore, the study sought to explain the continued actual use of mobile devices for teaching and learning by the teachers in their own classrooms.

Recent technological developments have improved mobile devices to make them suitable tools for teaching and learning, thus removing some barriers (Valtonen, 2015). For example, many applications adapt to different screen sizes so that the reading experience is much better than was possible ten years ago. Although some mobile devices still have small screens, they have numerous key functions that make them appealing to the user, such as displaying high-definition videos, fast access to the internet, and intensive graphic games. In addition, their open operating systems allow for the installation of additional applications and the use of a virtual keyboard (Cisco, 2013). Furthermore, the dawn of the Responsive Web Design (RWD) transformed web page design and how screens can be viewed on various devices (Hussain & Mkpojiogu, 2015). Teachers, therefore, need to be encouraged to continue using available technologies as constantly evolving technology makes devices more user friendly, and therefore could increase positive perceptions of mobile learning.

2.5 TEACHER PERCEPTIONS ABOUT MOBILE LEARNING

Because of the learners' access to technology and the creeping influence of technology in the education sector, teachers inevitably need to buy into using technology in their teaching methods and the classroom setting. Today's learners are coming from a generation that is growing up with an abundance of technology. Learners play games, browse the internet, and use instant messaging as part of their daily communication (Merchant, 2012). Computers, tablets, and cell phones form an essential part of their daily lives (Acarli & Sağlam, 2015). Based on the technology that this generation of learners own and can access, it should not be surprising that they also expect to use it in the classroom (Ghavifekr et al., 2016).

Learners, nowadays, do not just simply change their slang, clothes, body adornments, or style, but also experience a huge disjointedness in their overall learning, which may be related to the rapid diffusion of digital technology in the last decades of the 20th

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century (Prensky, 2001). Present-day students have access to, and use, technological devices with functionalities such as a Short Messaging Service (SMS), Multimedia Messaging Service (MMS), video, camera, the Internet, voice recording, WhatsApp, Facebook, Instagram, Tiktok and Bluetooth. Other characteristics of these devices include being personal, informal, accessible, and context-based (Alhassan, 2016; Kukulska-Hulme et al., 2011). This knowledge about the lives of learners changed teacher perceptions about technology in the classroom and encouraged them to find opportunities to use mobile learning (Stols et al., 2015).

Teachers see technology as a fundamental catalyst to improving teaching and learning (Mbatha, 2016). Because of the limited availability of computer laboratories and desktop computers in schools, mobile devices can be used to innovate teaching and learning methods (Traxler, 2013). The lack of infrastructure is offset by the infiltration of mobile devices, which can offer on- and off-line content for teaching and learning (Grimus & Ebner, 2015). Teachers realised that mobile devices make new methodologies, like gamification, simulations and brainstorming using chatrooms, available for teaching purposes. These technologies can increase motivation, and ultimately the influence of learning. The past two decades have seen a progressive introduction of mobile devices in education by teachers, which have distinctive elements that can augment the fundamental facets of teaching methods, thereby stimulating the achievement of educational outcomes (Sung et al., 2016). Nikolopoulou (2021), agrees, but warns that although mobile technology has grown significantly and is becoming more and more popular, little empirical research has been conducted on teachers' perceptions and views of the advantages, barriers, and concerns related to mobile device usage.

Many teachers seemed to have been ignorant of the fact that current students handle information differently from their predecessors, due to the time-saving characteristics of technology and the advantage of learning anywhere and at any time (Prensky, 2001). This may not be the case nowadays as teachers have also become more exposed to technological advantages. Many teachers are already using an extensive assortment of online instruction and learning tools and are participating in collaborative activities offered by social networking (Howard & Mozejko, 2015). Some teachers come from a millennial generation that grew up with technology, which may be why

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some of them already use it in the classroom. Howard and Mozejko (2015) concluded that at least a proportion of current-day teachers are no longer ignorant of the use of technology in education.

Most teachers do, however, still face challenges in the utilisation of technology in education. As teaching methods change and technology advances, teachers struggle to keep up with the developing learning styles of the "digital natives" (Prensky, 2001:1). The 21st century demands personal skills, such as designing digital resources, presentations and projects that make classroom activities look like the real world (Dede et al., 2010). It may be concluded that these demands pressure teachers to align the new technologies with their pedagogical methods to adapt to new ways of teaching.

In studies concerning their perception of technological engagement in the classroom, teachers concur that technology plays an important role in teaching and learning (Skenderi & Skenderi, 2011). Teachers also seem to believe that the adoption of technology in education will revolutionise the tasks of the educator in the near future (Buabeng-Andoh, 2012). Sadly, but interestingly, some teachers believe that technology will undoubtedly decrease the number of teachers needed in the near future (Perrotta, 2017). Thus, teachers must accept the reality that technology doesn't make them redundant, but rather enhances and redefines their critical role in the classroom (Nicolle & Lou, 2008; Traxler, 2013).

Though some teachers are assimilating technology into the classroom, a tremendous demand remains for professional development and relevant training to equip them with technological proficiency that could change negative perceptions (Lundgren et al., 2015). Appropriate and adequate training in technology is necessary to positively change teachers' perceptions about integrating ICTs into instructional processes and to increase their confidence and competency in classrooms (Hoye, 2017). Similarly, Peled et al., (2022), suggest that teachers' negative perception of mobile learning persists when technical support and professional development are inadequate. It is reasonable to assume that teachers adequately trained to use technology are more confident using technology in the classroom (Mehdipour & Zerehkafi, 2013). The likelihood that teachers will use technology in the classroom increases if they believe

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it can improve teaching and learning (Nistor, 2014). Even though a great deal of research still needs to be conducted on effective ways to implement mobile devices in the classroom, targeted professional development can make mobile learning a success (Christensen & Knezek, 2018).

2.6 TEACHERS' PROFESSIONAL DEVELOPMENT IN THE USE OF DIGITAL DEVICES

The realisation of the value of ICT through improved teacher and learner performance in education should promote the optimal usage of technology (Isaacs, 2015). However, the advancement of technology requires continued studies to determine the requirements for professional development of teachers involved in mobile learning projects (Crompton et al., 2016). Teacher Professional Development (TPD) programmes will benefit greatly from such continuous studies, as they will show teachers' progress in their journey to incorporating technology into their classrooms. Teachers' proficiency in technology use is more crucial than content expertise in the integration of technology (Kukulska-Hulme et al., 2011). According to Spante et al., (2018), the digital competence of teachers is strongly linked to their expert knowledge and becomes central to teacher professional development. The implication is that teacher's professional development activities must include an element that focuses on the competency of teachers to use technology.

Spante et al., (2018) agrees that today's teachers are expected to be digitally competent, because they are responsible for dealing with several issues ranging from the subject content to pedagogical tools. Therefore, Crompton et al., (2016) recommend training teachers in the use of technological devices to ensure that they can use them effectively. Teachers should be exposed to hands-on training that allows them to develop a high level of competency and become comfortable working with the technologies (Crompton et al., 2016). In their study, Karsenti et al. (2009) indicated that teachers reported being trained in basic computer skills by government training agencies, but that this training did not appropriately prepare them to integrate learning technologies optimally.

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In South Africa, 258 district officials were upskilled in using ICT in a teacher professional development laboratory project in partnership with Intel and the Department of Telecommunications and Postal Services through Operation Phakisa (Department of Planning, Monitoring and Education [DPME], 2015). A partnership between the Education, Training, and Development Practices Sector Education and Training Authority (ETDP-SETA) and Microsoft trained 6 394 teachers in ICT integration skills, 21 375 in basic computing skills, and a further 3 517 in advanced ICT skills under this project (Odendaal, 2017).

Even though technology may be readily available in South Africa, and training was provided to teachers, using these technologies successfully in classroom practice is still lacking (Botha & Herselman, 2015; Ramorola, 2014). This phenomenon aligns with the efforts of many governments around the world to provide technologies to schools. Many teachers still adhere to the traditional teaching approach despite these efforts (Uchendu, 2015). Prevailing professional development courses seem ineffective in grooming teachers for the 21st century (Borko, 2004). Hence, teachers require professional development methods that do not necessarily alter pedagogy (even though it may be required in certain circumstances), but rather enhance the knowledge, skills, and competency to teach with technology. Furthermore, continuous teacher professional development must inspire teachers to show grit and determination to tackle the challenges associated with ICT. The programmes also have to focus on enabling teachers to overcome their anxieties and build the confidence levels necessary to achieve quality and accountability (Charalambos & Glass, 2007).

The ability to integrate learning technologies into the classroom may develop after teachers acquire basic ICT skills, but it is not a natural process (Vandeyar, 2015). Teacher professional development in digital learning aims for teachers to actually integrate the learning technologies in their teaching and learning processes and see the value in its use (Ndlovu, 2015). Goal 16 of the Action Plan of 2019 Towards the Realisation of Schooling 2030 by the DBE states that it is the DBE's intent to "improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire careers" (DBE, 2015, p. 3). This goal is in response to the notion that teachers face new responsibilities and challenges, which need new

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skills, knowledge, and new roles, which can be obtained through professional development. “Effective, technology-related professional development is an important pillar for successful integration and sustainability of ICT in education” (Davis et al., 2009, p. 136).

Professional development is related to lasting developmental programmes that emphasise extensive knowledge, skills, and attitudes to efficiently educate learners (Steyn & van Niekerk, 2005). Hence, lifelong learning career development programmes are devised to support professionals when striving to obtain the relevant skills and knowledge (Oduaran, 2015). Teacher professional development is provided when gaps are detected, for example, when there are inadequate skills to do the work, there are changes in the nature of jobs, or when new technologies and other challenges on the job are introduced (Uchendu, 2015). It is a rational belief that advancing teachers’ knowledge, skills and attitudes is one of the most significant steps to improving student achievement (King & Newmann, 2001). To improve the learning environment for students, schools should offer valuable professional development opportunities to teachers (Khokhar, 2016). It may then be assumed that if teachers have easy access to the mobile devices, have been trained properly, and are competent in using them, they will see the value thereof and actually start using the devices productively in class. The study, therefore, sets out to investigate this assumption by exploring to what extent a professional development programme for teachers can influence their actual use of mobile devices in class.

Aspect that includes sense of efficacy, usefulness, and ease of use play a key role in the teacher's decision whether or not to use mobile devices in the classroom. However, perceived usefulness appears to be the strongest predictor of whether or not teachers will use mobile phones in their classes (Hur et al., 2015). ICT proficiency significantly influences users’ perceived usefulness of technology and, subsequently, its acceptance (Naidoo et al., 2019). Another contender in the perception battle is that teachers might be changing their view towards the utilisation of technology in education by improving their technology skills to enhance job security (Adomi & Kpangban, 2010).

To further investigate how teachers’ perception improved through professional

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development, a theoretical framework, will be explored and discussed in the next section.

2.7 THEORETICAL FRAMEWORK

Several worthy theories and framework that have been developed over the past few decades to understand the integration of technology into society, include the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006), Technology Acceptance Model (TAM) (Davis, 1989), the Theory of Planned Behaviour (Ajzen, 2011), and the Theory of Reasoned Action (Fishbein, 1979). All these theories have been developed based on studies conducted in diverse contexts and distinct units of study (Attuquayefio & Addo, 2014).

I studied these theories and several other information systems theories and models to identify the most suitable framework to inform the current study. In doing so, I found the Technology Acceptance Model (TAM), as introduced by Davis (1989), and subsequently, the Unified Theory of Acceptance and Use of Technology (UTAUT), as introduced by Venkatesh et al. (2003), most relevant to this study.

2.7.1 TECHNOLOGY ACCEPTANCE MODEL (TAM)

TAM is widely recognised as one of the information systems theories that explains how and why individuals decide to accept and use new technologies (Venkatesh & Davis, 2000). For example, Oye et al. (2012) observe that the TAM has been widely applied across various technological and geographical contexts. In addition, researchers note that some of the key areas where the TAM application is growing rapidly and proves to be useful, is the fields of education (Tenai, 2017) and health (Holden & Karsh, 2011). In these landscapes, the adoption and actual use of technology is regarded as the endpoint where users are expected to make use of technology in their unique environment (Wozney et al., 2006). Numerous researchers and professionals have buttressed technology as a change agent when improving work efficiency and creativity in the organisation (Mbatha et al., 2011).

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The education sector has not been completely lagging when it comes to the diffusion and implementation of technology. Hence, numerous studies show that technology is playing a meaningful role in enhancing instruction and learning (Almekhlafi & Almeqdadi, 2010; Mbatha & Manana, 2012; Thongsri et al., 2018a). Computer literacy is critical when it comes to the full adoption of any form of digital platforms in schools. Thus, teachers' computer skills, and perceptions regarding the ease of use and usefulness of technology, become critical in the design and integration processes within an education system. TAM is regarded as a useful framework to shed light on how technology and the educational world are becoming integrated. It is worthy to note that schools need to adopt technology to enhance teaching and learning (Ilomäki & Lakkala, 2018). They, furthermore, need to embrace technology because there are numerous benefits that learners and teachers enjoy from integrating technology in the classroom (Raja & Nagasubramani, 2018). According to TAM, the fact that schools might want to integrate technology into their teaching systems is regarded as behavioural intention (Cheon et al., 2012; Teo, 2012). The main intention for the teachers to integrate technology in the classroom is normally to improve teaching and learning (Hartman et al., 2019).

Research studies indicate that teachers also want to incorporate technology into their teaching methods because it helps them make their teaching more efficient (Ghavifekr & Rosdy, 2015; Schindler et al., 2017). It has been noted that the behavioural intention construct is influenced by the teacher's attitude (Cheon et al., 2012). This attitude refers to how teachers perceive the role of mobile technology in the classroom (Palau-Saumell et al., 2019; Santos, 2015). Put simply, if learners and teachers have a negative attitude towards the value that technology adds, they are most likely not to adopt or integrate it into their teaching and learning processes. Furthermore, it is clear that even if teachers perceive technology as useful, their behavioural intention may not become positive if they don't perceive the technology to be easy to master.

The model clearly purports that when individuals are provided with a specific new type of technology, a variety of dynamics tend to impact their decisions about whether they will adopt or reject that technology. This is true in the sense that many organisations have made technology available for their employees; however, not all these available technologies are used optimally. This imperfect level of integration is evident in many

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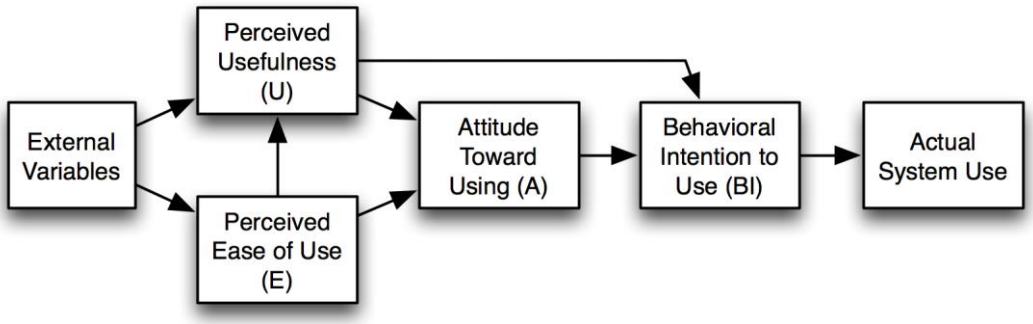
organisations whereby technology is made available, but due to a lack of skills among those who are meant to use that technology, it becomes a white elephant (Foko, 2009; Ford et al., 2014; Mbatha et al., 2011). For instance, a study conducted by Mbatha et al. (2011), established that all government departments in South Africa have made technology available for civil servants to increase service delivery. However, their study found that these technologies were not optimally used as some remained dormant for decades. The same situation can be found in education, as some technologies that have been provisioned are still not being used optimally (van de Vijver & Leung, 2017). However, when technology is easy to use, it is found that the likelihood of it being used by learners and teachers increase (Raphael & Mtebe, 2017).

As illustrated in Figure 2.3 below, TAM asserts that when users are presented with new innovations or technologies, numerous dynamics affect their decision to adopt or reject them (Lawrence & Tar, 2018).

Figure 2.3

T*echnology Acceptance Model (TAM)*



Davis (1989)

External variables refer to those aspects that impact the user's "perception of the usefulness and ease of use of any piece of technology" (Davis, 1989, p. 319). Although not the focus of this study, external variables could be regarded as teachers' workload, pre-determined curricular and assessment practices. Perceived Usefulness (U) is described by Davis (1989, p. 319) as "the degree to which a person believes that using

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a particular system would enhance his or her job performance". In addition, Perceived Ease of Use (E) is described as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 319). This study used teachers' opinions regarding the perceived usefulness of mobile devices in their teaching and learning environment to determine whether they saw the benefits of employing mobile devices. Based on teachers' perceptions associated to the perceived ease of use, this study attempted to determine teachers' level of comfort using mobile devices as part of their teaching and learning. Furthermore, they considered the teachers' opinions on whether they view mobile devices as user-friendly enough to integrate them into classroom teaching and learning. It is essential to know the aspects that influence perceived usefulness and ease of use, because they drive usage intentions and how these factors evolve with growing system adoption. With TAM, organisations can design intentional organisational interventions that would upsurge user acceptance and adoption of innovations or new systems (Camilleri & Montebello, 2011).

A thorough review of previous studies implied that notwithstanding its recurrent application in the information system industry and research, TAM had been broadly criticised for not being able to fully explain all the complexities involved in technology acceptance (Ajibade, 2019; Holden & Karsh, 2011; Rahimi et al., 2018). While TAM is simple to use and understand, it falls short in providing suitable explanations for the non-acceptance of mobile technology in schools (Laugasson et al., 2016). According to Laugasson et al. (2016), the TAM uses personality traits as determinants for the utilisation of technology, but meanwhile, in the school context, there may be other elements that need consideration. Similarly, Ajibade (2019) suggest that TAM is only conceptualised for personal opinion and intent, rather than for organisations like schools. Interestingly, Davis himself acknowledged that there were shortcomings in the initial model (Davis, 1989). Benbasat and Barki (2007) warn that this model has diverted researchers' attention from fundamental research questions, and gives researchers the impression that they are making progress in gathering knowledge.

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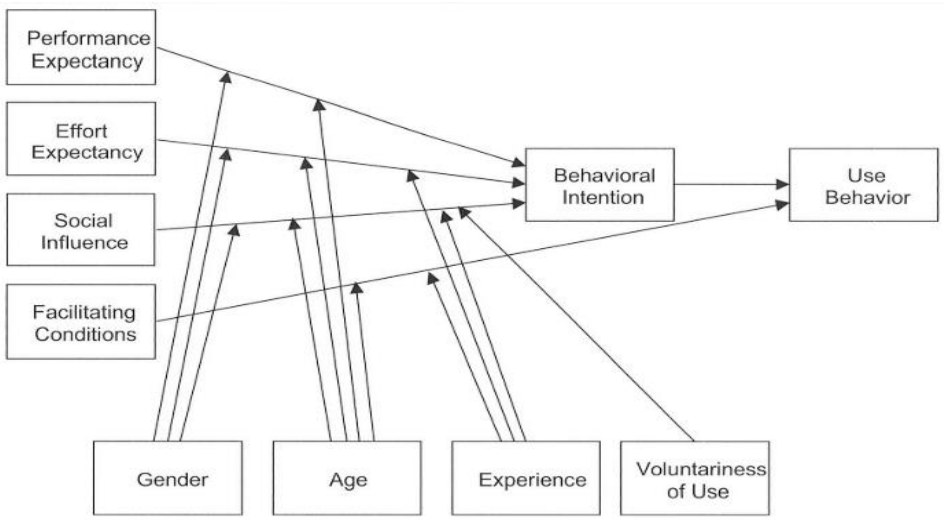
2.7.2 UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

There were multiple iterations of the TAM throughout the years, each adding a particular perspective to improve the model. Each of these iterations was developed due to the system's demands, ensuring that the model was improved with each system. Venkatesh et al. (2003) consolidated the various technology acceptance models to create a Unified Theory of Acceptance and Use of Technology (UTAUT). Moghavvemi et al. (2013) suggest that the UTAUT came about as researchers were trying to comprehend which aspects hinder ICT acceptance by consolidating previous technology adoption models. Multiple studies have subsequently adopted UTAUT in the field of education (Al-Jabri & Sohail, 2012; Baydas & Goktas, 2016; Hew & Brush, 2007; Imtiaz & Maarop, 2014; Lai, 2017; Straub, 2009). Figure 2.4 illustrates the proposed model of ICT acceptance and use by Venkatesh et al. (2003).

Figure 2.4

The UTAUT theoretical model



Venkatesh et al. (2003, p. 447)

The UTAUT postulates four core constructs, namely performance expectancy, effort expectancy, social influence, and facilitating conditions, which are defined in Table 1.1 of chapter 1 (Venkatesh et al., 2003). Performance expectancy in this study was used

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to assess the teachers' beliefs that using mobile devices will help them improve their job performance. Teachers were asked to assess how easy they find it to use mobile devices by asking about their effort expectations. Social influence was used to consider teachers' perceptions regarding how other colleagues feel that mobile devices should be used in their school. To assess teachers' beliefs about an appropriate technical and organisational infrastructure that is in place to ensure the proper use of mobile devices, we used facilitating conditions. The model also includes determinants of behavioural intention and usage behaviour, with four moderators, namely age, gender, experience, and voluntariness. The moderators of age, gender, experience, and voluntariness are seen to influence the relationship between the constructs and behavioural intent to use mobile technology (Palau-Saumell et al., 2019). In combination, all these constructs and moderators relate to predicting the behavioural intention to use technology and, eventually, the actual technology use (Venkatesh et al., 2003). According to Tan (2013), behavioural intention has to do with the attitude towards a behaviour, determining teachers' definite utilisation of mobile devices in the classroom.

As TAM evolved into UTAUT, a new component emerged: a subjective norm, also referred to as social influence (Taylor & Todd, 1995). Social influence refers to "the extent to which users perceive what influential people close to them believe in the use of a particular technology" (Venkatesh & Davis, 2000, p. 187). Although Perceived Usefulness and Perceived Ease of Use are the primary constructs in TAM, in UTAUT, they are incorporated under the broader constructs of *Performance Expectancy* and *Effort Expectancy*, respectively. Therefore, this study will address Perceived Usefulness and Perceived Ease of Use as sub-components of *Performance Expectancy* and *Effort Expectancy.* In this study, the social influence construct is regarded as the school's expectations of the teachers in incorporating mobile technology into their teaching and learning processes.

The education system generally adopts technology, hoping that teachers will use it to enhance teaching and learning. Teachers look to their peers to see what they are doing, and if they experience success with technology, the other staff are bound to become more interested. As such, social influence could impact the behaviour of the teachers, which leads to another component of the UTAUT model, which is voluntariness, regarded by Venkatesh and Davis (2000, p. 187) as "the extent to which

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potential adopters perceive the adoption decision to be non-mandatory." This study intended to explore whether this was indeed the case and whether teachers thought that they were forced to integrate mobile technology in the classroom, or not. Due to the use of mobile technologies and the internet for social interactions, teachers might think that the use of technology is not mandatory. This view may be accurate in most schools in the country as some of the teachers only use technology occasionally in their teaching processes. The education authorities, including district officials and principals, expect teachers to employ mobile devices supplied to schools voluntarily in their teaching. Similarly, Waxman et al. (2020, p. 194) conclude that "principals have a positive view of technology and are using technology themselves". This viewpoint implies that they will encourage the integration of mobile technologies into their schools.

The last component of the UTAUT model is facilitating conditions, which is described as the "degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 203). The facilitating conditions aspect of UTAUT is supported by the moderating factors, namely gender, age, experience, and voluntariness of use. In a school environment, the availability of internet connectivity, technical support, and mobile devices could facilitate conditions that encourage or hinder implementation. Furthermore, there are more female teachers in schools who have been teaching for a long time using traditional methods than male teachers. Thus, it may not be easy for them to change the way they have been teaching voluntarily.

Though Broos (2005) found that females had a more negative attitude towards technologies and the internet than males, Al-Emran et al. (2016) found gender not to affect the use of mobile technologies. It has been noted that younger teachers are more likely to integrate technology into their classroom, when compared to older ones (Cox, 2013; Erişti & Kurt, 2012). As these younger teachers typically have more hands-on experience with modern-day technologies, they perceive the use of technology as a way to facilitate their teaching experience in a positive way (Cox, 2013). Interpreted in light of this study, the teachers' facilitation conditions regarding the technology made available to them, may have played a significant role in their willingness to apply technology in their classroom settings. As such, this study explored the conditions

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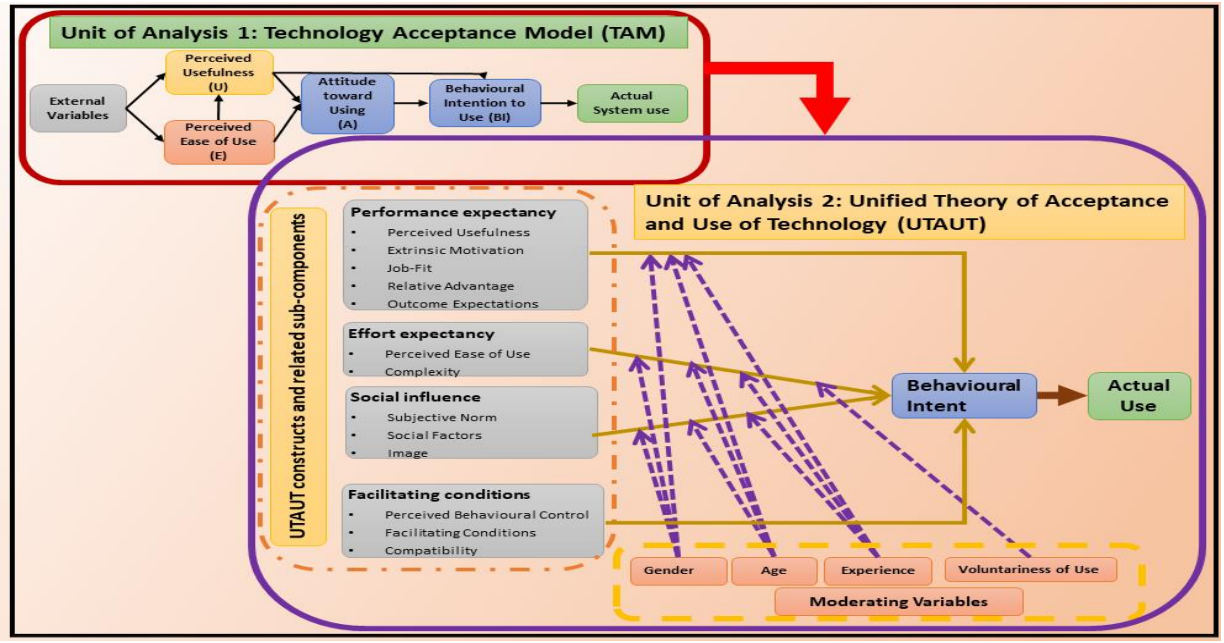
under which teachers were expected to use mobile devices in more detail. Figure 2.5 illustrates the TAM and UTAUT models that guided this study.

Despite TAM being widely used, Chuttur (2009) argues that TAM has several shortcomings, including very poor explanations and predictions, questionable heuristics, triviality, and an insufficient practical application. After analysing data from Unit of Analysis 1 and observing the implementation of mobile devices in schools, the researcher realised that mobile devices were still not optimally used. The research findings about mobile device usage were more focussed on personal attributes and personality traits, than on other aspects like policy, which are at play in a school context. This gap necessitated a closer look at other factors offered by UTAUT to achieve the study's intent better.

Figure 2.5

TAM and UTAUT models that guide the study



Adapted from Davis (1989) and Venkatesh et al., (2003)

All the components of UTAUT (see Chapter 3), assisted in exploring the perception of teachers concerning the usage of mobile technology in their classroom and will be used further in the study.

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2.8 CONCLUSION

This chapter reviewed previous studies on the diffusion and adoption of ICT, specifically mobile devices, in education. The term mobile learning was defined using numerous definitions as a variety of scholars coined it. In addition, the chapter discussed the benefits of mobile learning, teachers' perceptions regarding the use of mobile devices for teaching and learning, and the main barriers to the use of mobile technology in the classroom. The chapter also explored teacher perceptions with regards to educational technology. Finally, the theoretical framework, which includes both the TAM and UTAUT models were unpacked.

The next chapter presents the research methods and design that guided the entire study. The interpretivist paradigm, the study's qualitative nature, and the multiple case study model that was used, will be discussed. The chapter will also describe the research as a multiple case study with two units of analysis and elaborate on how data was collected and analysed.

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3. CHAPTER 3: RESEARCH METHODS AND DESIGN

3.1 INTRODUCTION

This chapter intends to present the methods and procedures used in the research process of this study to respond to the research questions and achieve the purpose of the study. The chapter also elaborates on the research paradigm for which interpretivism was identified. Furthermore, the chapter discusses the research methodology, the research design, the data collection, and data analysis methods used in the study.

3.2 RESEARCH PARADIGM APPLICABLE TO THIS STUDY

Positivism and interpretivism are the two key research paradigms used in educational research (Shah & Al-bargi, 2013). Mackenzie and Knipe (2006) indicate that in educational research, the phrase paradigm is used to refer to the researcher's "worldview'. Kivunja and Kuyini (2017) further elaborate that this worldview is the viewpoint, or set of common philosophies, that denotes an understanding or explanation of the research data. In other words, it is the procedural outlook that affords the researcher a theoretical lens that can be employed to establish the research and data analysis methods (Kivunja & Kuyini, 2017).

According to Ramorola (2010, p. 83), "a paradigm may be viewed as a set of beliefs or metaphysics that defines, for its holder, the nature of the world, the individual's place in it and the range of possible relationships to that world and its parts". Shah & Al-bargi (2013) define it as a unified collection of basic concepts, variables and problems attached with related methodological approaches and tools. Furthermore, Willig (2013) suggests that paradigms are essential requisites to a research project, and that the researcher must embrace an epistemological position. Typically, paradigms (see Figure 3.1) define the nature of an inquiry using three components. To begin with, ontology is the study of reality and the pursuit of knowledge about the nature of reality (Grix, 2019; Kivunja & Kuyini, 2017). Secondly, in epistemology, the researcher details the nature of the relationship between what he or she knows and what can be known (Grix, 2019; Kivunja & Kuyini, 2017). Thirdly, methodology refers to the practical

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processes by which a researcher studies whatever he or she believes can be known (Cohen et al., 2011; Myers, 2009).

Figure 3.1

Research paradigms

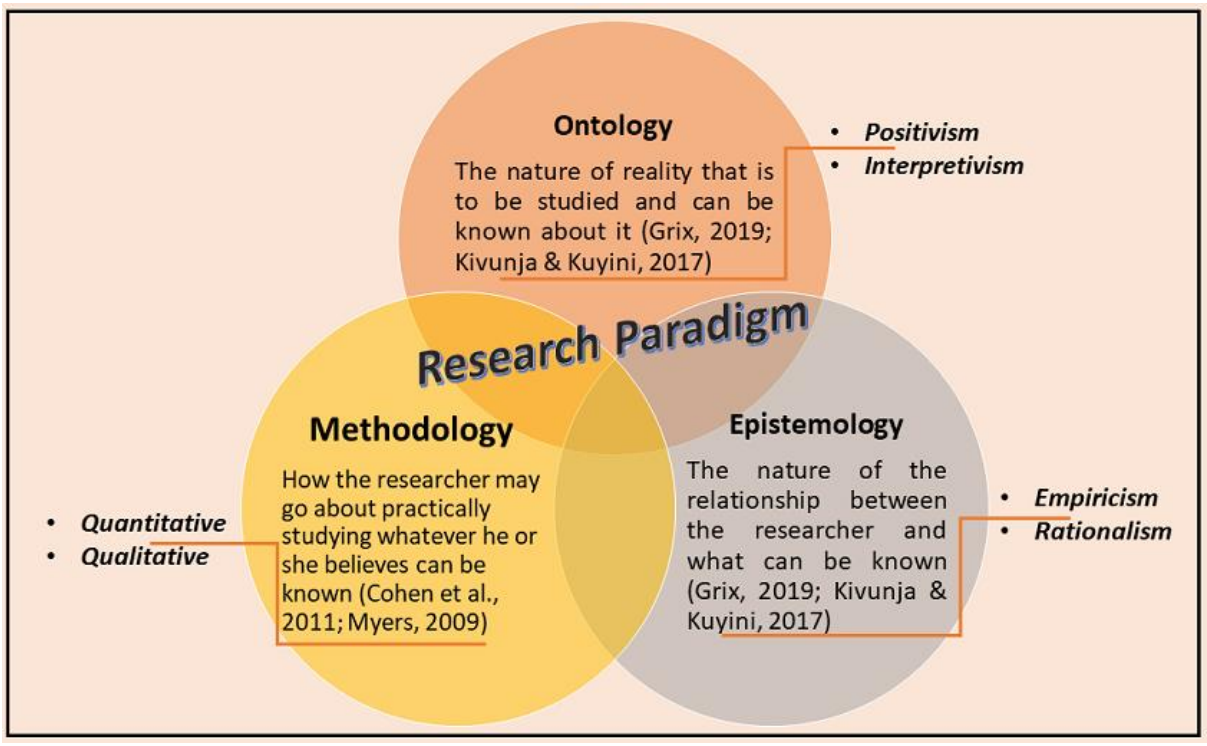

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Table 3.1 defines the paradigm aspects of two of the popular paradigms, namely, Positivism and Interpretivism.

Table 3-1

Definitions of the aspects of research paradigms

Aspect	Ontology	Epistemology	Methodology
Positivist	Stable external reality	Objective	• Quantitative • Experimental • Hypothesis testing
Interpretive	Internal reality of subjective experience	Observer inter-subjectivity	• Interpretative • Qualitative

Terre Blanche and Durrheim (1999, p. 4)

3.2.1 Positivism

Studies of Babbie and Mouton (2001), Remenyi (1992), Riege (2003) and Saunders et al. (2009) suggest that positivism is unbiased, and reality happens independently of personal incidents with its own cause and effect associations. There is a notion by positivist scientists that people behave logically most of the time (Babbie, 2010; Guba & Lincoln, 1994), which enables the explanation of social reality in rational terms.

However, Babbie (2010) rejects this notion by stating that people do not always behave logically. Furthermore, Babbie (2010) contends that to a certain extent, everyone reflects, construes and behaves instinctively. When applying natural science models to accounts of the social world and enquiries of social phenomena, one is trying to apply a positivist approach to social research (Denscombe, 2008), which isn't ideal. Based on Babbie's (2010) arguments, it is evident that this study should ideally not be aligned to the positivist approach.

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3.2.2 Interpretivism

There is an endeavour by humans to comprehend their world, thereby incessantly interpreting, creating, defining, justifying, and rationalising daily activities (Babbie & Mouton, 2001). These acts align themselves with the objectives of interpretivism, using the phenomenological approach, which aims to comprehend people (Babbie & Mouton, 2008). Furthermore, Collis and Hussey (2009) argue that what makes social reality subjective is the views of participants and the researcher's ideals and ambitions. In addition, interpretivist researchers believe that the significance that people allocate to their real lived world, should be used to interpret their reality (De Vos et al., 2011).

Primarily, the subject matter of the social sciences is differentiated from that of the natural sciences (Schwandt, 2014). Research in the social world entails subjectivity and significance created and allocated by people, with the researcher being an active participant (Blumberg et al., 2011). This reality, therefore, makes objective observation of the social world impossible (Blumberg et al., 2011).

Interpretive researchers are concerned with interpreting human comprehension of individual experiences rather than anticipating it (Daymon & Holloway, 2011). In this study, the attempt to interpret reality through perceptions, relate to the intent of teachers to utilisation mobile devices for instruction and learning. This study is, therefore, located in the interpretivist paradigm.

3.3 RESEARCH METHODOLOGY

The researcher attempts to candidly produce information that considers and encapsulates activities in the real world (Willig, 2013). The methodological effects of paradigm choice spread through the research questions, participants' selection, data collection instruments and collection processes, and data analysis (Kivunja & Kuyini, 2017). Positivists collect quantitative data analysed using quantitative procedures, whilst interpretivist affiliates with research methodologies and methods that gather and analyse qualitative data (Cohen et al., 2011; Shah & Al-bargi, 2013; Thornton & Houser, 2009; Yin, 2011). Flick (2011, p. 2) posits that "qualitative research involves an interpretive, naturalistic approach to the world", whilst Mouza & Barrett-Greenly

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(2015) indicate that it is the exploration of the personal experience and insights of the study participants that is involved. Furthermore, Wilson (2015) suggest that an interpretive position in research can be taken when the practices embrace the idea that people are inseparable from their world, and that an investigator shares this same world to some degree. Since this study is situated within the interpretivist paradigm, data will be gathered and analysed using qualitative methodologies and methods. Table 3.3 summarises the characteristics of quantitative and qualitative research methodologies.

Table 3-2

Characteristics of qualitative and quantitative research methodologies

Quantitative research	Qualitative research
Descripting and comprehending reality by identifying general "laws"	Different ways of looking at reality
Takes complexity into account by clearly defining the focus and techniques to be used	Incorporates the real-world context
Manipulates some variables (independent variables) while holding others constant	Studies behaviour in natural settings
Definition of research process ahead of time is required	Employs a flexible, emergent, but systematic research process
Focuses on cause and effect	Focuses on description and interpretation

Creswell (2009)

The purpose of this research reaffirms the characteristics of qualitative research as entailed in Table 3.2. Participating in a professional development activity presented teachers with different perspectives on the elements of mobile devices that could affect their intentions to use mobile devices in the classroom. The researcher discovered the

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meanings of the teachers' actions as they were expressed within the teachers' natural settings of their schools, which is a specific social context for them (Creswell, 2009; Grix, 2019). Furthermore, Merriam (2009) posits that qualitative research focuses on people's insights and consideration of their world, whilst Willig (2013) postulates that the attention of qualitative researchers is mostly inclined to lean towards how the participants recognise the importance of events in their context.

In this study, the real-world context and conditions of the participants entailed their overcrowded classrooms and the few mobile devices that were supplied by the Department of Basic Education (DBE) and other sponsoring agencies. An attempt to understand the teachers' perceptions, influenced by their beliefs and attitudes whilst influencing change in pedagogic practices, is paramount to the study. Therefore, a qualitative research method is relevant for this study in generating rich, detailed data in a natural environment and representing the participants' views. Data is gathered from the participants' context and own interpretation of reality. The researcher is at the centre of the data gathering process, thus bringing him closer to the participants.

Furthermore, the researcher is qualified enough to conduct the research, and the interest in the study is endorsed by being a teacher by profession and having studied computer-integrated education. In addition, the researcher had to adapt the design during the study from the initial plan by incorporating a second unit of analysis and by visiting an additional site that enabled the researcher to dig deeper and understand the teacher's perceptions on mobile devices. Thus, a further model was used in the second case to provide the researcher with the opportunity to learn more about the participants and obtain clarification for the study.

3.4 RESEARCH DESIGN

Creswell (2009) indicates that the purpose of the research design is to ensure that the research questions are answered and with the help of accumulated evidence. Cohen et al. (2011) support this by indicating that a research design comprises the strategy to be followed when undertaking the study, while Yin, (2011, p. 75) call them "logical blueprints".

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The research design for this study is an interpretive case study analysed through qualitative methods because the intention was to generate an understanding about the personal experiences of research participants in their real-world context (Willig, 2013; Yin, 2011). The case study design appeared fitting to capture the context in which teachers' intent to utilise mobile devices for instruction and learning was displayed in rich detail. Figure 3.2 illustrates qualitative research variations (Yin, 2011).

Figure 3.2

Qualitative research variations

Adapted from Yin (2011, p. 17)

The research aimed to explore the influence of the series of workshops on the teachers' actual use of mobile devices for teaching and learning purposes, and to then explain the continual use of these devices in their own classrooms. A qualitative case study design was employed to acquire insight into, and a deeper understanding of, the

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aspects that influenced the teachers' behavioural intent and actual use of mobile devices in class, while the distinct research questions influenced data collection and the data analysis process (Willig, 2013). Merriam (2009) defines a qualitative case study as a thorough, complete interpretation and study of a constrained phenomenon, such as a programme, an institution, a person, a process or a social unit. Stake and Kerr (1995) also define four characteristics of qualitative research which are applicable for qualitative case studies, namely holistic, empirical, interpretive and emphatic (See Table 3.3).

Table 3-3

Qualitative Case study characteristics

Characteristic	Definition
Holistic	The researcher should consider the interrelationship between the phenomenon and its context.
Empirical	The researcher bases their study on observations in the field.
Interpretive	Researchers base their perceptions on the interaction with the subject.
Emphatic	The researcher indirectly echoes the experiences of the subjects from their perception or angle.

Stake and Kerr (1995)

This study resonates with the abovementioned characteristics as it is conducted in the teachers' context of a school in a district, using the mobile devices given to them. Furthermore, the researcher observed the teachers as they used the mobile devices during the professional development workshops and allowed them to account for their experiences. These accounts were echoed in the writings of the study from the teachers' viewpoints since it gave their perception concerning their interaction with mobile devices. In addition, the researcher took care to provide thick and rich descriptions (Yin, 2011) of the two case studies to ensure that the study would be replicable by another researcher in a different context.

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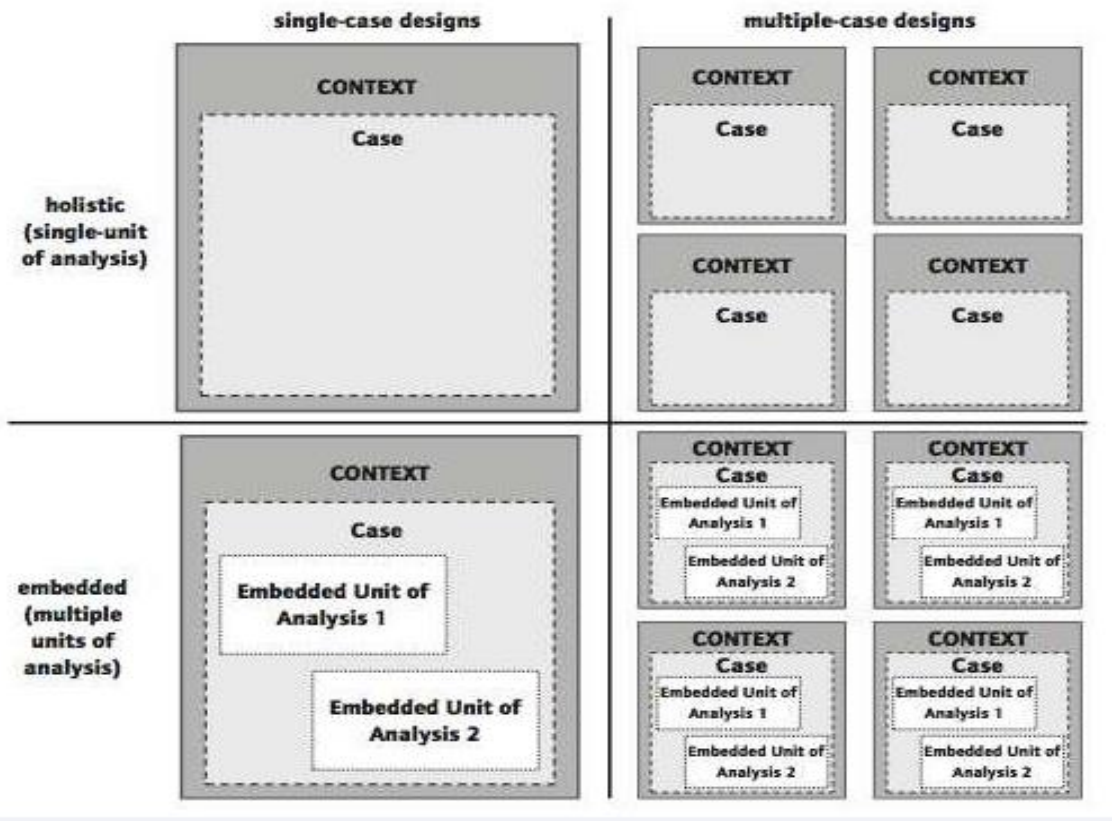
The study further sought to explain fundamental connections in real-life interventions, linking programme implementation with its effects. Consequently, using single-case design with a multiple embedded units of analysis method to enable the researcher to explore differences within cases, was used (Yin, 2011). Figure 3.3 illustrates the basic designs for case studies.

Figure 3.3

Basic designs for case studies



Yin (2014, p. 50)

The study applied a single-case design with multiple embedded units of analysis to explore how teachers' actual use of mobile technology for teaching and learning can be influenced through professional development. Despite being complicated, a single case study design with multiple embedded units of analysis allows for the production of valuable and dependable models (Yin, 2011).

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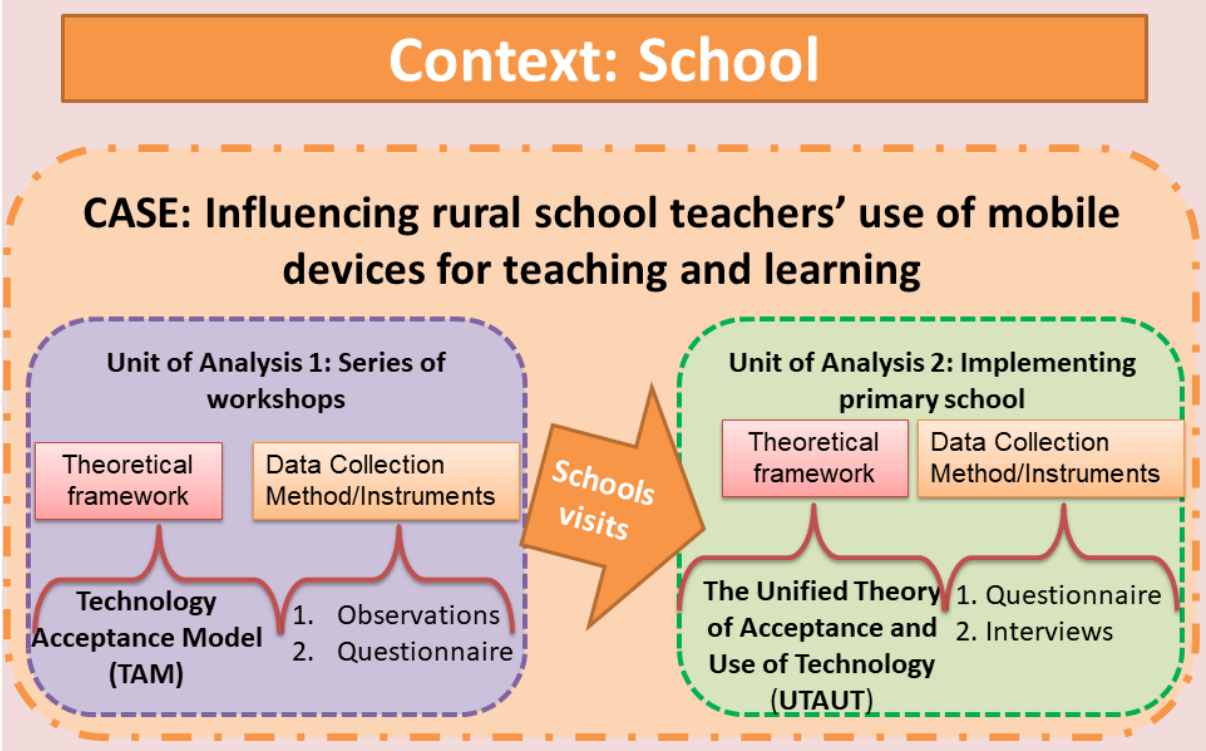
A single case study design with multiple embedded units of analysis was employed in this study (See Figure 3.4) by commissioning two levels of analysis:

- **Embedded Unit of Analysis 1** - The Bojanala district workshop series and its influence on teachers' attitude towards the use of mobile technology in their classrooms.
- **Embedded Unit of Analysis 2** - The implementation and use of mobile devices for teaching and learning by teachers during their classes in a primary school.

Figure 3.4

Single case study design with two embedded units of analysis



Adapted from Yin (2014)

For this single case study design with multiple embedded units of analysis, with the data collected while the teachers were engaging in activities in their real context of a classroom, the analysis of such data and the consequent findings will be discussed separately for each unit of analysis.

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3.5 UNIT OF ANALYSIS 1

Unit of Analysis 1 focussed on a series of the Bojanala district teacher professional development workshops intended to influence teachers' actual use of mobile technology for teaching and learning. Davis' (1989) TAM was used as a point of departure to produce the professional development initiative for the teachers of the Bojanala district. The professional development initiative took the form of a series of workshops at the request of the district e-learning official and focused on the use of mobile devices for teaching and learning.

The purpose of the workshops was to capacitate the teachers with the appropriate skills to enable them to use mobile devices to facilitate teaching in their classrooms. The intention was to be a catalyst for a behavioural change in their subsequent intention to use the available mobile devices for educational purposes. To investigate whether the workshop was such a catalyst, the researcher explored the teachers' perceptions about the usefulness and ease of use of mobile devices to see whether they influenced their attitude, behavioural intent and actual use of mobile devices in class.

3.5.1 Population and Sampling

The population of this study was purposefully and conveniently selected from teachers in the Bojanala district of the North-West province in South Africa (see Figure 3.5). Polit and Beck (2006, p. 506) define a population as a group of individuals having the same qualities, whilst a sample is defined as "the section of the wider population that will be engaged" in the study. In research, the two sampling methods used are probability sampling, whereby the population members get an equal opportunity to be chosen as a representative sample, and non-probability sampling techniques in which it is unknown which individual from the population will be selected as a sample (Greener, 2008). For this study, non-probability sampling techniques were used.

The specific sampling techniques used in this study were convenience and purposive sampling. Bhattacherjee (2012) defines convenience sampling as a method of drawing a sample from a component of the population that is close at

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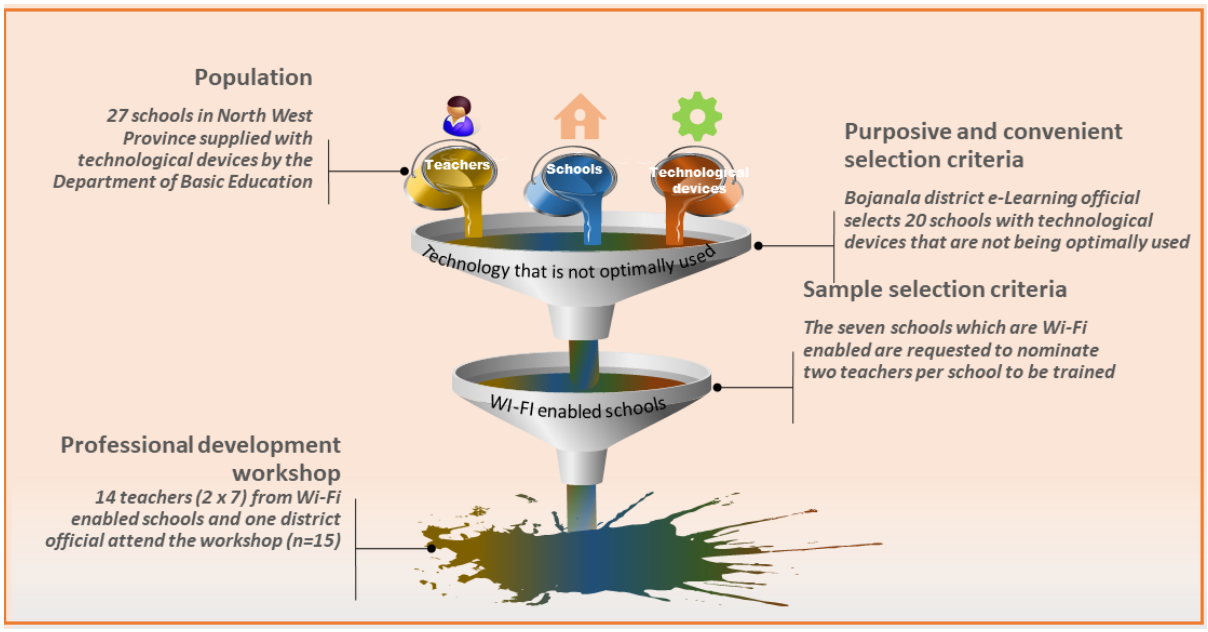
hand and readily available. At the same time, Saunders et al. (2009) posit that purposive sampling allows the researcher to select cases that will enable them to answer the research question and meet the study's objectives. Therefore, the research design of this study required a sample of teachers who found themselves in schools where mobile technologies and internet connectivity were available, but not yet used to their full extent. In Figure 3.5, a summary of the population, sample and activities in which the participants were involved are displayed.

Figure 3.5

Population and sampling



Of the 20 schools in the Bojanala district with Wi-Fi and mobile technologies, but who do not yet use the technology optimally, 14 teachers were conveniently and purposely selected. Their schools have had access to mobile technologies supplied by the National Department of Basic Education. As an additional criterion, each school was requested to nominate two teachers to attend the series of workshops based on their potential to implement what they have learned from the workshops in their schools, upon their return. The selection criteria resulted in 14 teachers and one district official attending the district professional development workshops that focused on mobile devices for teaching and learning purposes. The group included both primary and secondary school teachers, with three males and 11 females. Figure 3.6 illustrates the

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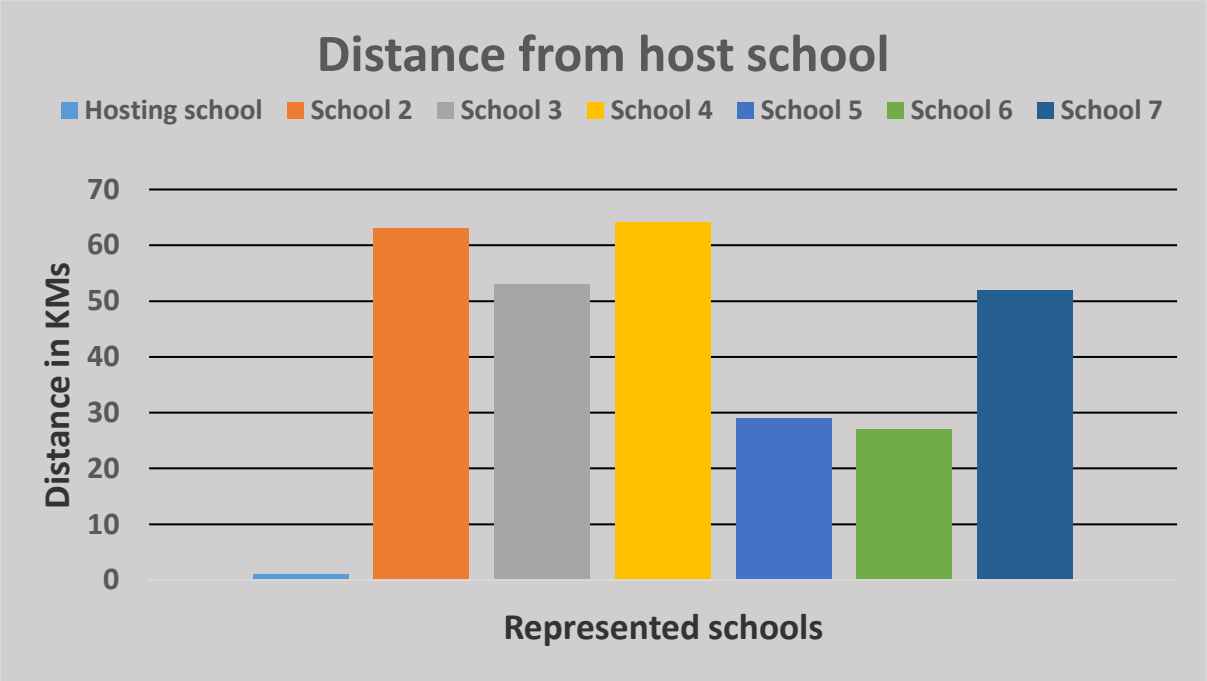
distance of each represented school from the host school that each teacher had to travel.

Figure 3.6

Distance from host school



The schools where the teachers came from were all located within 64 kilometres of the venue selected for the workshop. The Bojanala district from which the schools were selected is predominantly rural in a geographical landscape, where the data collected provides to the thick descriptions that are intended to give other researchers who may want to replicate the study in the rural areas a good understanding of the context.

3.5.2 Data collection instruments

Qualitative data was collected through questionnaires and observations. Figure 3.7 illustrate the data collection matrix.

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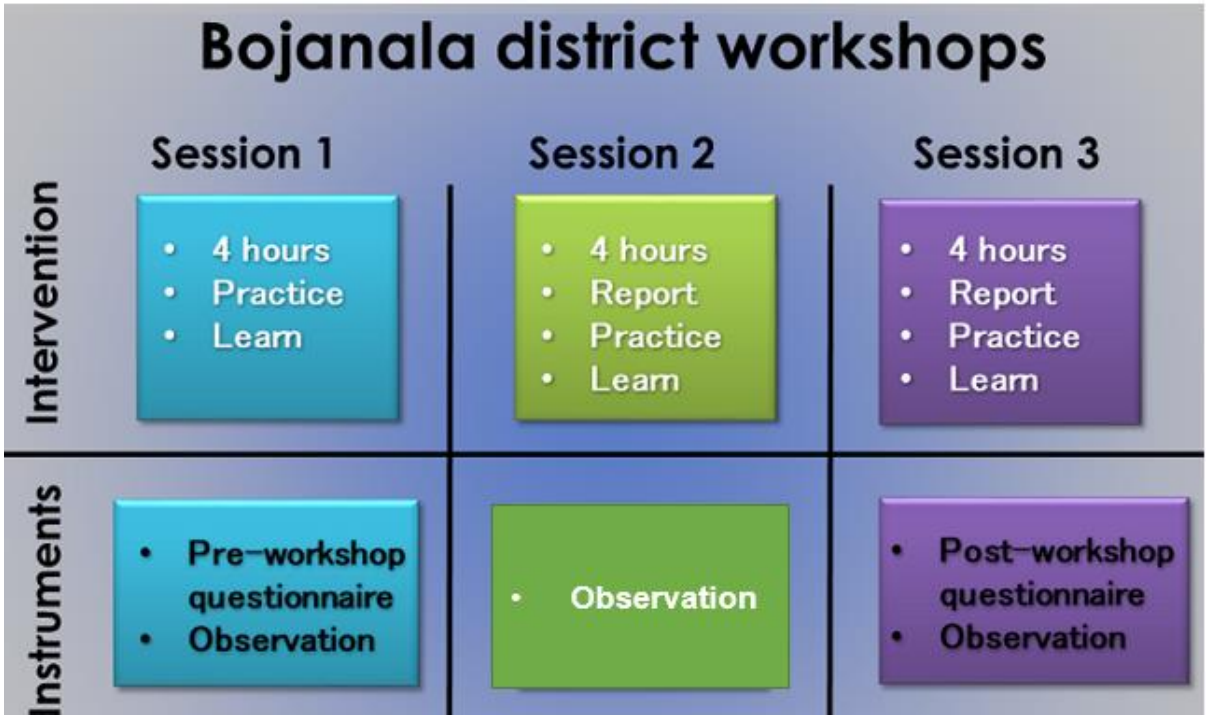
Figure 3.7

Data collection matrix



Questionnaires are one of the major research instruments for determining people's perceptions, understanding, attitudes and tendencies for future action (Bulmer, 2004). Based on the two constructs of the TAM, the questions enabled the researcher to acquire information with regards to teachers' perceptions about the usefulness and ease of use of mobile devices. They also provided information on the role that external factors play in their adoption of mobile learning and the influence of these elements on their attitudes, behavioural intent and actual use of the devices in class (Davis, 1989).

Davis' (1989) instrument from which this questionnaire (See Annexure D: TAM questionnaire) was adapted was developed and validated for the constructs *perceived usefulness* and *perceived ease of use*, to determine user acceptance of technology (Davis, 1989; Ramayah & Ignatius, 2005). The questionnaires used in this study were developed using Google Forms and were administered electronically through a WhatsApp group called "Mobile Learning", created specifically for the research. The intention was to allow respondents to elaborate on the experience of using their own

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mobile devices. Furthermore, it was convenient to distribute a link to the questionnaire in this manner, as all participants had access to the “WhatsApp” group.

Respondents rated their opinion of *perceived ease of use* and *perceived usefulness* using a 5-point Likert scale ranging from 1=Strongly disagree, 2=Disagree, 3=Neither disagree nor agree, 4=Agree, to 5=Strongly agree. For their *intent to use mobile devices* in teaching and learning, opinions were rated using a 5-point Likert scale ranging from 1=Very Unlikely, 2=Unlikely, 3=Neither unlikely nor likely, 4=Likely and 5=Very Likely.

Participant observation checklist (Annexure E) was used to document and collect data during the three professional development workshops on using mobile devices in teaching and learning. The researcher was a participatory observer and took notes of the participant actions and comments. Unlike interviews, which are somewhat formal, participants’ observations enable the researcher to uncover meaning and to discover interpretations (Easterby-Smith et al., 2012).

In the workshops, the participants were trained on how to use mobile devices as resourceful tools for teaching and learning by introducing various applications that were either downloaded or directly accessible on the Internet. The study did not focus on the intervention in itself, however, a section of this study was dedicated to its design. This focus is in line with the commitment of the study to rich and thick descriptions to enable future researchers to replicate the study in their own environments.

3.5.3 The design of the intervention

Open Educational Resources (OERs) were utilised in designing the intervention. According to Al-Adwan et al., (2018), an OER is a digitised resource that is freely available for everyone to access, modify, and reuse for the purpose of teaching, learning, and research. The advantages of OERs influenced the selection of the tools used to familiarise teachers with the use of mobile devices for teaching and learning during the workshops. OERs were used to avoid costly applications that would need

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participants to subscribe, especially since they were from schools in disadvantaged areas and depended solely on a government budget.

The instructional principle of scaffolding was used. Mishra (2013) describes scaffolding as when a competent person shifts the level of support and adapts the amount of guidance to fit a learner's existing skills. As the participants had diverse prior experience with mobile learning, the workshops' facilitator had to accommodate and support each participant at their specific level. A supportive learning environment was intentionally created, and participants were encouraged to support and help one another where needed.

The workshop was presented over a period of six weeks, with three contact sessions, one every two weeks (See Figure 3.8). The intervention was designed based on pre-selected open-source applications that could be considered useful at any school level and in any discipline.

Figure 3.8

Workshops

The first workshop involved familiarising participants with their devices and downloading applications where applicable. Figure 3.9 illustrates the workshop session one programme.

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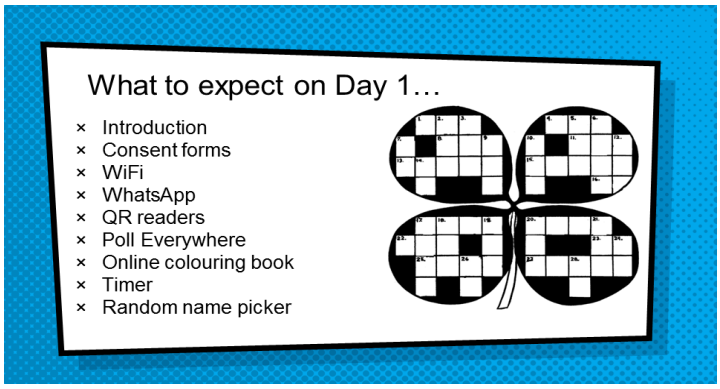
The participants had to connect to the school's Wi-Fi using credentials set for participants by the host school's service provider. This was done through mobile devices that they brought from their schools and their personal mobile devices.

Figure 3.9

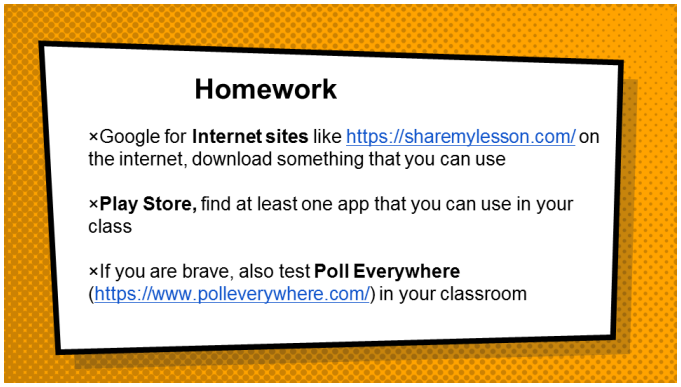
Programme for Workshop 1



Activities relevant to teaching were used as examples on the open-source applications to which the teachers were exposed. The teachers participated in the intervention as learners but were then expected to implement what they have learned in teaching their disciplines in their own classrooms during the two weeks following the workshop. As such, each workshop ended with participants being given homework, that included exploring sites that provided teaching tools and resources considered beneficial to teaching and learning. Figure 3.10 illustrates the homework given and the sites they had to explore on their own.

Figure 3.10

Homework for Workshop 1



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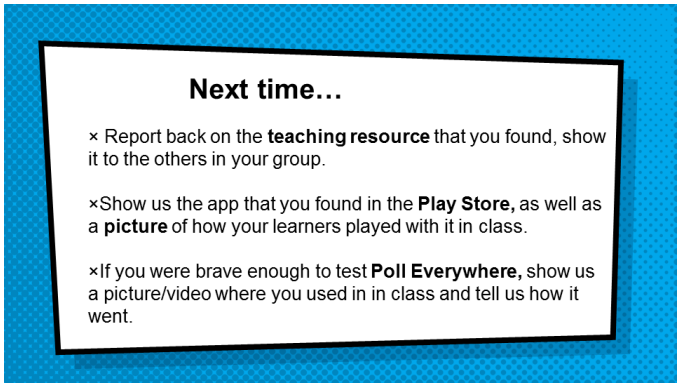
The second workshop, started with participants reporting back on their implementation of what they learned during the first workshop. They elaborated on their experience, sharing both their successes and the challenges they experienced. The participants were allowed to request further assistance on the technical aspects of the applications that were used.

In the third workshop, other applications were explored, and their relevance to teaching and learning were explained. This allowed the participants to demonstrate how they used the applications in their own subjects and to discuss the challenges they experienced.

At the end of each workshop, participants were given the opportunity to elaborate on their experiences during the training and at the beginning of the next workshop to share their expectations for the workshop. They also had the opportunity to share the experiences they had introducing mobile learning into their classroom during the two weeks since the previous workshop with the members of their group. Figure 3.11 illustrates the expectations for the next session.

Figure 3.11

Expectations for Workshop 2



This study alluded to the fact that integrating new technologies mandates a change in the professional development of teachers' content knowledge, practices and attitudes (see Chapter 1: Background). The research raised a concern on how teachers can be assisted to experience the technology, thereby enabling them to assume new roles and capacitating them to integrate mobile devices into their daily activities of teaching

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and learning (Foko, 2009). Through this series of workshops on the integration of mobile devices into the teaching and learning practices of the teachers in the Bojanala district, the intent was to investigate how encouraged and empowered teachers were to implement the devices into their own classrooms. The teachers' familiarity with the devices for personal use gave them the courage to explore freely during the series of workshops. The demonstrations guided the teachers on using mobile technologies to develop learning materials relevant to the ever-changing educational system spearheaded by the evolution of the internet and new media.

3.5.4 Data analysis

Stake (2006) posits that to comprehend cases qualitatively, the researcher has to experience the activity as it ensues in its context and the particular situation. A method of natural language analysis, namely, content analysis was employed. Content analysis is the method of probing data for predetermined concepts and philosophies (Easterby-Smith et al., 2012).

In this study, the questions were set or formulated to collect data based on predetermined concepts of *perceived usefulness* and *perceived ease of use*, enabling easy cataloguing of themes during analysis. Furthermore, the researcher was a participatory observer who took notes of the participants' actions and deliberations during the workshop activities. Data from the questionnaires and the observation checklist was extensively analysed by reading through responses and matching them to findings from other data sources. Furthermore, the questionnaires' data was analysed by means of descriptive statistics and graphical representation of the data to assist the reader. The findings of the data will be further elaborated on in Chapter 4 and linked to themes emanating from the concepts of perceived usefulness and perceived ease.

3.6 UNIT OF ANALYSIS 2

For teachers to realise effective gains from mobile devices and inspire commitment from learners, they have to integrate these devices and apps into the curriculum (Chou et al., 2012). The researcher conducted school visits three months after the series of

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the Bojanala district teacher professional development workshops. The purpose of the school visits was to observe if teachers were implementing the knowledge gained from the workshops by integrating their mobile devices into their teaching and learning practices. Out of the three schools visited in the Bojanala district, only one school was found to be actively implementing their mobile devices. The visited schools were conveniently selected due to their proximity and easy access for the researcher.

The implementing school became the focus of further study as the second unit of analysis in the single-case design with multiple embedded units of analysis. The objective was to probe further, and TAM was found not fit for purpose as it only considered usefulness and ease of use, thus not being suitable for providing insight into what enables the teachers from the observed school to implement and apply the knowledge gained from the workshop they attended as described in Unit of Analysis 1.

The researcher sought suitable models and ultimately employed the unified theory of acceptance and use of technology (UTAUT), which was introduced by Venkatesh, Morris, Davis, and Davis in 2003. The UTAUT model was expanded by consolidating several concepts of eight models applicable to Information Systems (IS) usage behaviour (see Figure 3.12). The model had additional variables besides perceived usefulness and ease of use, that would assist the researcher in understanding possible reasons of implementing mobile devices at the particular school, which possibly relate to facilitating conditions and social conditions.

The constructs and variables used were derived from the study's theoretical framework as espoused by Venkatesh et al. (2003). Figure 3.12 illustrates the UTAUT model's variables, upon which the study and subsequently data collection instruments were formulated.

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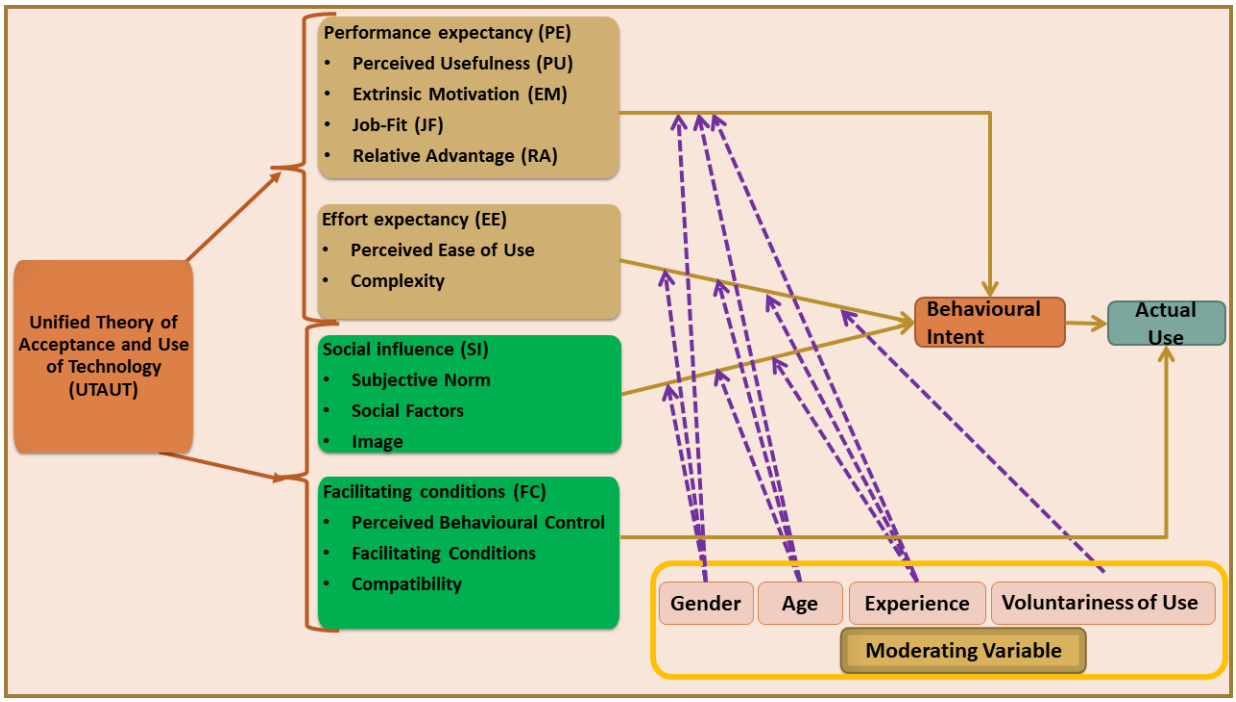
Figure 3.12

UTAUT variables



Adapted from Venkatesh et al. (2003)

3.6.1 Population and Sampling

As explained in Unit of Analysis 1, the population of this study was purposefully and conveniently selected from teachers in the Bojanala District of the North-West province of South Africa (See Figure 3.6). The teachers were conveniently and purposely selected because their schools have access to technology equipment supplied by the National Department of Basic Education. Still, it seemed as if the technology was not being used optimally or not being used at all. The district official selected Wi-Fi enabled schools in the Bojanala district. As an additional criterion, each school was requested to nominate two teachers who would attend the workshop and be able to implement what they have learned from the workshop. Even though only two teachers out of 26 from the implementing primary school, which serve as the second unit of analysis, attended the workshops, 13 teachers completed the questionnaire (see Annexure F), and seven volunteered to participate in the semi-structured interviews (See Annexure G).

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The school is situated in a village within the Bojanala educational district of the Northwest province in South Africa. The setup of South African primary schools comprises of three phases, namely, Foundation phase: Grade R to 3, Intermediate phase: Grade 4 to 6 and Senior phase: Grade 7. The school that was observed catered for all three these phases. The school had an enrolment of 998 learners, with a ratio of approximately 1:47 in each classroom, which in itself, can be seen as a clear indication that, if introduced properly, mobile technology can add value.

3.6.2 Data collection instruments

The UTAUT model, which explores acceptance and the use of technology by probing *Performance Expectancy* and *Effort Expectancy*, *Social Influence*, *Facilitating Conditions* and *Moderating factors* of gender, age, experience, and voluntariness of use, guided the researcher to formulate the data collection instruments. Figure 3.13 illustrates how the data was collected in Unit of Analysis 2, to explore how the actual and continuous use of mobile devices in a particular school can be explained.

Figure 3.13

Data collection

Data collection instruments/methods	Sample size (respondents/interviewees)
Questionnaire	13 teachers (respondents)
Lesson observation	Head of department
Interview	7 teachers (interviewees

The questionnaire sought to gather information on variables relating to the UTAUT model, namely *Performance Expectancy* and *Effort Expectancy*, *Social Influence*, *Facilitating Conditions* and *Moderating Factors*. These variables would enable the researcher to acquire information with regards to teachers' perceptions about:

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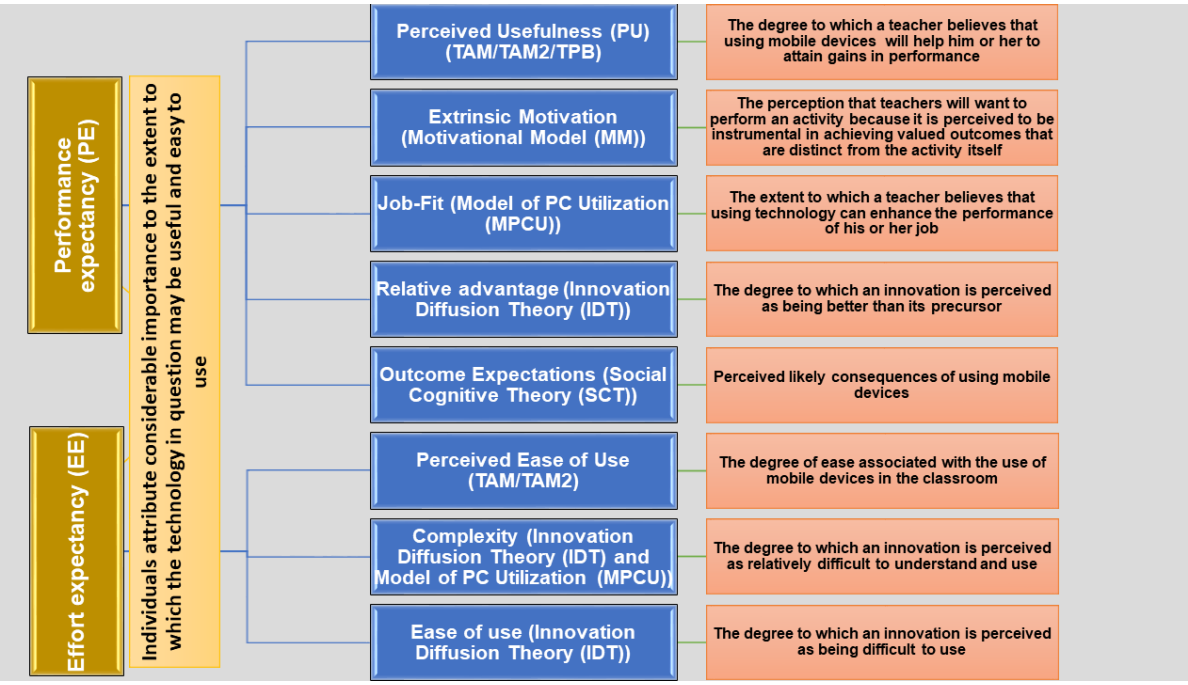
the usefulness and ease of use of mobile devices; status and facilitating conditions; as well as age, gender, experience and self-initiative and its influence on their attitudes, behavioural intent and actual use of mobile devices in class (Venkatesh et al., 2003).

The questionnaire was divided into three sections according to the UTAUT variables. **Section one** comprises the *variables* (see Figure 3.14), which relates to teachers' attributing considerable importance to the extent to which the technology in question may be useful and easy to use. The related constructs are *Performance Expectancy* (PE) and *Effort Expectancy* (EE).

Figure 3.14

Performance Expectancy (PE) and Effort Expectancy (EE)



Adapted from Venkatesh et al. (2003)

Section two comprises variables (see Figure 3.15), which relate to teachers associating the importance to the facilitating conditions such as help desks and training programs and the experiences of other individuals in using the mobile devices. The related constructs are *Social Influence (SI)* and *Facilitating Conditions* (FC).

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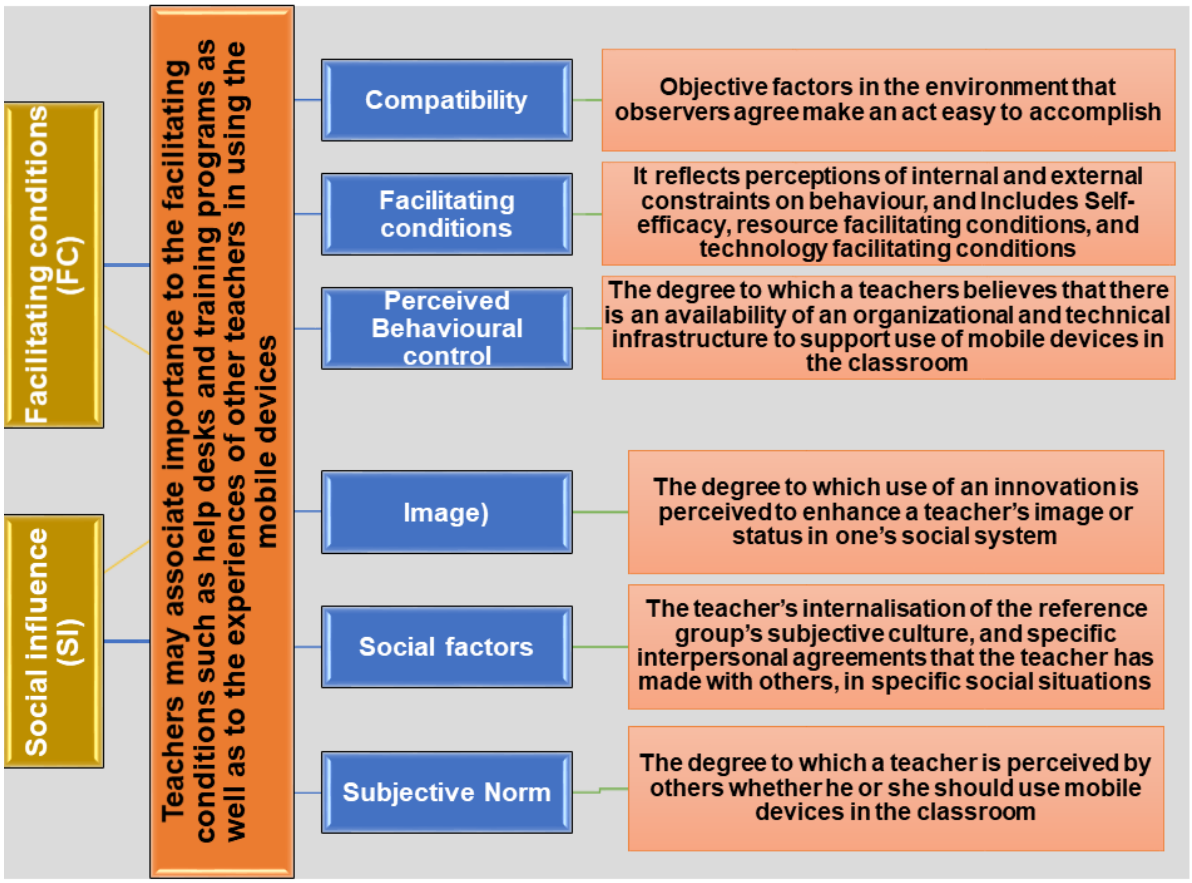
Figure 3.15

Social influence and facilitating conditions



Adapted from Venkatesh et al. (2003)

Section three of the questionnaire relates to the moderating variables of age, gender, experience and voluntariness of use (see Figure 3.16). The variables are considered in determining how they influenced the teachers' attitudes, behavioural intent and actual use of mobile technologies in class.

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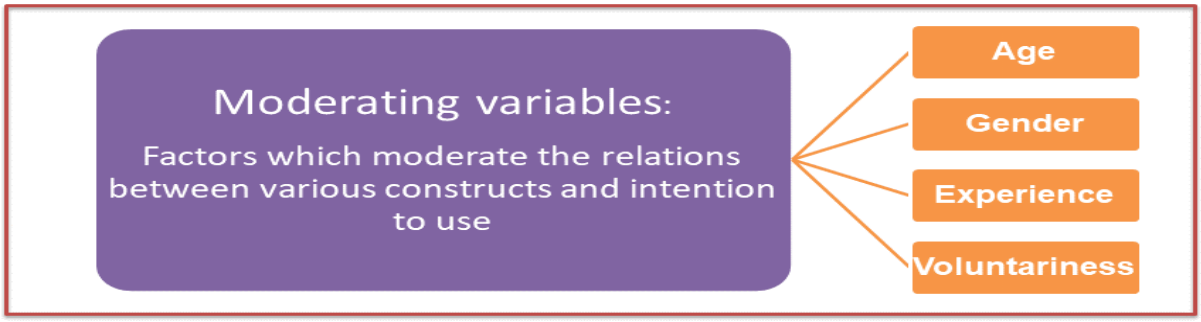
Figure 3.16

Section three - Moderating variables



Adapted from Venkatesh et al. (2003)

The questionnaires used in this study were developed using Google Forms and administered electronically through a WhatsApp group called “Mobile Learning”, created specifically for the research. The intention was to allow respondents to elaborate on their experience of using mobile devices. Furthermore, it was convenient to distribute a link as all participants had access to the WhatsApp group.

Respondents rated their opinion on technology attributes and contextual factors using a 5-point Likert scale ranging from 1=*Strongly disagree*, 2=*Disagree*, 3=*Neither disagree nor agree*, 4=*Agree*, to 5=*Strongly agree*. For their *intent to use mobile devices* in teaching and learning, opinions were rated using a 5-point Likert scale ranging from 1=*Very Unlikely*, 2=*Unlikely,* 3=*Neither unlikely nor likely,* 4=*Likely* and 5=*Very Likely*. The biographical section of the questionnaire was used to seek information that would enlighten the researcher regarding the influence of moderating factors.

Interviews are regarded as a more realistic and less systematised data collection tool which may widen the extent of comprehending investigated phenomena (Alshenqeeti, 2014). The setup of the interview should be structured through subject guides that elucidate areas of concern, even if the focus interview is not rigorously arranged (Easterby-Smith et al., 2012). Furthermore, Easterby-Smith et al., (2012) suggest that this requires that the researcher gain the participants' trust through personal interaction, while enabling them to employ the critical incident technique. Flanagan

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(1954, p. 09) define a critical incident technique as “a procedure for gathering certain important facts concerning behaviour in defined situations”. On the other hand, Allen (2017) sees it as a logical, flexible procedure that includes investigating particular circumstances to establish likely consequences of activities displayed by participants in a dedicated context. The incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effect to be considered critical (Easterby-Smith et al., 2012).

The study employed semi-structured interviews to enable the researcher to delve into and encourage the interviewees to expand their response. The interview protocol (Annexure G) entailed questions that sought to gather information on variables relating to *Performance Expectancy* and *Effort Expectancy*, *Social Influence*, *Facilitating Conditions* and *Moderating factors* of gender, age, experience, and voluntariness of use (Venkatesh et al., 2003). Table 3.4 illustrate the interview questions and how they link to the model (UTAUT) variables.

Table 3-4:

UTAUT variables and interview questions

UTAUT Variables		Interview Questions
Performance expectancy (PE)	**Perceived Usefulness (PU)**	How useful do you think it is to use mobile devices in your classroom?
	Extrinsic Motivation	How would mobile devices help you to achieve learning outcomes in a fun way?
	Job-Fit	In what way would you say mobile devices will enhance your/learners' performance?
	Relative advantage	How are mobile devices better than board and chalk?
	Outcome Expectations	How would mobile devices lead to effective learning?
Effort expectancy (EE)	**Perceived Ease of Use**	In your own opinion, what are the challenges of introducing mobile devices into your classroom?
	Complexity	How does utilising mobile devices affect your daily tasks/ activity?
	Ease of use	In you understanding, does mobile devices have a positive impact on learners or in your school?

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Social influence (SI)	**Subjective Norm**	How encouraging are your colleagues wrt the use of mobile devices for teaching and learning?
	Social Factors	In your opinion does mobile devices promote collaboration among learners?
	Image	To what extent does mobile devices promote positive outlook on learning?
Facilitating conditions (FC)	**Perceived Behavioural Control**	1. What factors would you regard as barriers to your using mobile devices in your classroom? 2. What do you think should be done to overcome these barriers?
	Facilitating Conditions	What assistance is available for you to implement teaching with technological devices in the classroom? Follow-up: At what level of the school system do you receive support?
	Compatibility	How convenient is it to access the mobile devices in your school?
age		
gender		
experience		
voluntariness		Do you think teachers in the school have intentions to use mobile devices in the classroom?

The researcher was invited to observe an English First Additional Language lesson where the topic was “Storytelling”. Digital lesson implementation enables learner-driven inquiry-based learning by exploring different applications using mobile technology. Furthermore, a digital lesson enhances interaction among learners, improves learner engagement with learning material, and encourages creativity and personalisation of work according to character and ability. Interpersonal skills, collaboration, teamwork, and critical thinking are some of the skills learners acquire from such a lesson (Rahmat & Au, 2013).

3.6.3 Data analysis

The researcher used the same content analysis method used to analyse data in Unit of Analysis 1 (See 3.5.4) to analyse the data collected. The questionnaire and interview questions were formulated to collect data based on predetermined concepts

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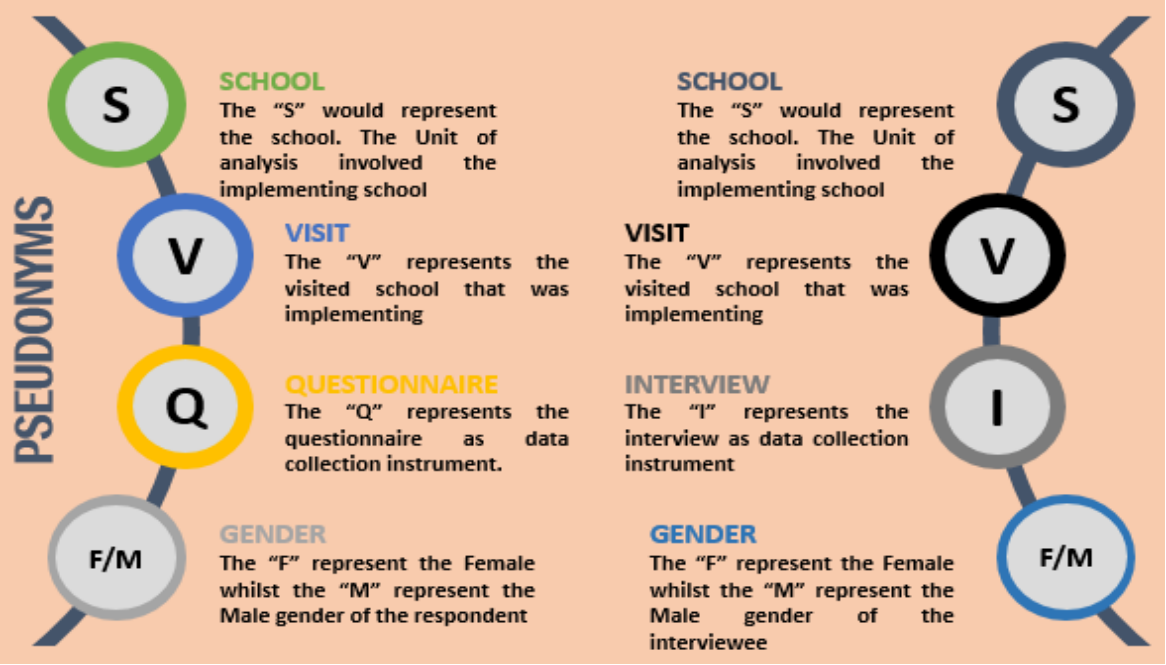
of moderating variables, technological attributes and facilitating conditions, which are the UTAUT model constructs (Venkatesh et al., 2003). The questionnaires' data was analysed by means of descriptive statistics and graphical representation of the data to assist the reader. Furthermore, the researcher was a participatory observer who took notes of the participants' actions and deliberations during the observed lesson activities. Data from the questionnaire, the observation notes and interview transcripts were extensively analysed by reading through the participants' responses and observation notes. The keywords created were catalogued according to the variables during analysis and matched to findings from other data sources.

Figure 3.17 represents the coding used as pseudonyms to identify the questionnaire respondents and the interview participants to ensure anonymity and confidentiality.

Figure 3.17

Coding system



The findings of the data will be further elaborated on in Chapter 4 as catalogued according to UTAUT constructs.

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3.7 MEASURES TO ENSURE TRUSTWORTHINESS

Willig (2013) defines validity as the degree to which our research portrays, evaluates or explains what it aims to describe, measure or explain. The author Willig (2013) further posits that the agility and open-mindedness of qualitative research methods provide the space for validity issues to be addressed during the research.

Even though the trustworthiness of qualitative research has been criticised, measures to ascertain its thoroughness have existed for many years (Shenton, 2004). Researchers have the opportunity to enhance the trustworthiness of their studies by having a protracted encounter with data sources, constant observation of developing matters, satisfactory checking of raw data with their sources, triangulation of raw data; usage of critical readers, sufficient review and adequate justification of the research (Bassey, 2007). Furthermore, Guba (1981), suggested four criteria for qualitative research trustworthiness: namely dependability, confirmability, transferability and credibility (see Table 1.2). The trustworthiness of this study will be discussed according to these four criteria suggested by Guba (1981).

3.7.1 Credibility

The credibility of the study was ensured through persistent observation (Bassey, 2007). According to Shenton (2004) and Bitsch (2005), extended interaction with the context and participants is advantageous to the researcher because it helps him/her understand the essential characteristics of the setting. The researcher was actively involved in the study and conducted observations during the professional development sessions and three months after the Unit of Analysis 1. The observations resulted in further study being conducted, namely Unit of Analysis 2, at a school that was implementing mobile devices. Furthermore, the employment of the crystallisation method by means of a variety of data collection instruments guaranteed credibility of the study (Ellingson, 2014).

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3.7.2 Transferability

The researcher facilitates the transferability judgment by a potential user through a thick description of the case, and purposeful sampling (Bitsch, 2005). In addition, transferability is described as the thorough account and establishment of the study's setting by providing background data to enable associations to other settings to be made (Guba, 1981).

In this study, the researcher gave a thorough description of the background (Chapter 1: 1.2 and 1.3), and the problem statement also elaborated on the milieu. Furthermore, the teaching and learning context was in a school that reports to a district, the province, and the national department. The researcher's assumptions were based on the interpretive paradigm, which led to the qualitative research design methodology being used. The population and sample were purposefully and conveniently selected because their schools have access to technology equipment supplied by the National Department of Basic Education. Still, it seemed as if the technology was not being used optimally or at all. The district official selected Wi-Fi enabled rural schools in the Bojanala district. As an additional criterion, each school was requested to nominate two teachers who would attend the workshop and be able to implement what they have learned from the workshop. This resulted in 14 teachers and one district official attending the district professional development workshop on the use of mobile devices for teaching and learning. The activities of the series of workshops were briefly described. The researcher was actively involved through data collection and in analysing the data, and reporting on the findings. Furthermore, the researcher made recommendations from the findings.

3.7.3 Dependability

To ensure stability of the data collected, the researcher, when preparing research instruments such as questionnaires, interviews, and observation, sought advice and comments from the study's supervisor and language specialists to ensure the accuracy of the research instruments. The instruments were adapted from those of Davis that were already validated, which would enable other researchers to repeat the

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study if necessary. Furthermore, the instruments were submitted for critique to the ethics board before the researcher was granted ethical approval.

3.7.4 Confirmability

Confirmability is defined by Connelly (2016, p. 435) as “the degree findings are consistent and could be repeated”. Measures must be taken to ascertain that the study’s findings are the outcomes of participants' experiences and thoughts and not the researcher's favourite descriptions to avoid investigator bias to ensure confirmability (Shenton, 2004). Furthermore, the analysis of the findings were shared with an objective critical, whilst the data collection instruments and collected data are available for scrutiny.

The researcher’s study supervisor reviewed the findings in this study, and a co-supervisor was appointed to be a critical reader. The supervisor was part of the professional development sessions and thus better positioned to critique, review, and check that the findings emerged from the data collections instruments.

3.8 ETHICAL CONSIDERATIONS

In qualitative research, participant observation and interviews may culminate in a trusting self-disclosure and sharing of personal information and private experiences due to the researcher's involvement (Cacciattolo et al., 2015). It is of utmost importance that the researcher considers ethical issues such as subject approval and informed consent, privacy, confidentiality and anonymity to protect participants from exploitation and harm (Mauthner et al., 2012; Noaks & Wincup, 2004).

3.8.1 Informed consent and subject approval

The researcher adhered to the University of Pretoria’s ethics requirements and protocol when applying for permission to conduct research. The research proposal was approved by the departmental committee. Data collection instruments were submitted with ethics application forms and an ethical clearance letter with reference SM 18/01/02 was issued. by the university’s ethics committee. To conduct research at

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the various schools, a letter of approval to conduct the research was received from the Northwest Department of Education and Sports Development (Annexure A). An information leaflet and consent form that guaranteed voluntary participation, stating that participants could withdraw from the study at any time, was developed on Google forms (Annexure B). This was done to ascertain the participants' comprehension of what the research entailed and the implications of their participation (Noaks & Wincup, 2004).

3.8.2 Confidentiality, anonymity and trust

English was used as the language of research, while participants were allowed to respond in a language with which they are comfortable and competent. The identity of the participants and of the schools was protected by using pseudonyms (Cohen et al., 2011). In keeping the participants' information confidential, all identifying descriptions were removed before dissemination and only the researcher, supervisor and critical readers had access to research records. Recorded interview audio files were kept in a locked hard drive.

3.9 CONCLUSION

This chapter discussed the research paradigm applicable to this study. The distinction between positivism and interpretivism was made to deliberate on the assumptions that led to selecting the suitable paradigm. The chapter also identified the applicable research methods that necessitated the employment of qualitative methods to guide the study. The chapter moreover discussed the research design, population and sampling, data collection and data analysis techniques.

Furthermore, the single case study design with multiple embedded units of analysis used to enable the researcher to explore differences within cases, was discussed. This choice culminated in two embedded units of analysis: the teacher professional development as Unit of Analysis 1 and the implementing school as Unit of Analysis 2. During these activities, questionnaires, an observation checklist, and interviews were used as data collection instruments. The ethical considerations with which the study

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complied to, to ensure subject approval, informed consent, confidentiality, anonymity, and trust were explained.

Chapter four will elaborate on the findings and analysis, and the discussions will be based on the two units of analysis according to the elements of TAM and UTAUT. Unit of Analysis 1 will deliberate on the aspects of the pre-workshop questionnaire, as well as perceived usefulness and perceived ease of use of TAM. Unit of Analysis 2 will deliberate on the moderating factors, performance expectancy, effort expectancy, social influence and facilitating conditions of the UTAUT model.

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4. CHAPTER 4: ANALYSIS, FINDINGS AND DISCUSSION

4.1 INTRODUCTION

This thesis aimed to investigate the influence of a professional development initiative on teachers' actual use of mobile technology for teaching and learning. The study investigated the teachers' beliefs about how useful and easy it is to use mobile technologies. The study considered the influence that the teachers had on each other, the conditions under which they taught, their gender, age, experience in teaching, and their willingness to have used mobile technology in their classrooms for teaching and learning. A series of workshops were conducted with follow-up visits to three schools. The findings are grouped and discussed according to the two units of analysis as they were unpacked in Chapter 3.

4.2 UNIT OF ANALYSIS 1: THE BOJANALA DISTRICT TEACHER PROFESSIONAL DEVELOPMENT (TPD) WORKSHOP

Data was collected by administering pre- and post-workshop questionnaires (Annexure C and D) for this study, as was elaborated upon in Chapter 3. The pre-workshop questionnaire was deployed to profile the workshop participants by collecting demographic and other data related to their knowledge and the use of technological devices.

4.2.1 Pre-workshop questionnaire

Participants were asked to respond to questions that aimed to collect demographic data and to understand their prior knowledge and familiarity with technological devices. This section of the questionnaire also sought to understand elements that relate to the participants' age, experience, gender, ownership, and usage of ICT devices. Other elements included the functionalities and use of mobile devices, access to the Internet, and whether the mobile devices were used for teaching and learning in their classrooms at that time.

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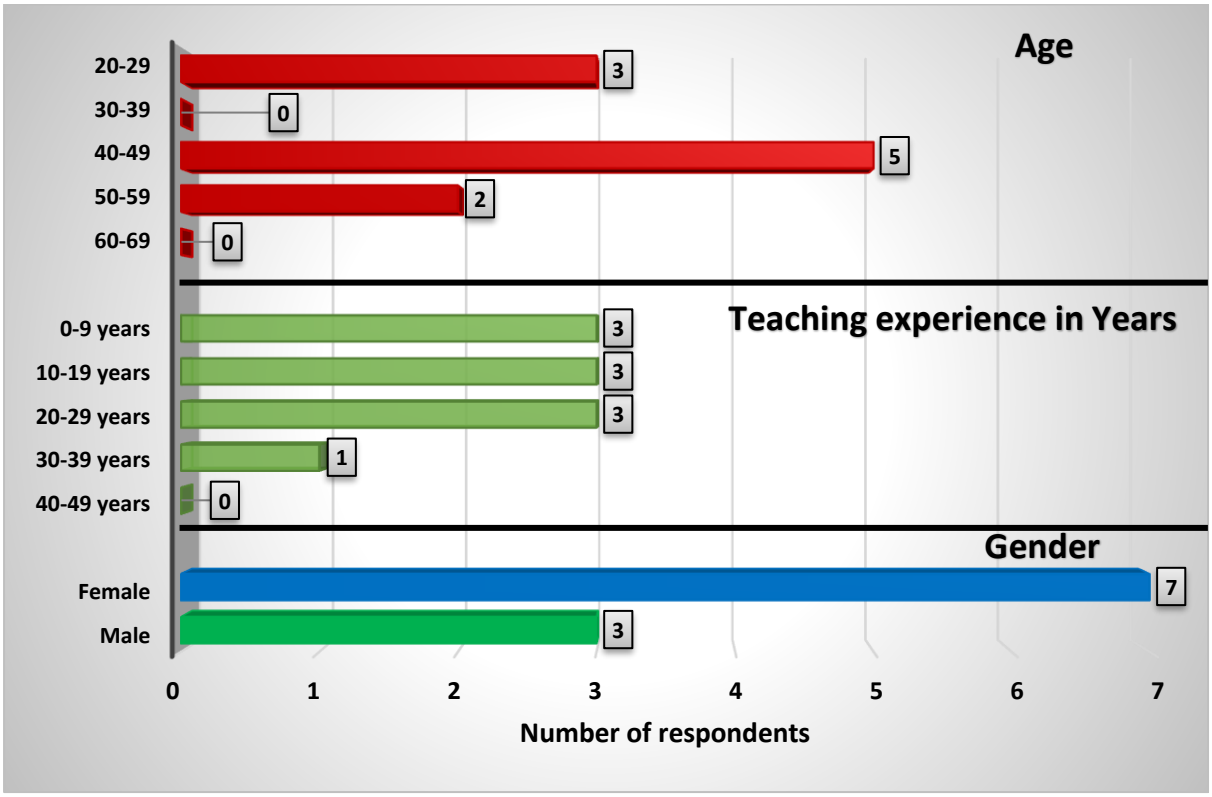
Demographic data

Fourteen teachers attended the workshop, but only ten responded to the pre-questionnaire and 11 responded to the post-questionnaire. In some instances, the respondents did not respond to all the questions asked.

Figure 4.1

Demographic data



As seen in Figure 4.1, most participants were female, above 40 years of age, with more than ten years of experience. Although the cohort included both young and older teachers (according to age and teaching experience), most were experienced teachers. When I saw the age and experience of the participants, I became concerned about the potential willingness of these participants to change their attitudes or behavioural intent towards using mobile devices for teaching purposes due to some stereotypes associated with their age and level of experience. Guma et al. (2013) argues that teachers who have been teaching for a long time may not be as eager to integrate ICT into their teaching as younger teachers. Winter et al., (2021) found that

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technology was used more frequently by younger teachers than by older colleagues, as well as by teachers who received in-service training. According to Guma et al., (2013) young teachers are likely to be more proficient at using technology, which may explain this inequality.

Another study by Umar & Yusoff (2014) revealed that the use of ICT skills for teaching and learning by junior teachers was considerably higher than those of senior teachers. The implication is that it may be easy for younger participants (between the ages of 20 and 29) to use mobile devices for teaching and learning, as they are still young and often have a lot of technological know-how. In addition, those who recently graduated, would in all likelihood have attended courses which emphasised integration of technological devices in teaching and learning, thus providing them with the necessary skills to integration mobile devices in the classroom.

Furthermore, this is the cohort of learners that Prensky (2001) says grew up surrounded by technology and tools of the digital era that include computers, video games, digital music players, video cams and cell phones. The older participants (those between 40 and 59) may feel that it is too late to change how they do things. Hew and Brush (2007) identified teacher attitudes and beliefs as one of the main barriers to ICT integration into teaching and learning. Rosen and Maguire (1990) further caution that teachers' teaching proficiency does not necessarily purge computer anxieties. As a result, many proficient teachers are likely to exhibit caution and uneasiness in relation to computers.

This study, therefore, intended to explore how the professional development initiative influenced participants' use of mobile devices for teaching and learning purposes, despite the advanced age and high levels of teaching experience of the participants. The workshops intended to provide the participants with a hands-on experience using mobile devices and to investigate whether the workshops influenced their willingness to integrate mobile technology into teaching and learning.

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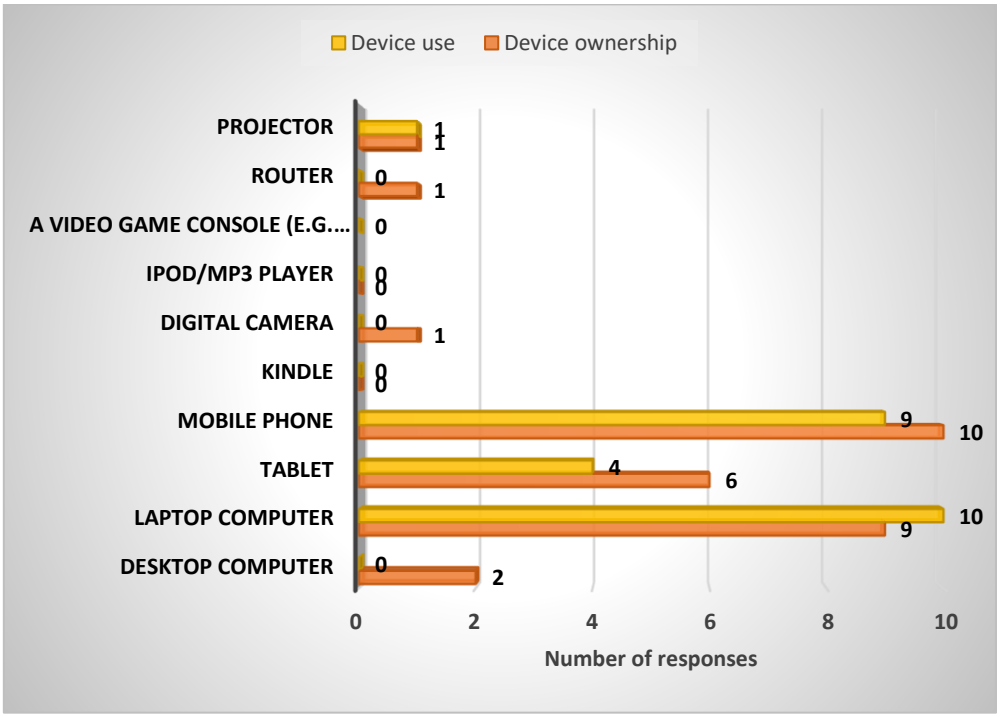
Ownership and usage

Figure 4.2 illustrates the responses given to indicate the technology devices that the participants owned and used for personal purposes. Respondents had to choose from a list of devices provided. Most of the respondents owned a mobile phone (10), tablet (six), or laptop computer (nine). This correlates with Ford and Botha (2010), who state that most teachers in this study possess one, or a combination of mobile devices which might be a reflection of all the teachers in South Africa. Furthermore, Taleb and Sohrabi (2012) posit that mobile devices are essential because if people needed to choose, it is more affordable than personal computers. Thus, because all the respondents owned at least a laptop, tablet or mobile phone, it was expected that they would know how to use their mobile devices and might be eager to use it in their classrooms. In addition, Bidin and Ziden (2013) indicated that learners carry mobile devices everywhere and use them throughout the day for their everyday activities.

Figure 4.2

Owned and used technological devices



One can then make assumptions about how mobile devices create opportunities for teachers to incorporate their use in the classroom. One might wonder, though, why

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there are seemingly still hindrances to their integration. Bidin and Ziden (2013) assumed that the hindrance either relates to the attitude of the teachers, how lessons are designed for the mobile devices, or how the inherent pedagogical and content knowledge are applied to suit the use of these devices.

A follow-up question was asked to determine how regularly respondents used their devices (See Figure 4.2). Instead, they indicated that they do not use many of these devices. It is surprising that they also do not use digital cameras, although it is nowadays an integral feature of most smart mobile devices. However, the researcher assumed that they interpreted the question to refer to a digital camera as a separate device and not the one that is embedded in their mobile phones, laptop, or personal computers. Alternatively, the participants may have found that their mobile devices were too old to have a digital camera feature. Similarly, the reason for not using kindles, iPods or video game consoles may be that their mobile devices are powerful enough and can allow them to play games, read books, and listen to audio; hence they were not using those devices either. The other reason for not using kindles, iPods or video games consoles might be their age group. They may simply not be interested in listening to music on-demand or playing high-resolution interactive games in the same way that the younger generation does.

Most of the respondents owned and used a mobile device frequently. It was interesting to note that the participants all had access to mobile devices, and possibly used them as personal devices. Based on Bidin and Ziden's (2013) opinion, teachers' ownership of a mobile device is likely to indicate their willingness to use their device in pedagogical activities. In Moore and Iida (2010), the assumption is that teachers' access to mobile devices influences how frequently they use them. It was, therefore, hoped that the professional development activities would be a stimulus towards ensuring that the mobile devices would be seamlessly integrated into the teachers' classrooms.

Functionalities and frequency of functionality use

The respondents were asked whether their devices had functionalities to send and receive email, text messages, or instant messages to someone (e.g., WhatsApp,

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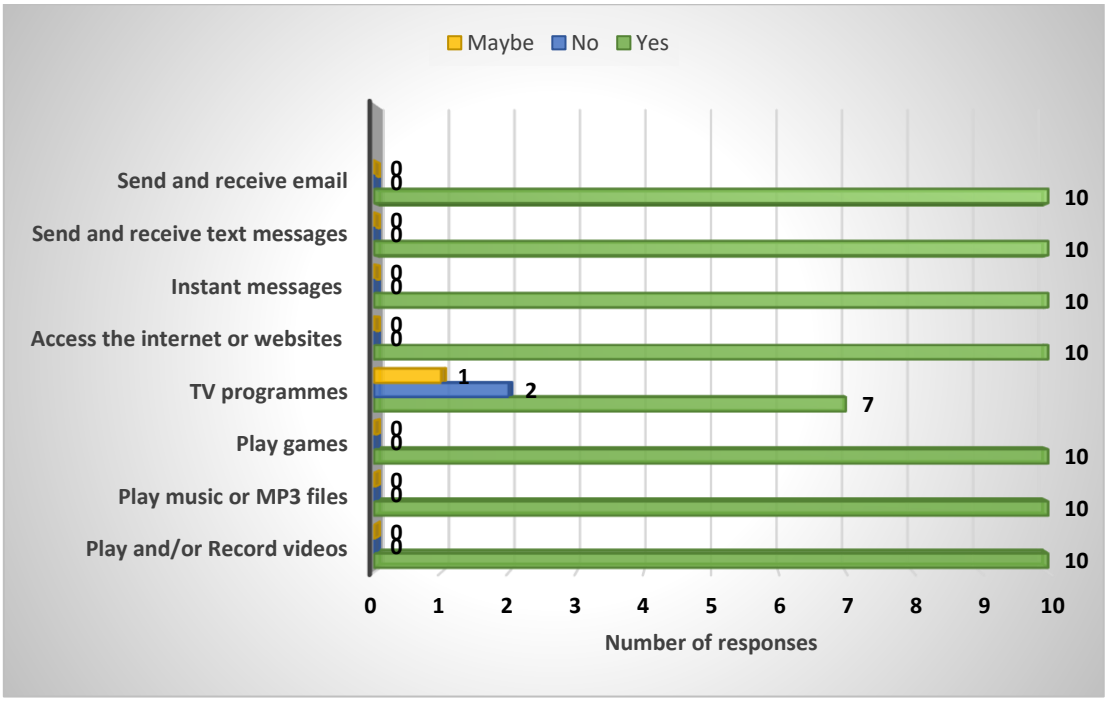
Google Hangout, and Facebook). They were also asked if their devices could access the Internet or websites for news, weather, sports, or other information, and whether it could be used to play games, take pictures, play music or MP3 files, and play or record videos. Figure 4.3 illustrates that most of the respondents in this study owned or used a mobile device with the typical functionalities needed for email, text/instant messages, audio/video. It is assumed that "Yes" meant that one of the examples given was present and "No" meant that none were present as the question did not solicit responses related to the combination of functionalities mentioned.

Figure 4.3

Functionality use



For this research study, it was important to know the scope of functionalities available on the participants' mobile devices. This information is important because research has shown that the use of Short Messaging Service (SMS), Multimedia Messaging Service (MMS), video, camera, the Internet, voice recording and Bluetooth, as well as specific mobile phone characteristics (personal, informal, contextual, and portable), are found to reinforce learning (Kukulska-Hulme et al., 2011).

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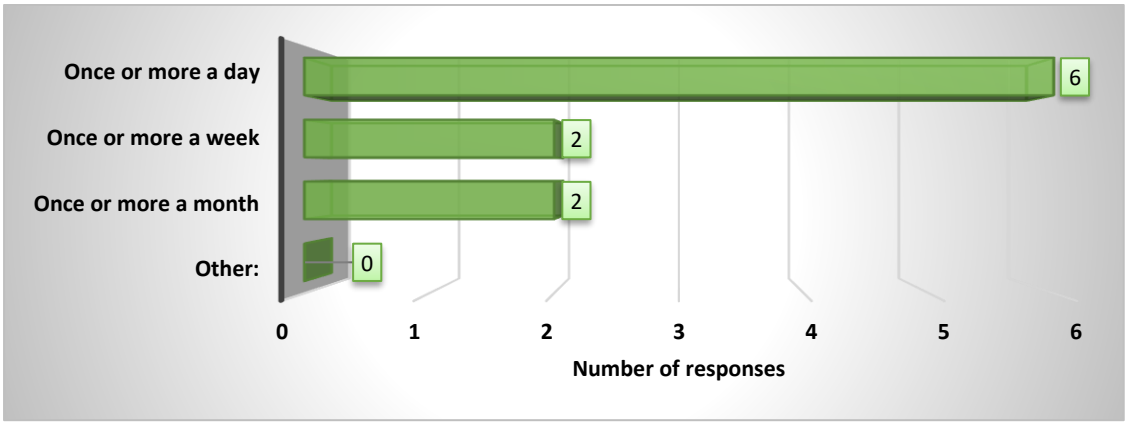
Furthermore, most of the respondents reported that they use the functionalities daily, whilst others did so only weekly or monthly (see Figure 4.4).

Figure 4.4

Frequency of device usage



Knowing how often the respondents use their mobile devices for the mentioned functionalities was important to the researcher. It indicated the participants' prior abilities, use of, and relationship with their mobile devices. Furthermore, it served to indicate whether participants had access to mobile devices with which they were familiar. It is assumed that access and familiarity with mobile devices would open possibilities for educators to prepare lessons suited to today's learners. Moreover, Prensky (2005) states that it is a well-known fact that learners use multimedia and games to gather and analyse learning material. In hindsight, it may have been more helpful to ask about each of these functionalities separately instead of grouping them all in one. However, the questionnaire was set assuming that they all owned or had access to smartphones and that those without them probably worked on really old mobile phone technologies.

Based on Mwalongo's (2010) contention, frequent use of personal mobile devices would help teachers transfer the skills they need for their everyday teaching. The transfer of specific competencies acquired from the frequent and daily use of mobile devices was anticipated to be true for this study. The participants already used their mobile devices to send and receive emails and text messages, used social media platforms like Google Hangout and Facebook, accessed the Internet, took pictures

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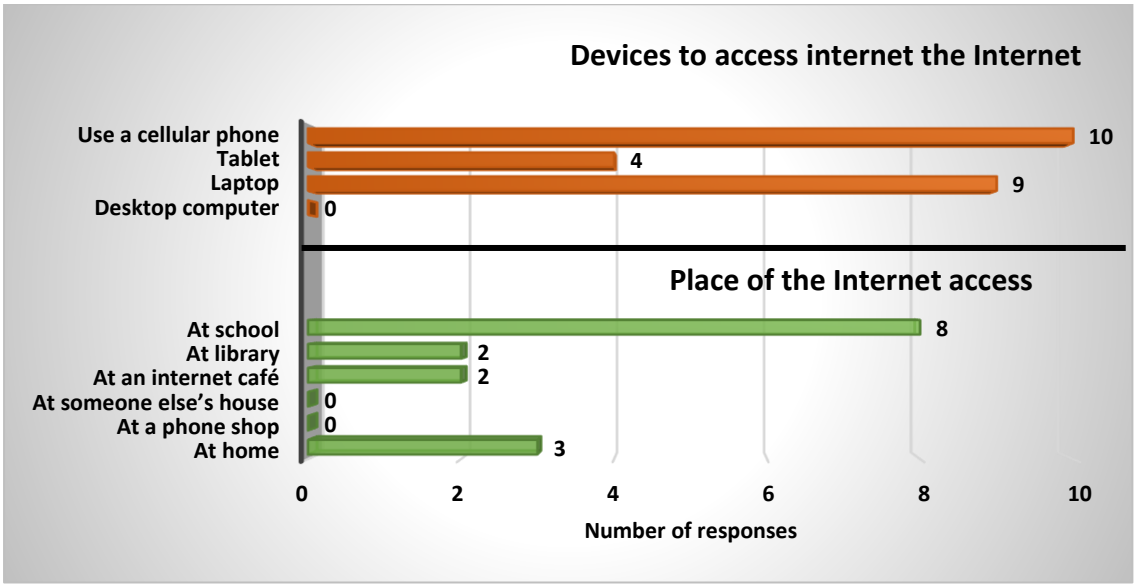
and played music and videos. Therefore, it was anticipated that it would have been reasonably easy for them to transition to a space where they would willingly use these functionalities in preparing their lessons. This assumption was supported by research indicating that ICT competency stimulates teachers' use, or integration, of ICT in teaching and learning (Liaw et al., 2007; Sandholtz & Reilly, 2004). During the workshop, I observed that participants' anxiety increased when they ran into difficulties while participating in some workshop activities, even though they already knew and used their devices. From the outset of the workshop, I witnessed that they were willing to seek help from their peers and facilitators, which helped them reduce their anxiety levels and resulted in increased progress.

The Internet access

It was important to know whether the participants have access to the Internet to send and receive information, and access and use applications as part of the series of workshops and if so, with which of their devices. All ten respondents indicated that they use their mobile phones to go online or to access the Internet, whereas nine also used their laptops. Only four respondents also used tablets to do so, as displayed in Figure 4.5.

Figure 4.5

Devices used for the Internet access and where the Internet is accessed



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A follow-up question asked the participants where they accessed the Internet, to which most responded that they did so at school, while others accessed it from the library, internet café or home (See Figure 4.5).

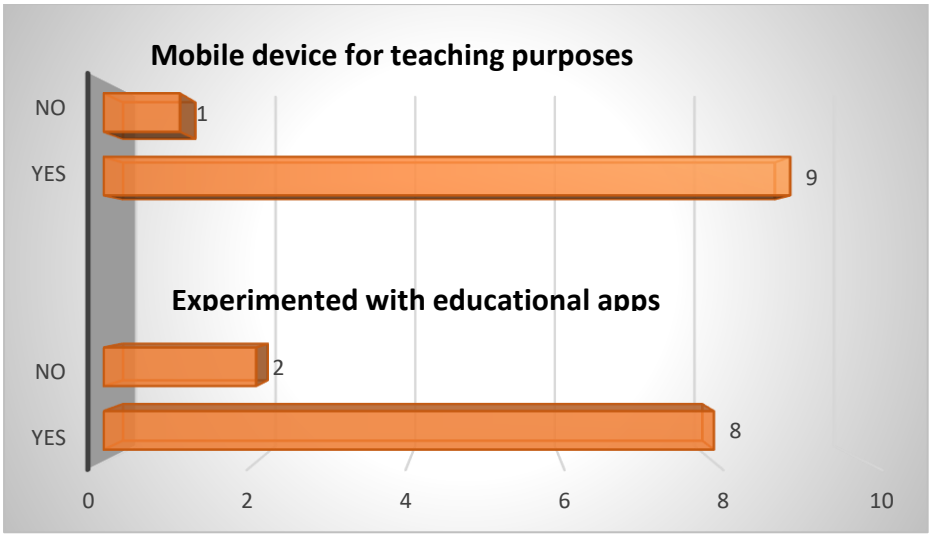
The respondents' use of mobile devices for Internet access exceeded that of other devices like desktop computers, thus signifying the important role mobile devices could play in creating a new channel of learning, in part due to their portability and affordability (Taleb & Sohrabi, 2012). Thus, the assumption was that participants in this study could access the Internet, and the vast resources available online, to prepare and enhance their lessons by using their mobile devices and the readily available Internet access at their respective schools.

Mobile devices for teaching

It was not expected that respondents would indicate that they already used their mobile devices for teaching purposes. Still, interestingly, most of the participants responded positively to having used mobile devices for teaching purposes. All the respondents were able to download apps; however, only third experimented with educational apps in class (Figure 4.6).

Figure 4.6

Mobile devices use for teaching



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Even though participants were already using their devices to access and download educational resources, the actual rate of integrating mobile devices in teaching in a meaningful manner was still very low. This finding concurred with those of Dube et al. (2018), who also found that the actual rate of integrating mobile devices in teaching in a meaningful manner was still very low. This finding may have been the reason for the district official's request for this type of workshop to encourage the optimal use of mobile devices in the district's schools. A possible reason for the non-optimal use of mobile devices might have been that the comprehension of content knowledge and technology implementation in reinforcing learners' learning and achievements is considered to be a consequence of the teachers' augmented knowledge level, confidence, and attitude towards technology (Guma et al., 2013). Therefore, one could assume that the teachers' lack of confidence in their ability to integrate technology in the classroom, might have been why teachers did not integrate technology into their teaching activities. It was clear that the teachers owned or had access to mobile devices and used them in various capacities. As such, it was logical to assume that their technological knowledge was in place. But how to integrate that in the classroom, otherwise combining it with the content and pedagogy, is an issue; therefore, professional development workshops seemed like a good solution to create this integration.

Furthermore, Totter et al. (2005) posit that teachers avoid using ICT in teaching because they lack the confidence to use mobile devices. The teachers' ability to apply pedagogical and content knowledge properly would ultimately lead to successful integration (Schmidt et al., 2009). Therefore, the teachers' professional development workshops were important and focused on ensuring that the participants build their own levels of confidence and to do so whilst fostering a sense of community among the participants.

Lastly, the respondents were asked to rate their general computer skills. The respondents confidently indicated that they possessed either intermediate or advanced computer skills (see Figure 4.7).

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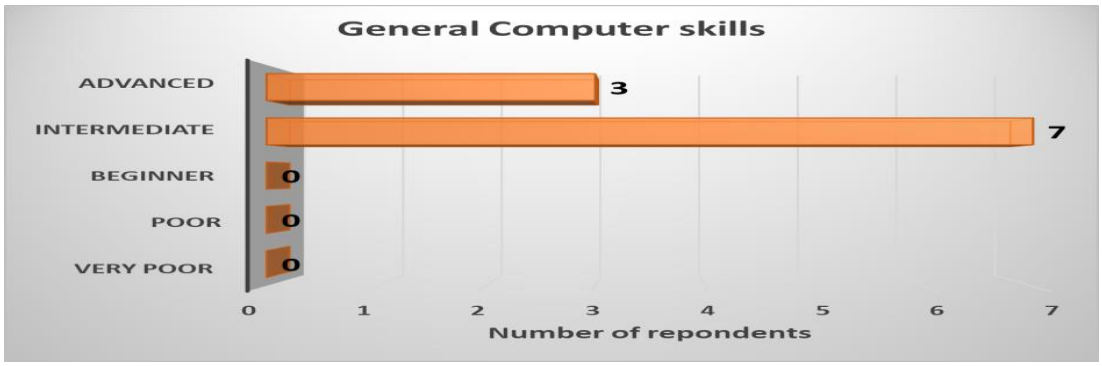
Figure 4.7

General computer skills



From these responses, it is evident that computer skills and the ability to use mobile devices were not an issue regarding the actual use of mobile devices. The respondents all indicated that they had above-average computer skills and had access to, or owned, their own mobile devices and could access the Internet with them, albeit from home or school. Their mobile devices had the necessary functionalities that enabled them to read books, listen to audio and possibly take pictures, and they have already experimented with educational apps. However, despite all these conditions being in place, the level of integration of mobile devices into their teaching practices was still low. This phenomenon then necessitated further probing into the causes for the poor integration of these mobile devices into teaching and learning in schools.

4.2.2 Post-workshop questionnaire

A series of three teacher professional development workshops were designed and developed for teachers to learn more about how they could use the available mobile technology in class. These workshops included activities intended to equip the teachers with technology tools and strategies to integrate mobile devices seamlessly into their teaching. They were also exposed to various open educational resources (apps and digital tools) available online to enhance their lessons. The workshops were designed based on the notion that mobile learning may involve an extensive assortment of mobile applications and therefore, also new teaching and learning techniques (Bidin & Ziden, 2013).

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The post-workshop questionnaire was administered after the series of teacher professional development workshops (TPD) were completed. The purpose of the questionnaire was to evaluate the effectiveness of the workshops that were intended to firstly influence the participants to recognise the usefulness of the electronic tools accessible with mobile devices. Secondly, the workshops intended to demonstrate to the teachers how easy it is to incorporate these technology tools in the daily activities of teaching and learning.

Participant observations were also conducted in this study to gather data. In addition, Kawulich (2005) posit that participant observation has become an increasingly popular means of collecting information in the field of education and that it involves observing, and participating in, the activities of a population to gain an understanding of their lives. In this study, the findings derived from the observations were integrated with the questionnaire responses of the participants.

Chapter 3 elaborated on the TAM framework and the activities of the TPD. The researcher believed that teachers need to have confidence in their ability to use the technology, since the literature tells us that a lack “of confidence and experience with technology influence teachers’ motivation to use technology in the classroom” (Balanskat et al., 2006, p. 238). In the questionnaire, the respondents rated their opinions regarding the *perceived usefulness* and *perceived ease of use* of the mobile devices using a 5-point Likert scale ranging from 1=Strongly disagree, 2=Disagree, 3=Neither disagree nor agree, 4=Agree, to 5=Strongly agree.

Perceived usefulness

Perceived usefulness is defined as the extent to which a person believes that using a particular system will enhance their job performance (Abu-Dalbouh, 2013). Mobile learning has distinctive technological characteristics which offer positive pedagogical affordances through mobile devices (Park, 2011). It was important to explore the participants’ perceptions regarding the usefulness of mobile devices in their classrooms. Participants were asked to rate their opinion on various aspects like fun, repetition, engagement, feedback, access to online material, and communications with

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parents to determine perceptions regarding the usefulness of using mobile devices in the classroom.

After the TPD workshop, most respondents agreed or strongly agreed that mobile devices would enable them to add fun elements to their class activities (see Figure 4.8). Because the applications that the teachers were exposed to in the workshops were regarded as fun, they could be used to reach the Generation Z learners (Johnston, 2013), many of whom prefer to be engaged through fun activities such as games (Schindler et al., 2017; Sun et al., 2016). As the teachers participated enthusiastically in the workshop activities, I observed that they were enjoying themselves, and were demonstrating continuous use of their own mobile devices throughout the sessions. In one demonstration, where a tool that measured the levels of sound in the classroom in a fun visual manner was introduced, it was obvious that the teachers themselves found it fascinating. They actively made a noise to test the effect, and then encouraged everyone to be quiet, to see how the tool responded. A number of the teachers afterwards stated that they were going to introduce the tool in their own classes the next day.

By bringing out the fun element through games, the mobile devices immediately became useful to the teachers. This finding signifies that the teachers found the mobile devices useful in terms of the potential value that they could add to the teaching and learning process. It is important to know about the fun element and potential of games because the current cohort of learners, reason, reflect, and process information differently from their predecessors (Prensky, 2001; Tapscott, 2009) as the learners seem to prefer games to “serious” work” (Prensky, 2001, p. 4).

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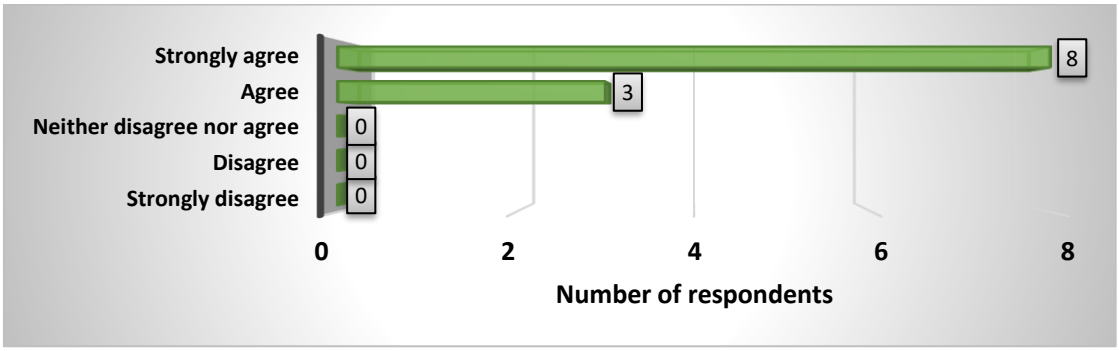
Figure 4.8

Mobile devices would enable me to add a fun element to the class



The learners' preference for fun and games further implies that teachers may use mobile devices for fun activities such as games and interaction in class, for example, by using online learner response systems. These fun activities can be included in their lesson planning, possibly resulting in a transformation of their pedagogical practices. Annexure H illustrates the lesson that was observed, in which fun activities were incorporated. Bidin and Ziden (2013) suggest that games lead to learners acquiring skills entrenched in each game level without them realising that they are learning. Therefore, most learners learn well whilst they are having fun. Similarly, mobile devices introduce environments that affords learners genuine and significant learning experiences that offer fun and effective learning (Fatimah & Santiana, 2017).

In contrast to the fun elements, respondents were asked whether, in their opinion, mobile devices would have the potential to eliminate repetitive and tedious activities. Teachers were seen to respond with astonishment to demonstrations of the mobile device applications' unique ability to handle and automate repetitive tasks that they are normally required to do manually and find tiring. The workshops exposed the teachers to various applications that would alleviate the pressure normally associated with marking individual scripts. For example, teaching, lesson planning, instructional delivery, assessments, and class management are all typical tasks that are perceived as repetitive, and in many cases, as tedious. According to Ayeni and Amanekwe (2018), teachers with a high workload often experience stress due to expectations related to the fact that educational goals are often dependent on how they manage to complete these repetitive tasks. During the workshops, I observed that the teachers

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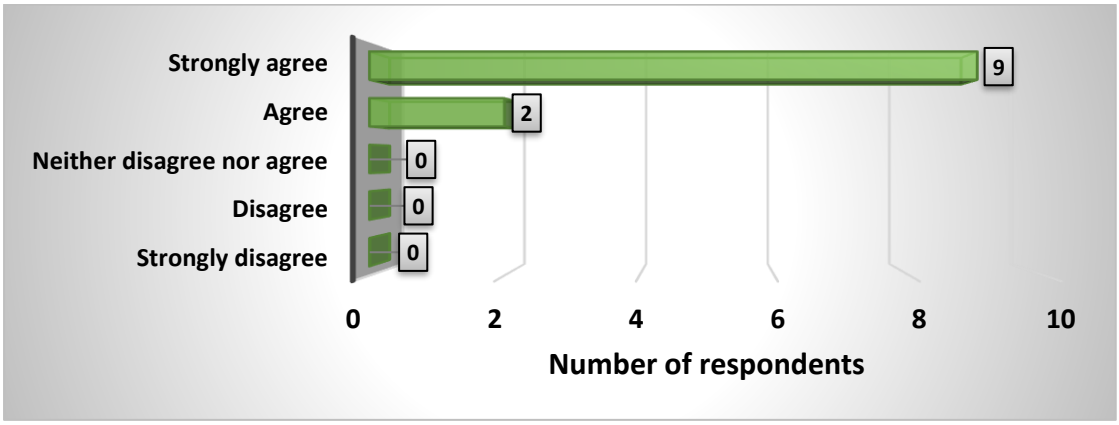
displayed a certain level of mastery and knowledge in terms of mobile devices, and that even though some experienced challenges, most were able to solve them and work through the activities. The respondents further strengthened the usefulness of mobile devices in terms of eliminating repetitive and tedious activities, as most participants *strongly agreed* or *agreed* (see Figure 4.9).

Figure 4.9

Mobile devices would eliminate repetitive and tedious activities



Timperley and Robinson (2000) posit that reasonable instructional workloads lead to effective and efficient teachers. Therefore, it was promising to see that respondents regarded mobile devices as tools that can assist them in being more efficient and effective by affording them the opportunity and environment to manage their workloads.

The survey focused on the usefulness of mobile devices from the teacher's perspective because in the workshops the teachers were the learners. According to Wang et al. (2009), learners who engaged in mobile learning became behaviourally, intellectually, and emotionally immersed in their learning activities, transforming them from docile to active learners. Almost all the applications that the teachers were exposed to in the workshop series required active participation on behalf of the learners. The immersion of learners in their learning activities suggested that it led to a more active approach to learning when they were fully engaged. This finding culminated in the participants' positive response to whether using mobile devices in class would motivate their learners to become more engaged with the learning content.

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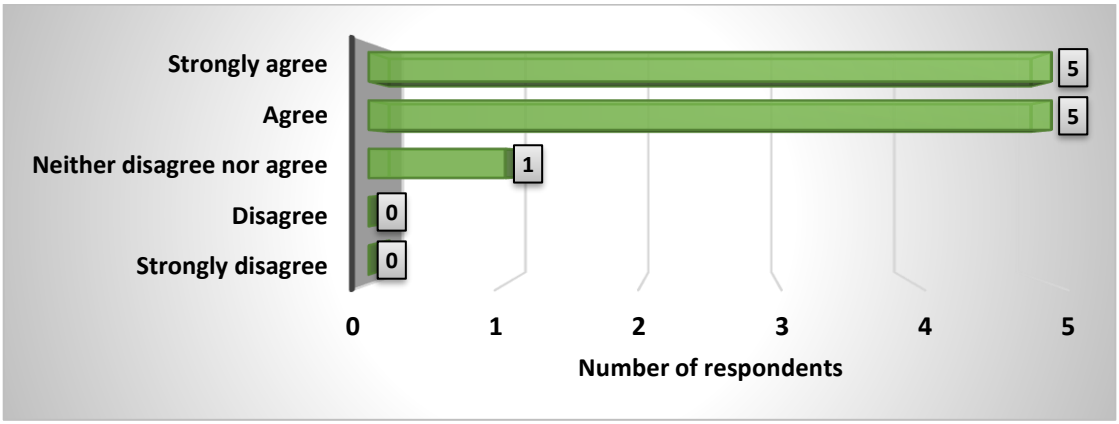
Most respondents *agreed* or *strongly agreed*, with only a few of the respondents *neither agreeing nor disagreeing* (see Figure 4.10). During the workshops, I also observed that all the teachers were fully engaged in the activities, and they displayed confidence and were seemingly comfortable in using the mobile devices.

Engagement is defined as "the glue, or mediator, that links important contexts - home, school, peers and community - to students and in turn to outcome of interest" (Christenson & Reschly, 2012, p. 3). Newmann (1993, p. 12) define engagement as "the students' psychological investment in and around effort directed toward learning, understanding or mastering the knowledge, skills or crafts that academic work is intended to promote". Newman's definition resonates with what engagement was defined as in this study. Engagement was seen as being a crucial element in keeping learners focussed on learning activities in the classroom. It was evident that teachers believed that the learners would be in a better position to achieve learning outcomes by introducing mobile devices.

Figure 4.10

Using mobile devices in my teaching would motivate learners to engage



Swan et al. (2005, p. 110) posit that mobile devices "may increase student motivation to learn and increase their engagement in learning activities". From the hands-on experience of the workshops, participants wanted to see their learners working together and being actively involved in their learning.

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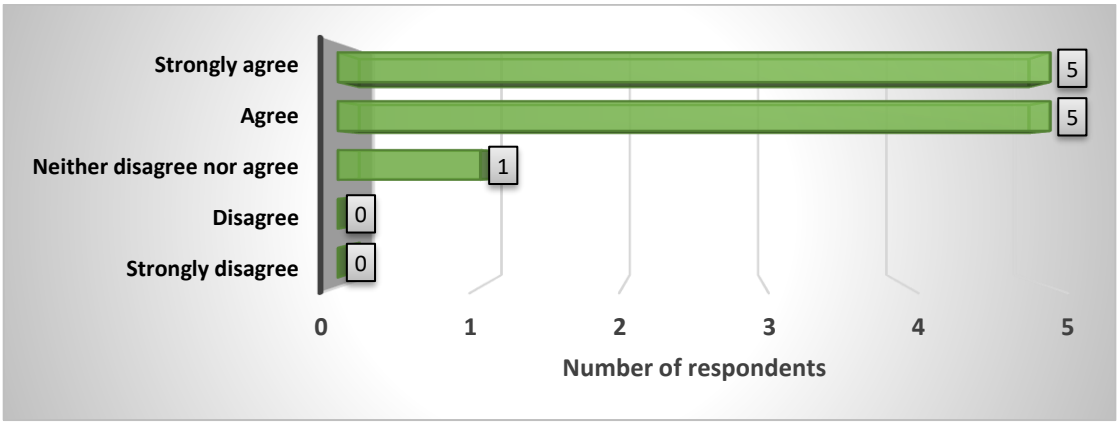
While most of the respondents were excited about the usefulness of mobile devices in class, there was uncertainty in others. The uncertainty seems to contrast with the view of other researchers (Bidin & Ziden, 2013; Wang et al., 2009) who believe that as soon as learners became actively involved with mobile learning activities, there is a likelihood that they would develop learning tactics that impact their levels of motivation. It would have been interesting to be able to probe further to determine the source of the doubt. Although technology plays a part in education, Almekhlafi (2006) notes that it is most effective when used as a teaching tool that involves learners in learning activities.

According to Figure 4.11, the respondents believed that using mobile devices provided opportunities for learners to connect. This finding is in line with the literature that indicates that mobile devices enable learners to share ideas and collaborate mainly due to the advancement of technology and availability of the internet (Al-Emran et al., 2016). For this study, the sharing of ideas and the ability to collaborate meant that the introduction of mobile devices allowed learners to connect.

Figure 4.11

Mobile devices provide opportunities for learners to connect with one another



The responses indicated a positive outlook for collaboration, with only one participant not convinced. Bidin and Ziden (2013) posit that mobile devices support inclusion and allow more opportunities for participation, and as a result, learning becomes more successful. It is acknowledged that mobile devices facilitate both asynchronous and synchronous learning (Chaka & Govender, 2017). However, the learning tasks to be

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supported determines the mobile application collaboration abilities of synchronous/asynchronous communication (Guerrero et al., 2006). Yamagata-Lynch (2020, p. 194) found that “in synchronous learning, when compared to asynchronous learning, participants find a stable means of communication, tend to stay on task, feel a larger sense of participation and tend to experience better task completion rates”. In addition, Huang et al. (2008) posit that synchronous and asynchronous learning both play an important role, since asynchronous learning provides electronic materials to learners anytime, anywhere. At the same time, Huang et al. (2008) furthermore argue that synchronous learning offers prospects for group discussions, peer tutoring and brainstorming. Hastie et al. (2010) suggest the merger of physical and cyber classroom settings through synchronous learning to facilitate unconstrained connectivity for teachers and learners from any part of the world. It seems as if the participants in this study regarded the fact that mobile devices allowed learners to collaborate, as useful. The findings further showed that mobile devices could encourage the creation of a culture of communication that fosters seeking and giving support through collaborative tasks and activities that foster social and technical skills throughout learners' learning (Kárpáti et al., 2008).

Feedback is regarded as a crucial element in teacher performance to enable the achievement of learning outcomes (Hattie, 2008). Figure 4.12 illustrates that the respondents believed that using mobile devices would enable them to give individualised feedback to all learners in class. It is believed that this perception related to the exposure that teachers had in the series of workshops, where some of the applications were set up to provide individualised feedback to learners when they used their mobile devices.

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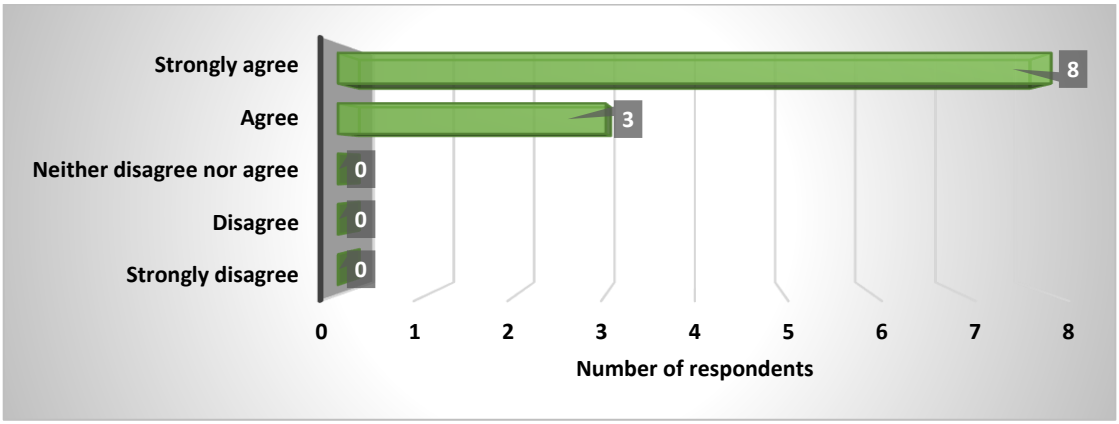
Figure 4.12

Mobile devices enable individualised feedback



Introducing these mobile applications meant that a vehicle for two-way communication was created, which provided teachers with the ability to determine if learning had occurred. This finding agrees with Wilson (2012), who argued that the use of mobile devices plays a meaningful role in the teaching process as the immediate, individualised feedback the devices provide enables respondents to determine their own successful learning. In addition, in virtual learning environments where mobile devices are used, the ability to correct learners' mistakes quickly during activities culminates in effective and meaningful learning (Geertsema & Campbell, 2014). This study, therefore, regarded immediate, individualised feedback as an encouraging advantage in the use of mobile devices for teaching and learning, which enabled support and assistance to learners during the learning process.

The respondents regarded mobile devices as enablers to communicate with learners' parents (see Figure 4.13), thereby opening up an additional communication channel with learners' primary caregivers. This finding is aligned with Beecher (2019, p. 49) who believes that "parents and caregivers are natural and motivated teachers, who can have a positive impact on their children's learning".

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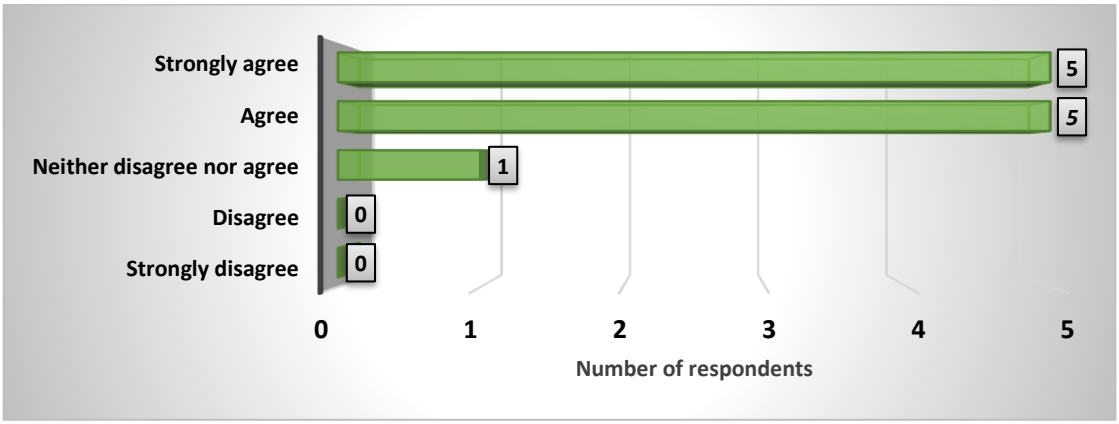
Figure 4.13

Mobile devices open channels of communication with parents



Similarly, Hong et al. (2016) hint that parents are aware of the capabilities of mobile devices and wish that education could exploit these technological advancements because mobile devices make learning fun and interesting for their children. In addition, Ozdamli and Cavus (2011) propose that there has to be an advocacy of the benefits of mobile devices for the parent by amalgamating mobile technologies into a parent-teacher collaboration to intensify the learner's academic success. Therefore, realising the benefits of mobile devices as enablers of communication with effective teaching implies, among others, the ability to generate advanced, ground-breaking teaching approaches that assist and develop learners' skills and abilities (Fatimah & Santiana, 2017). Similarly, Khokhar (2016) believes that the teachers' mindset and opinion of ICT effectiveness are crucial to successfully implementing mobile devices in teaching and learning. It is evident that the mobile devices boosted the respondents' confidence levels and allowed them to have a positive outlook towards their own teaching performance.

Despite two respondents neither disagreeing nor agreeing, nine respondents believed that mobile devices would make their teaching more effective, which was regarded as a positive sign (Figure 4.14).

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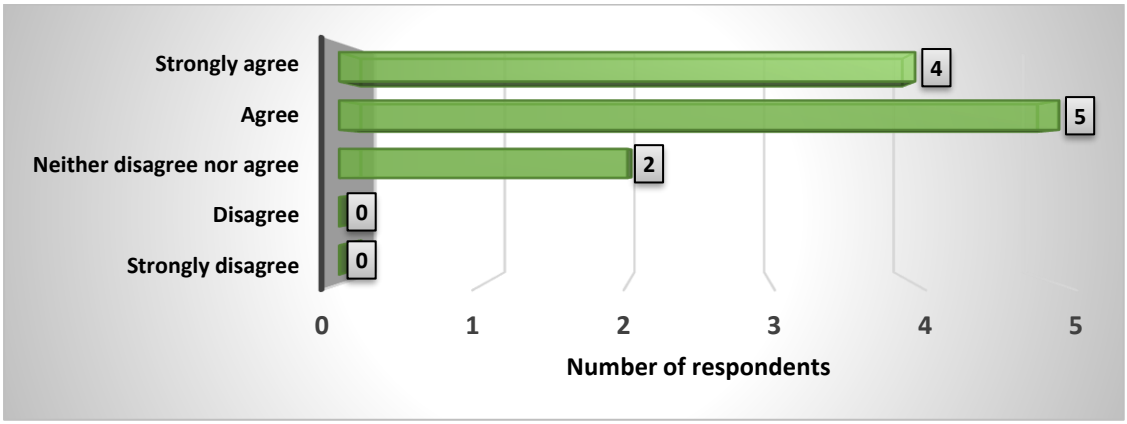
Figure 4.14

The use of mobile devices would make my teaching more effective



The three workshops, per se, may not have been adequate to instil the much-needed motivation and confidence boost in all the teachers (Mwalongo, 2010). Nevertheless, the lingering doubt in their own abilities did not imply that these specific respondents have not gained trust in the usefulness of mobile devices but may rather indicate that they still lack the required confidence in their ability to implement the newly gained skills. Balanskat et al. (2006) suggest that teachers who lack confidence are unable to adopt new pedagogical procedures and might not be keen to use ICT in the classroom due to their perceptions of inadequacy with regards to ICT skills.

Figures 4.15 and 4.16 illustrate that the respondents perceived the mobile devices to be convenient because of their ubiquitous nature. In addition, the devices enabled them and their learners to access the learning activities at times and places convenient to them.

Bidin and Ziden (2013) posit that the strengths of “anytime” and “any place” boost the reputation of mobile learning and is an acknowledgement of mobile learning’s potential to support efficient methods of delivering instruction and of acquiring knowledge.

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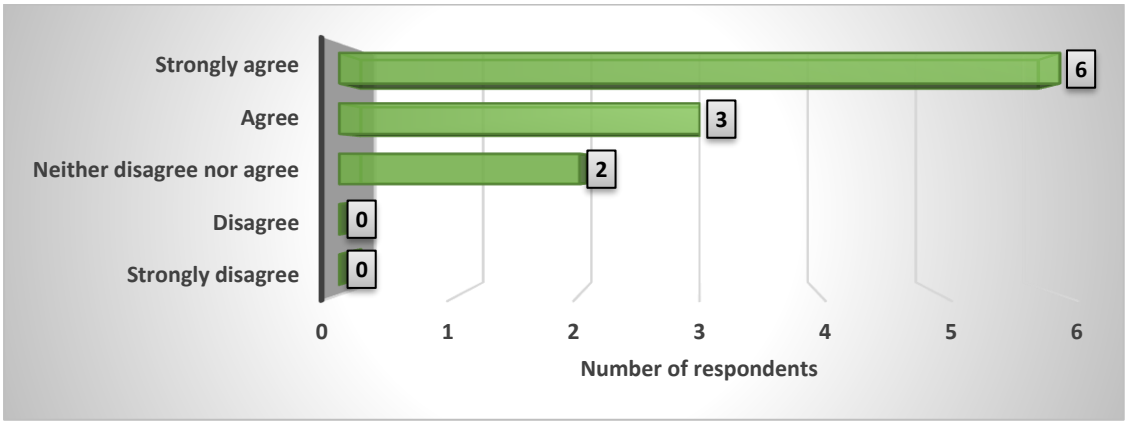
Figure 4.15

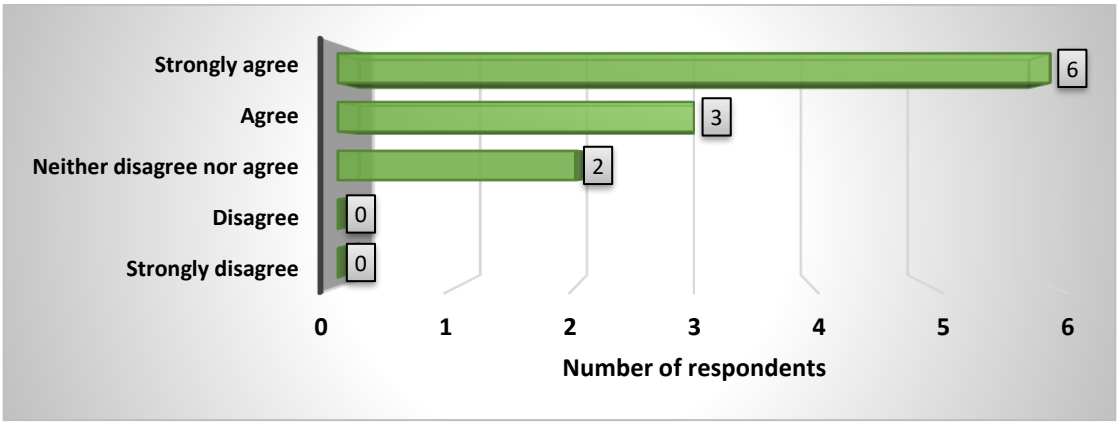
I can access the learning activities at times convenient to me



After realising that mobile communication devices could not accommodate traditional synchronous content, Huang et al. (2008) developed the Interactive Service module system to enable synchronous access to learning activities conveniently from diverse locations through mobile devices. In their study, Traxler and Leach (2006) also reported that teachers felt that mobile devices offered them prospects of access to anytime, anywhere professional activity. Similarly, accessing learning activities became one of the advantages of mobile devices realised by the respondents. This convenience feature was supported by the responses illustrated in Figure 4.16.

Figure 4.16

The online activities are accessible at convenient locations



Mobile devices enable access to learning material and learning activities anywhere, anytime (Bidin & Ziden, 2013; Sadaf et al., 2012). After the TPD workshops, the

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impression given by the participants was that the activities were regarded as effective in building participants' confidence in their belief that mobile devices are useful and should be implemented in the classroom. Participants further believed that mobile devices created a fun environment where students could engage and receive immediate feedback. The mobile devices offered opportunities for learners to collaborate whilst simultaneously opening channels of communication with parents. What is of the utmost importance towards the aim of the actual implementation of mobile devices in teaching and learning was that teachers acknowledged that these devices made their teaching more effective and improve their job performance.

These results indicate the perceived usefulness of mobile devices used in the classroom, as reported by the respondents. While one might have anticipated that TPD workshops would motivate teachers to use mobile devices in their classrooms, the overwhelming response of the participants after the workshops confirmed it. The workshops seemed to have strengthened the teachers' belief that mobile devices are useful in class.

Perceived ease of use

Perceived ease of use is defined as the extent to which a person believes that using a particular system will be free of effort (Abu-Dalbouh, 2013; Foko, 2009). Aspects like usability, technical and functional features of mobile devices may hinder its use for teaching and learning (Bidin & Ziden, 2013). These features may negatively influence the user's expectations and attitude towards mobile devices if a teacher regards them as difficult to master.

Participants were asked to rate their opinion on a variety of aspects about the ease of use of mobile devices to determine whether participants experience the use of mobile devices in the classroom as easy. When answering the question of whether they regard it as easy to learn how to operate a mobile device, most of the respondents *strongly agreed* or *agreed* (see Figure 4.17) that they would find operating their mobile devices easy. Only few of the respondents were unsure.

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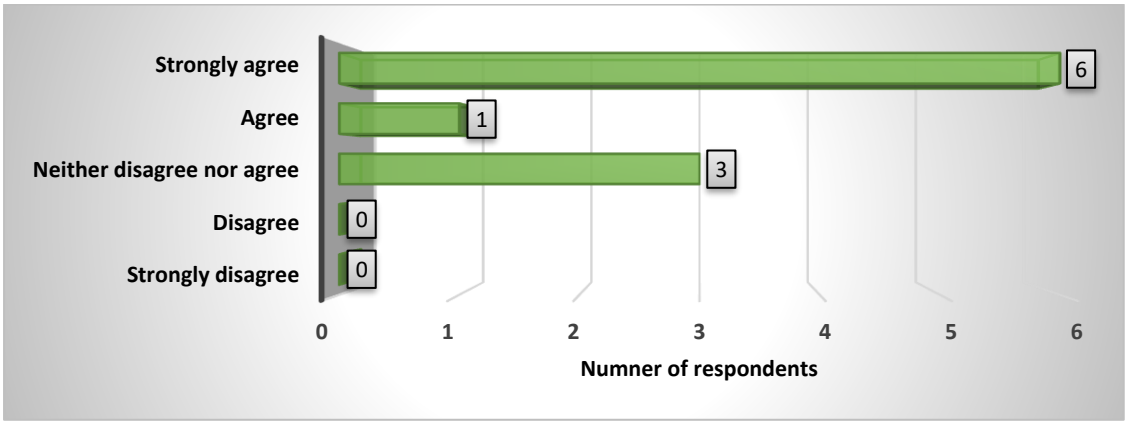
Figure 4.17

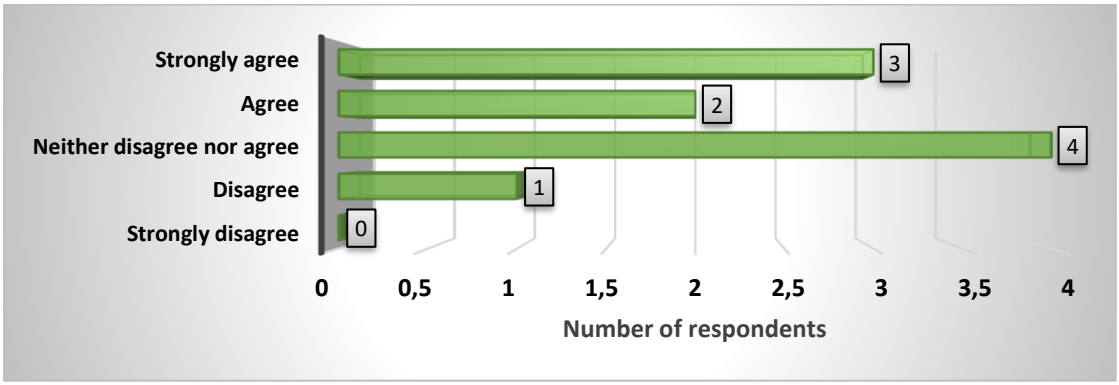
Learning to operate a mobile device is easy



According to Totter et al. (2005), deficiency in ICT-competence is unmistakably an impediment to teachers' implementation of new technologies in the classroom. In addition to prevailing attitudes and beliefs, existing competency and skill levels are perceived as major barriers hindering teachers from using technology (Ertmer et al., 2012). Consequently, only half *agreed* or *strongly agreed* that it would be easy to get the mobile device to do what they want it to do (see Figure 4.18), emphasising the decline in confidence in their own capabilities. Howard and Mozejko (2015) suggest confidence in using technology is a significant influence on teachers' willingness to implement technology. The uncertainty of the few who neither agreed nor disagreed with the statement may possibly have been attributed to their doubt concerning self-efficacy and not regarding themselves as capable or competent.

Figure 4.18

It's easy to get the mobile device to do what I want it to do



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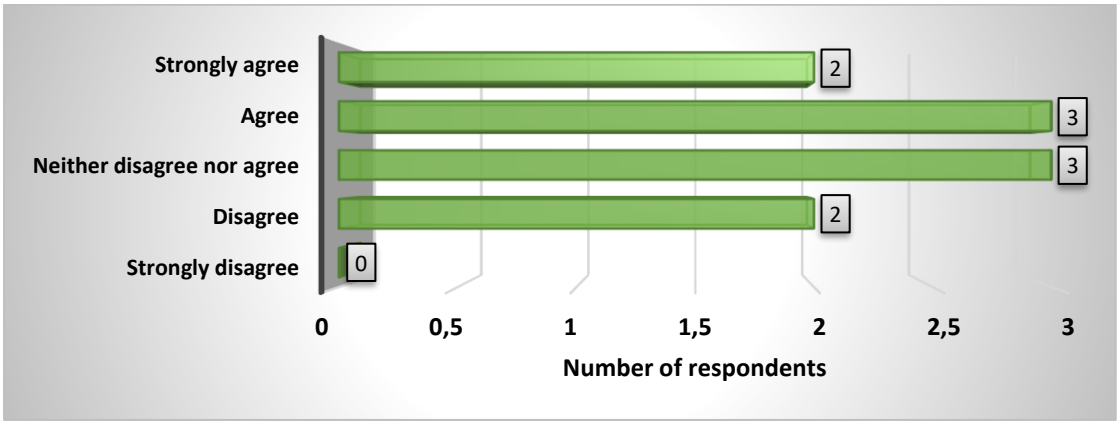
This finding confirms that although the activities in the TPD workshops may have raised the participants' awareness of the usefulness of mobile devices and their possible integration in the classroom, the duration of the workshops may not have been long enough to instil the necessary levels of confidence in the participants. It is important to note that confidence is a side effect of competence and that teachers need regular, just-in-time exposure and support of the functionalities that mobile devices bring to the classroom. Hence, the series of three workshops have seemingly not yet provided sufficient time to practice the new skills, as all the teachers did not report that it would be easy to integrate mobile devices in their classrooms (Figure 4.19).

Figure 4.19

It would be easy to integrate mobile devices into my class



The ease of use and the usefulness of the technology affects the actual use of the mobile devices and the associated applications, and teachers' attitudes toward technology affect their intention (Davis, 1989). It is interesting to note that despite the respondents' lack of confidence in terms of the ease of use of the mobile devices (how easy it is to learn to work with mobile devices, how easy it is to get the mobile devices to do what you want it to do, and how easy it is to integrate mobile devices into their teaching and learning practices), they indicated a positive intent in their response to the question about whether they are keen to experiment with mobile devices in class (Figure 4.20), which confirm what Davis (1989) said, that although it might not be that easy to use, if it is useful then the intent to use it will be there..

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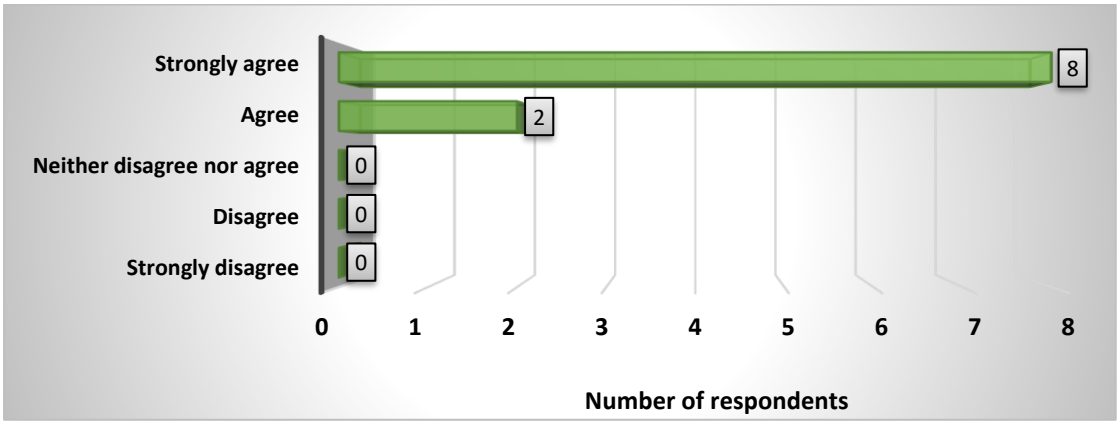
Figure 4.20

I am keen to experiment with mobile devices in my class



Most of the respondents indicated that they are quick learners regarding technology (see Figure 4.21). It is, therefore, of concern that they did not express the same level of confidence when they were asked about the levels of ease regarding the use of mobile devices. This view applied to the ease of getting the devices to do what they wanted them to do (see Figure 4.18), and the ease of integrating the technology into their classrooms (see Figure 4.19). The results imply that there may be other, possibly contextual factors, that also contribute to their belief that they would be able to implement mobile devices into their classrooms. It also reiterated the notion that the typical once-off training sessions that accompany the delivery of new technologies to schools are, in essence, inadequate to address the teachers' belief in their own capabilities.

This study showed that even when training is spread out over time, for example, when offered in a series of three workshops, all teachers are not yet confident in their own ability to integrate mobile devices in their classrooms.

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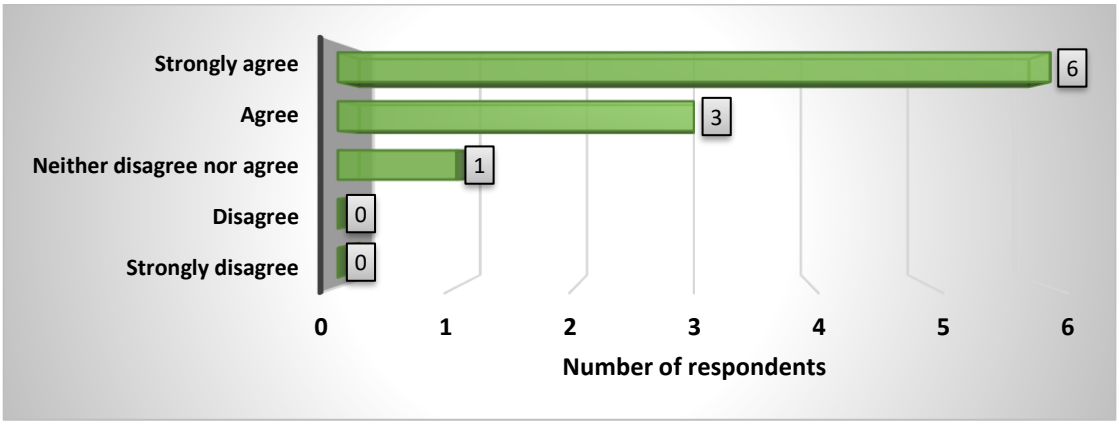
Figure 4.21

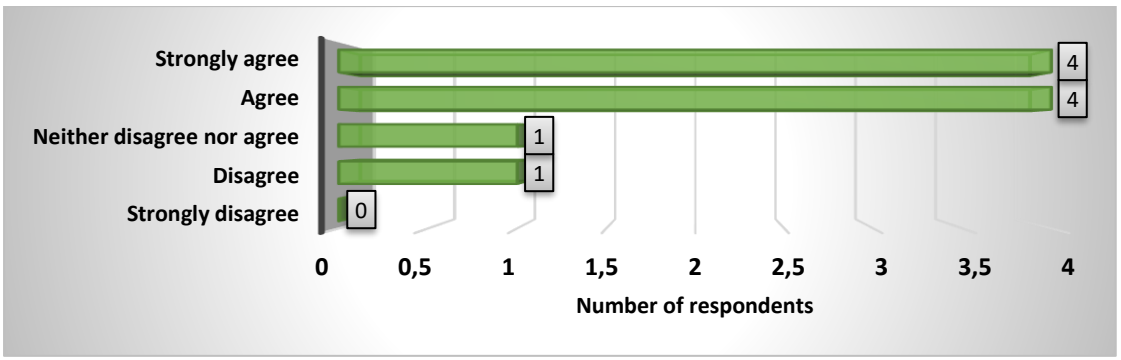
I am a quick learner when it comes to technology



Although participants indicated that they are keen to experiment with mobile devices and that they are quick learners (Figure 4.21), the responses relating to whether the participants would have been able to master the use of mobile devices in class with ease (Figure 4.22), was slightly less confident. However, it was still encouraging to see that they showed intent, even though 10% were still doubtful. The respondents who neither disagreed nor agreed may be lacking self-confidence. This view concurs with Mashile (2016, p. 23), who alluded that "self-confidence in using computers is also a material consideration as teachers' attitude and experience with technology are also factors associated with technology integration in instruction."

Figure 4.22

I will be able to master the use of mobile devices in class with ease



It is envisaged that if the participants used the mobile devices more frequently, it would boost their confidence levels. According to Totter and colleagues, teachers "with little

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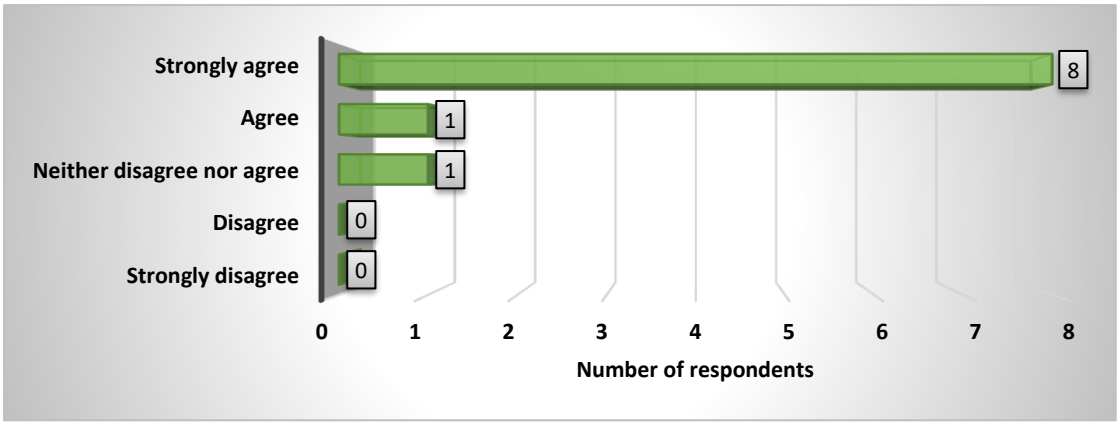
confidence in using ICT in their work will try to avoid them" (Totter et al., 2005, p. 97). Bingimlas (2009) also indicated a lack of confidence as a deterrent to teachers' desire to integrate technology into teaching.

A positive finding of this study is that most of the respondents (80%) indicated that they were already using their mobile devices to execute personal tasks like shopping, reading, searching for information, sending email, WhatsApp, SMS, watching videos and banking (see Figure 4.23).

Figure 4.23

I am already using my phone for personal tasks



It is to be reasoned that if the teachers were already familiar with the device and used it in their personal lives, these familiarity levels may carry those skills and attitudes over to the classroom. For example, both teachers and learners can search for information on the Internet, they can make and watch videos, and group work and communication can occur via WhatsApp. However, introducing mobile devices in class would require rethinking and flexibility on the part of teachers because the learners themselves are moving quickly to embrace mobile devices for learning (Prensky, 2005).

Overall, the responses were encouraging regarding the successful implementation of mobile devices as teaching and learning tools. The respondents indicated that they already use mobile devices in their personal lives and regard themselves as fast

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learners. The respondents also indicated that they were keen to experiment with mobile devices in their classrooms.

However, some respondents were hesitant and felt that it was not easy to learn how to use mobile devices to do what they are supposed to do in the classroom context. A possible explanation might be that teachers lack confidence. However, once they see others successfully managing in their classrooms, they might be able to build their confidence levels by repeatedly practising their skills. Their familiarity with the devices for personal use may have given some of the participants the courage to explore various new applications during the workshops.

In terms of usefulness and ease of use, the fact that these mobile devices are ubiquitous, and enabling access to functionalities anywhere, anytime without many constraints, seemed inspirational for the respondents. Thus, the ability to see the usefulness and ease of use of mobile devices enabled some teachers to take advantage of the mobile devices, making teaching efficient and learning effective whilst increasing their own job performance.

The district was putting pressure on teachers to use the devices given to schools. The data showed that participants found the mobile devices “useful” in both their personal and professional lives, even before the series of workshops, but definitely so afterwards. Although some of them were doubtful of their own technical abilities, the majority also perceived mobile devices as easy to use. A significant group of teachers showed a high level of confidence in their own ability to master teaching with mobile devices, demonstrating a high perceived level of “ease of use”.

The data gathered and analysed in Unit of Analysis 1 gave the researcher a valuable, but superficial impression of how a series of professional development workshops can influence teachers’ willingness to use mobile devices in their classrooms. Therefore, the focus then shifted to Unit of Analysis 2.

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4.3 UNIT OF ANALYSIS 2: THE IMPLEMENTING SCHOOL

An analysis of the data from the pre-workshop questionnaire administered during Unit of Analysis 1 shows that the respondents reported above-average computer skills, and access to mobile devices and the Internet. Their mobile devices also had all the necessary functionalities, and the majority reported that they had experimented with apps previously. However, despite all these positive conditions, the integration of mobile devices into their classrooms remained low.

The professional development intervention aimed to strengthen the participant's belief in mobile devices' usefulness and ease of use further. The post-workshop questionnaire responses implied that participants now intended to use mobile devices for teaching and wanted to take advantage of the affordances of the devices. Some of the respondents did, however, revealed a lack of confidence in their own skills levels. It was also stressed that the intent of the participants depended on them rethinking their pedagogical ways while knowing that the learners would welcome these devices.

The school visits conducted after the workshops indicated that many of the teachers still did not fully implement these devices in their classrooms. However, there were favourable facilitating conditions and most teachers' levels of confidence and their beliefs about the usefulness, ease of use, and intent to use the mobile technologies, were in place. Only one school out of the seven that attended the workshops was actively implementing mobile devices in its classrooms. We, therefore, know that there must be something more at stake than simply the perceived usefulness and ease of use that can be solved with a single professional development initiative, even when designed to run over three workshops, as the intervention did. A closer investigation was needed to determine why teachers were not actively and optimally using mobile devices to benefit their learners in class as yet, when they see mobile devices as useful and relatively easy to use. This phenomenon urged the researcher to employ another, more comprehensive acceptance model to further probe what must be in place for teachers for teachers to use their mobile devices to their full potential.

A new questionnaire was drawn up based on the UTAUT model constructs (Venkatesh et al., 2003). The UTAUT model was found to be well suited to this second unit of

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analysis because it has been applied to a large extent to clarify how individuals embraced the technologies (Dwivedi et al., 2019). Table 2.1 in Chapter 2 explained the UTAUT model constructs in more detail.

The questionnaire was used to collect data that solicited information regarding performance expectancy, effort expectancy, social influence, facilitating conditions, and moderating factors, which are all constructs that are captured in the UTAUT model (Venkatesh et al., 2003). Eight teachers, of which two had attended the earlier TPD workshops, responded to the questionnaire based on their experience of using mobile devices in their classes. The respondents are identified with pseudonyms using the prefix SVQ and an alphabet to indicate male or female (M/F). Some questions demanded a response based on a 5-point Likert scale ranging from 1 = *Very hard/ Very unlikely/ Very difficult*; 2 = *Hard/ Unlikely/ Difficult*; 3 = *Not sure;* 4 = *Easy/ Likely/ Easy;* to 5 = *Very Easy/ Very Likely/ Very Easy.*

All eight of the respondents who completed this questionnaire also agreed to participate in the interviews. In order not to keep teachers away from their preparation and marking work for a long time, the interviews lasted for an average of 10 minutes per interviewee (See Table 4.1). Once transcribed, the word count of the interview transcripts was 7382.

Table 4-1

Duration of interviews

Interviewee	Duration
$SVIM_1$	00:14:10
$SVIM_2$	00:09:05
$SVIF_1$	00:15:12
$SVIF_2$	00:14:09
$SVIF_3$	00:09:42
$SVIF_4$	00:10:45
$SVIF_5$	00:09:50
$SVIF_6$	00:08:03

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The interviewees are identified with pseudonyms using the prefix SVI and an alphabetical symbol to indicate male or female (M/F). Interviews were conducted to probe further and to obtain rich data to inform the findings of this study.

The following sections discuss the findings of this study in more detail. In the discussion, data from the questionnaire are crystallised with data from the interviews to ensure trustworthiness.

4.3.1 Moderating Factors

The moderating variables of gender, age, experience, and voluntariness of use are assumed to mediate the impact of the four essential variables, namely performance expectancy, effort expectancy, social influence and facilitating conditions, of the UTAUT model on usage intention and behaviour (Ahmad, 2014). Figure 4.24 illustrates respondents' gender, age, teaching experience, and voluntariness concerning their implementation of mobile devices for teaching and learning.

The majority (six) of respondents were female, and only two were male. This is a typical picture of teachers in schools (UNESCO, 2016). Most of the teachers (7), were older than 40 years, while most (7) had more than 20 years of experience. These statistics show a surprising but positive picture. While Umar and Yusoff (2014) found that the younger generation is mostly keen to implement technology, in our study, the older and more experienced teachers also implemented technology in their classrooms. O'Bannon and Thomas (2014), also found that whilst some research suggests that technology integration by teachers can vary with age, they are not consistent.

In Section 4.2.1, when I discussed the demographical details of the first Unit of Analysis, I mentioned the Umar and Yusoff (2014) study, which indicated that teachers in the age group 20-29 are keener to implement technology than older teachers. In this Unit of Analysis 2, I found opposite different result. All the teachers in this study, except for one, were older than 29, and all were actively implementing technology in their classrooms. Most teachers have been teaching for a long time and could be deemed to be on the older side, signalling a propensity towards a preference for

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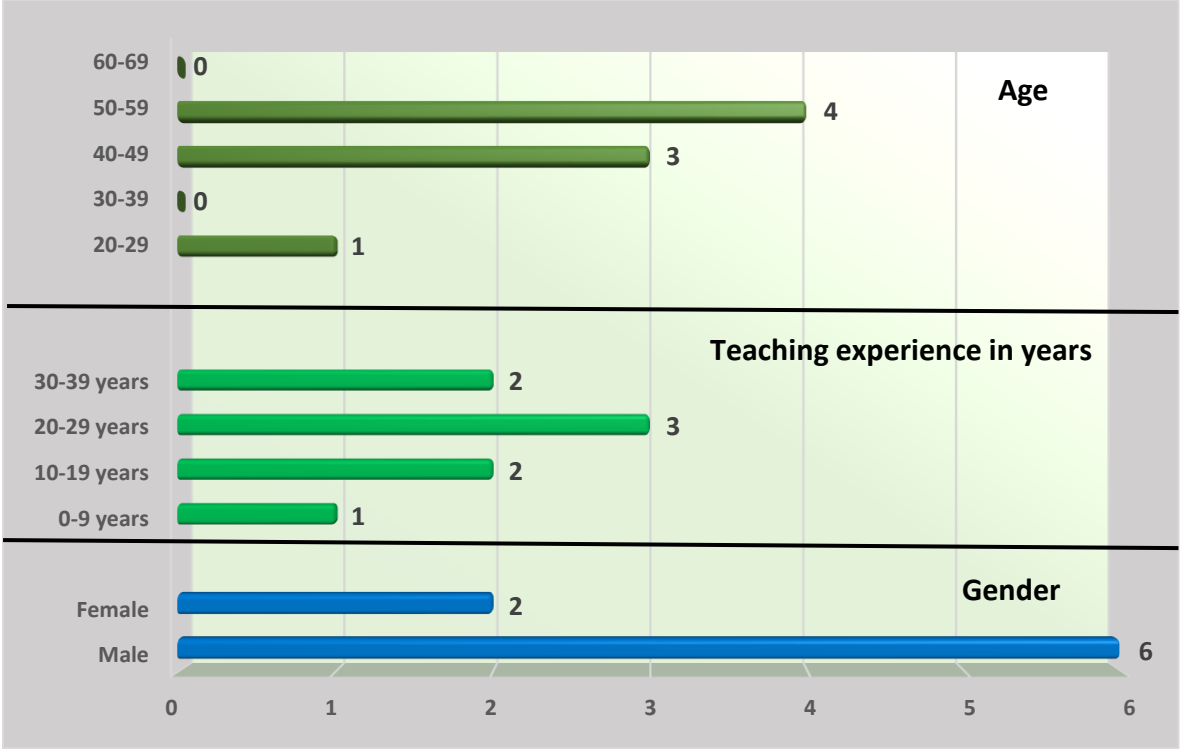
traditional teaching methods. However, in this study, the older teachers embraced the new technologies.

Figure 4.24

Moderating variables



Sharples (2006, p. 21) opines that “schools try to manage technology in a way that fits traditional classroom teaching through teacher mediates and knowledge communication”. This viewpoint created an interest in how teachers managed implementation, as the participants' voluntariness showed a positive outlook and willingness to change to the new ways of teaching, whilst incorporating and integrating mobile devices into their teaching. It also signalled a level of preparedness to change their pedagogical ways and take advantage of the anytime and anywhere features and functionalities, and the multitude of learning resources accessible from mobile devices.

4.3.2 Performance expectancy

The first two constructs of the UTAUT model relate to teachers attributing considerable importance to the extent to which the technology in question may be useful and easy

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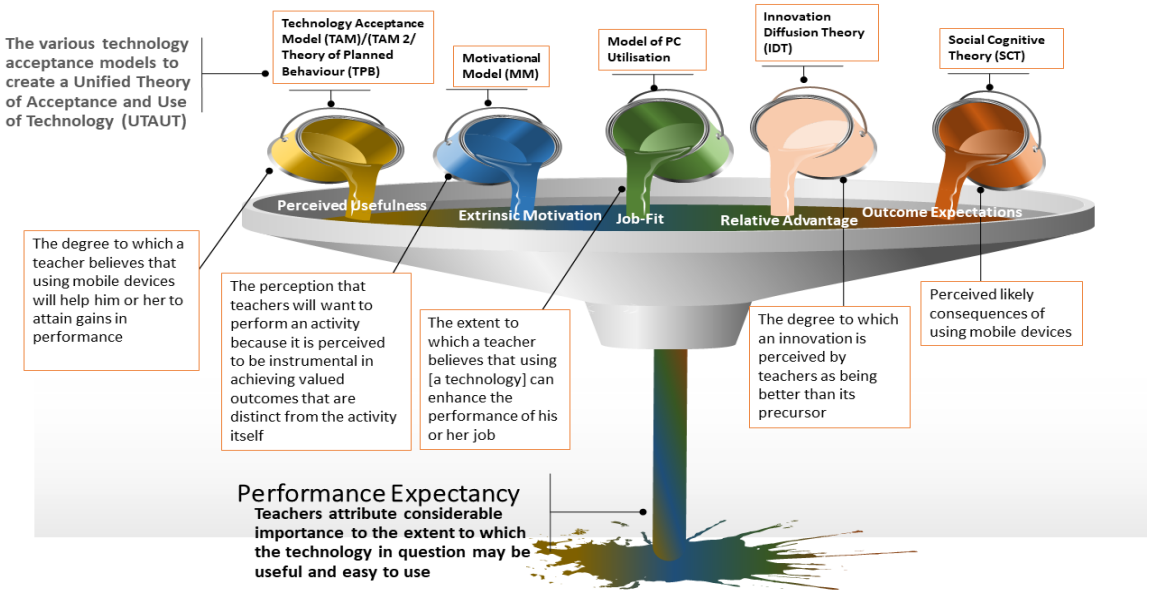
to use (Mutlu & Der, 2017). These related constructs are *performance expectancy* (PE) and *effort expectancy* (EE). Figure 4.25 illustrates the *performance expectancy* and the related variables.

Figure 4.25

Performance Expectancy and related variables



*A*dapted from Venkatesh et al. (2003)

Performance expectancy (PE) includes variables like perceived usefulness (U), extrinsic motivation, job-fit, relative advantage, and outcome expectations.

Perceived Usefulness

All the respondents to the questionnaire (see Figure 4.26) indicated that they found mobile devices useful in the classroom. As $SVIM_1$ mentioned:

> It is useful more especially for learners with learning difficulties, because you're able to use different learning styles to accommodate those learners who are not able to cope in class.

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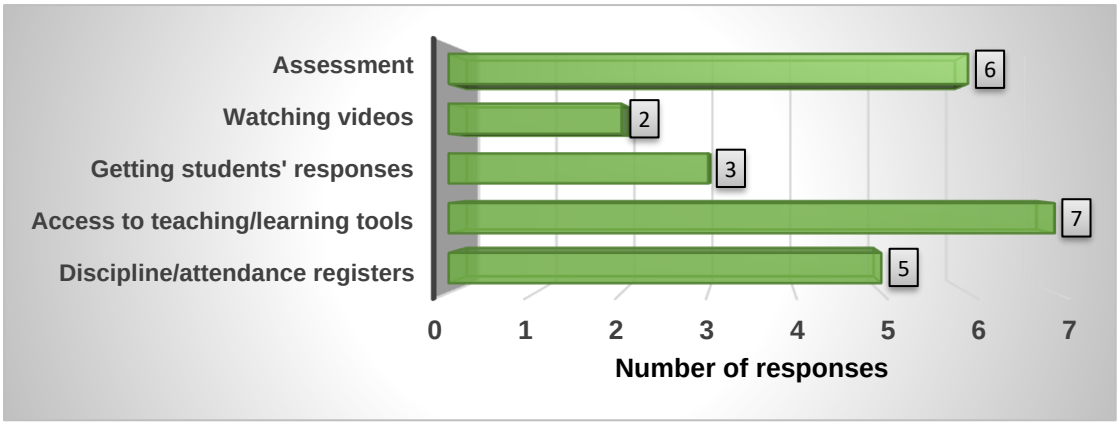
This observation agrees with that of Lefoe et al. (2009) who found that educators are eager to integrate the use of mobile devices in teaching and learning activities.

In relation to its usefulness, the respondents indicated that they would consider using mobile devices for a variety of teaching and learning activities (See Figure 4.26). For example, they indicated that learners could do assessments, watch videos, submit responses, access teaching and learning resources, and be disciplined via mobile devices.

Figure 4.26

The purpose for which the teachers would use mobile devices



This willingness to implement mobile devices is an indication that the respondents regard mobile devices to be helpful for various tasks in which they may have to engage. This reiterated the fact that teachers regarded mobile devices as useful tools for teaching.

One participant indicated that the mobile devices enabled them to accommodate learners who had learning difficulties, support those with different learning styles, and accommodate learners who were struggling to cope in class ($SVIF_1$). This viewpoint agrees with Shuler (2009), who mentions that one of the key opportunities offered by mobile devices is individualised instruction for diverse learners who can learn at their own pace.

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Another participant ($SVIM_1$) reported that learning with mobile devices helps learners concentrate since they can watch downloaded videos explaining concepts, thus making teaching and learning fun. To emphasise the notion of usefulness, he stated:

> Mobile devices are very helpful. Usually, what we do when we prepare lessons, we do have Wi-Fi that we get from the … Administration. So, we download videos that are relevant to the topics. We use the videos that are relevant to the work that we are presenting to the learners. So, I think they are very helpful because they even pay attention, they see on their mobile devices, and they can also remember what they saw from the video. ($SVIM_1$)

Participant $SVIF_3$ alluded that they tend to learn more when they see things practically, for example, when they use tablets which draws their attention to the lesson. The suggestion is echoed by Prensky (2001), who coined the term “digital natives” to refer to learners who grow up using technology such as the Internet, computers, and mobile devices. Sousa-Vieira et al. (2016) stated that learners gain various forms of work skills, conspicuous attentive behaviour, new learning preferences, and improved skills for learning and working within rich online social contexts, due to using mobile devices.

The use of mobile devices in the class also brought about a change in the behaviour of students. Participant $SVIF_7$ indicated that when they use mobile devices, it “brings discipline to the class in a way that they can grab the attention of the learners”. At the same time, Participant $SVIF_8$ indicated that “it improves concentration and the attention of the learner”. The use of mobile devices resulted in learners paying much more attention than usual in the class.

The positive responses and sentiments of the respondents and interviewees were encouraging and indicated that they experienced mobile devices as being useful. Their perception regarding the usefulness of mobile devices may be the reason for their attempt to use mobile devices in their classrooms.

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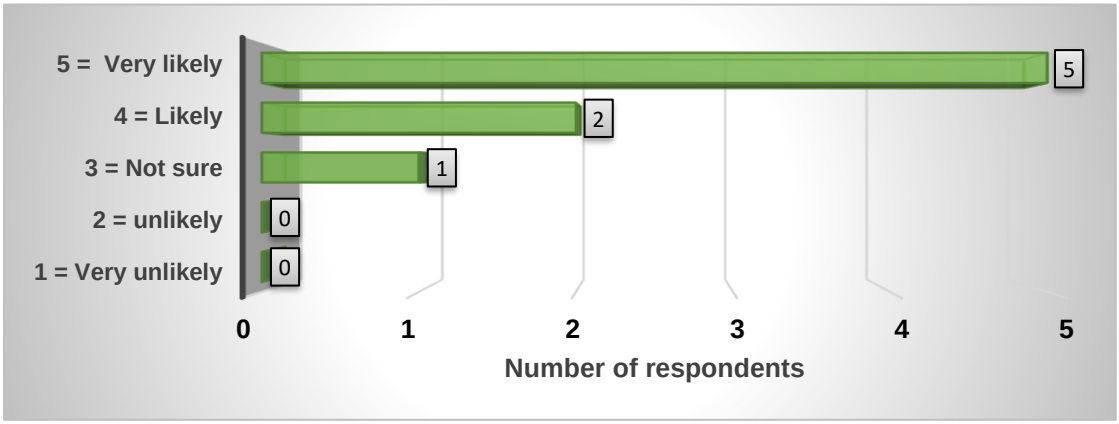
Extrinsic Motivation

Teachers may decide that they want to implement mobile devices simply because they are perceived to be worthwhile (Tan, 2013). The use of mobile devices also benefits teachers. Teachers can differentiate between individual learners' needs by introducing mobile devices, making it easier to share electronic resources with learners and teach them independently (Dias & Victor, 2017). Sousa-Vieira et al. (2016) suggest that online social networks could be coupled with gamification aspects for teachers to increase learners' performance and motivation through using mobile devices. Mobile learning technologies strengthen the broadcast and distribution of rich multimedia content (Traxler, 2013). Teachers may be motivated to implement mobile devices more voluntarily in classrooms due to the positive effects of this technology on learner performance. Figure 4.27 illustrates that most respondents ($SVQM_1$, $SVQF_1$, $SVQF_2$, $SVQF_4$ and $SVQF_5$) indicated that using mobile devices would "very likely" make their teaching more meaningful and fun.

Figure 4.27

Mobile devices make teaching meaningful and fun



This notion of creating games to teach serious content is one of the advantages offered by mobile devices that teachers are supposed to apply to their methodology, as confirmed by Prensky (2005). Today's learners were born in the era of new technology that includes what he calls "tools of the digital age", like computers, videogames, digital music players, video cams and cell phones. Mobile devices afford teachers unique opportunities to use a game-based learning methodology to deliver meaningful and

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fun content for their learners, because Generation Z learners prefer games rather than intense work (Schindler et al., 2017).

According to Bidin and Ziden (2013), mobile devices support the notion of inclusion and allow more opportunities for participation, and as a result, learning becomes more successful. Thus, when asked whether mobile devices helped to achieve learning outcomes in a fun way, $SVIF_1$ stated in agreement:

> They [the learners] learn and play at the same time. I think for them it makes learning and teaching fun so that they can be able to understand more than just writing because learners don't like to write. If they do something practical, I think it makes learning fun. ($SVIF_1$)

It is important for teachers to create learning activities that include elements that appeal to learners' interests and informally captivate their attention. Mobile devices seem to afford teachers the ability to use them as tools that enhance learning activities such as writing, among others, because of their research capabilities. Wang et al. (2009) suggest that teachers can generate an enhanced learning context by combining text, audio, and video, that appeal to the learning interests of what Tapscott (2009) calls the "net generation".

$SVIM_1$ advanced that:

> The traditional way has always been more of a one-way street, but now with mobile devices, it's more of a collaboration with educators. Now it's no longer the educator leading the class, but learners being more interactive with educators and being more critical using their critical thinking to be interactive in the classroom. ($SVIM_1$)

Learners are now motivated to be actively involved in their learning and even to collaborate. According to Rieger and Gay (1997), mobile devices serve a good purpose in collaborative environments by allowing learners to share information and organise their activities, whilst Kotrlik and Redmann (2005) summarise it by

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suggesting that technology stimulates learners to learn collaboratively. The responses emphasised the sentiments that mobile devices make shared learning meaningful and fun for the learners.

Furthermore, $SVIF_4$ specified the following in support:

> We can download games so that they can interact with the subject and use different kinds of web search and puzzles.

The comments support the existing literature where Bidin and Ziden (2013) consider games a crucial aspect of mobile devices, whereby learners become involved and inspired and do not realise that they are learning. Bidin and Ziden (2013, p. 723) believe that “these digital games have become the substitute to a world of learning where everything learners learn is old-fashioned and simply boring”. Since learning is becoming more exciting, Taleb and Sohrabi (2012) concluded that mobile technology learners had more motivation for learning than others.

The respondents and interviewees in this study confirmed that mobile devices could create meaningful and fun learning. When learning with mobile devices, certain activities are enhanced. Because students are actively involved, more learning outcomes are reached. The fact that the devices allow the inclusion of games implied that learners are engaged with appealing, interactive, and collaborative content. These gaming elements inspired learners to learn. Because of the motivational nature of games and multimedia, it is evident that the respondents’ perception was that mobile devices had an extrinsic motivational effect on their learners.

Job-Fit

When asked whether the respondents considered mobile devices to be able to enhance their job performance, one-half of the respondents ($SVQF_1$, $SVQF_2$, $SVQF_3$ and $SVQM_1$) agreed that using mobile devices would “very likely” enhance their job performance. $SVIF_1$ asserted in her comments that her hopes are that the school results would improve. The full response is indicated in Figure 4.28.

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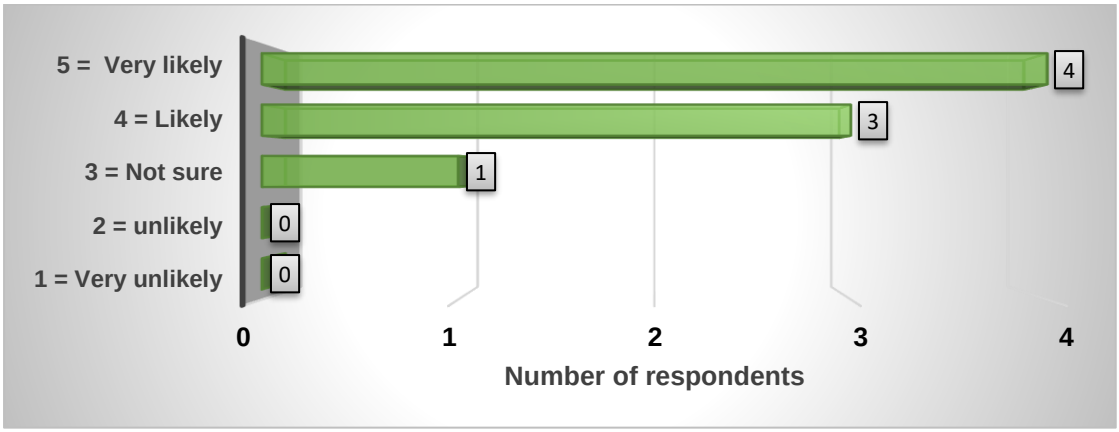
Figure 4.28

Mobile devices enhance job performance



Dias and Victor (2017) indicate that current research on the use of mobile devices in classrooms has shown positive outcomes for their use in the classroom. The same sentiments were echoed by $SVIF_6$ when she said:

> Because it can quickly give the results and an indication of how far the learner has achieved certain assessments. You'll be able to quickly identify where the strength and weakness of the children in the classroom is.

In agreement, three respondents, namely, $SVQF_4$, $SVQF_5$ and $SVQM_2$ selected *likely* (see Figure 4.29), whilst $SVIM_1$ emphasised that:

> Mobile devices enhance the educator's work, and definitely will help them because, if we look at our generation currently, learners react more to visual listening and touching, so using this [the mobile devices] will actually help a lot. ($SVIM_1$)

Only $SVQF_6$ selected *not sure*, which represent few of the respondents. Venkatesh et al. (2003) caution that effective output in organisations is dependent on acceptance and usage of technology by employees. This response may imply that employee acceptance of technology depends on how they perceive technology's contribution to their effectiveness in executing their tasks. Thus, it is fair to say that most of the

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respondents believed that using mobile devices enhanced their job performance and that they thought that the devices helped them a lot.

Relative Advantage

The participants generally regarded mobile devices as more useful than using the traditional direct instruction method of board and chalk. This viewpoint indicates that these participants perceived a relative advantage in using mobile technologies rather than the previously used methods. According to Dias and Victor (2017), mobile devices presented a new generation of educational tools that offer innovative use and immediate access to various resources. For example, when asked how mobile devices are better than board and chalk, the participants felt that accessing information on mobile devices is now easy and saves time. One of the participants indicated:

> You can access information easily, and it saves time and paper cause at some point you see that you print out [too much] and use chalk and stuff. So, with mobiles, you just charge [the device] and use it for interactive problems. Like when you're doing maths– there's a worksheet that you can do, on those gadgets, which are easier for children because they are now familiar with the technology. ($SVIF_6$)

Likewise, $SVQF_1$ and $SVQF_4$ responded that mobile devices would be *very likely* to enable them to complete tasks more efficiently than before (Figure 4.29). Additionally, $SVQM_1$ and $SVQF_2$, $SVQF_5$ and $SVQF_6$ selected *likely*, whilst only $SVQM_2$ selected *not sure*.

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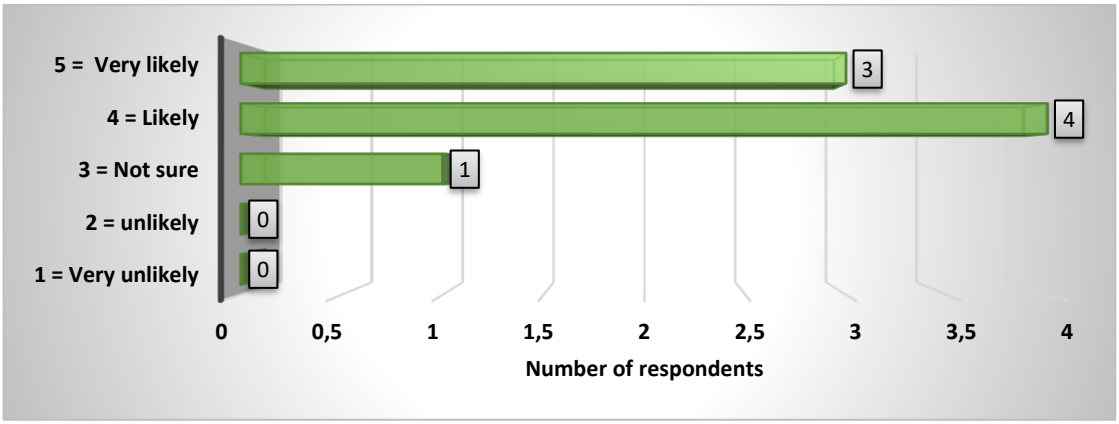
Figure 4.29

Complete tasks more efficiently than before



SVIF$_1$ also conceded that

> It is better than chalk and board because learners get bored, but immediately when you start engaging them when they do something that they touch, it makes it more interesting.

Once again, another participant alluded that

> When we look at this nowadays, like the teaching and learning especially from these learners of nowadays in the 21st century, they tend to enjoy it more when working with devices like the tablets. Most of the time, they will tend to be busy with something else, when you're just teaching them. But if you're having the devices, they put in all their effort and then they concentrate a lot. It leads to effective learning because when you're using these tablets, the learners engage themselves in whatever lesson you'll be teaching. So, that is why I'm saying its effective compared to the one where we're using previously. (SVIF$_3$)

SVIF$_8$ attributed the advancement of the learners' prior knowledge to mobile devices because:

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> Nowadays children are more into those devices and the technology is more advanced. So, they are quickly to be drawn to the matter that is at hand - they quickly [snaps fingers] see what is going on, on the topic that is discussed. ($SVIF_8$)

Participants conceded that there was an improvement in the learners' schoolwork. They attributed this to the use of the mobile devices the learners bring to school, as it gives them an advantage of tapping into a vast array of information resources. This model makes the teachers' work easier as it reduces the printing of worksheets. Learners also concentrate more and are more engaged as they attempt activities and can have quick and easy access to information. Furthermore, using mobile devices is not something new that learners must learn, as they already know how to use them for personal purposes. This pre-knowledge made the participants' teaching with mobile devices better than the traditional way of teaching.

Outcome Expectation

There were different responses from participants regarding the extent to which mobile devices lead to effective learning. Theoretically, they knew the benefits of using mobile devices, as well as the positive outcomes. However, they all experienced that introducing mobile devices in class was challenging at first. Although many learners now had access to mobile devices, it was still a challenge because some learners were seeing and touching them for the first time in their lives ($SVIF_1$). This inequality was because some of the learners were from poor and disadvantaged backgrounds. One participant indicated the challenge as follows:

> Okay, like some of the learners are disadvantaged. Some of them come from disadvantaged families and they don't have the basics of using the devices. So, it is a bit challenging when introducing them [the mobile devices], but then some of them can't use them, so that is the challenge. ($SVIF_3$)

The novelty of the mobile devices created serious distractions in class as the participants realised that initially, the learners were more curious about how the

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technology work than about the learning that needed to happen. This was confirmed by one participant:

> The challenges that I had, learners were excited; they didn't want to listen because for some of them, it was first time that they were touching these mobile devices, and there was a lot of noise in class. They didn't understand what to do; they were asking others what to do, how to open, how to do this and this. At the end of the day, it was just quiet; it was interesting. ($SVIF_1$)

After the initial challenges, the participants started seeing the positive side of using mobile devices. They felt it yielded positive results, leading to more effective learning, as one participant stated:

> I can say the devices lead to effective learning because some of the information we don't have but they can get it from these devices. They google - so they get the information from the device by googling. It becomes fun and they get more information than from us. ($SVIM_2$)

Additionally, $SVIM_1$ responded by saying:

> Now in the past, you said 'let's do revision', and you used previous papers, but now if you're using a more interactive app that gives immediate feedback, it becomes interactive. Learners become critical thinkers - they critically think about the questions, so it is more engaging, and they can actually do more because of mobile devices. ($SVIM_1$)

According to the participants, school results ($SVQF_1$), learner attendance ($SVQF_3$), and discipline ($SVQM_2$) improved, among others, because of the introduction of mobile devices. These improvements were further indicators of the positive influence when mobile devices are implemented in the classroom. For teaching to be effective, it is important to grab the learner's attention. This notion is confirmed when Gagné lists

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"gaining the learner's attention" as the first of the nine events of instruction/teaching (Gagné et al., 2005). In addition to gaining the learners' attention, Martin and Ertzberger (2013) confirm that mobile devices provide the opportunity to grab learners' attention and engage them in new and innovative ways.

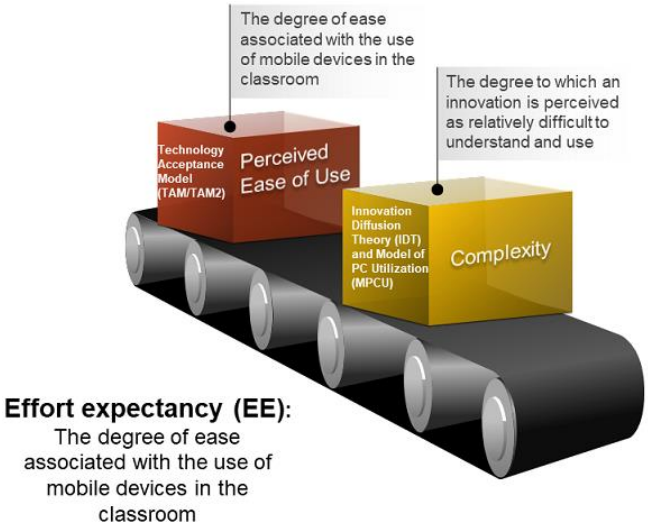
The participants in this study confirmed that the new ways of integrating mobile devices in the classroom increased the likelihood that access to mobile devices would improve disadvantaged learners' performance. Consequently, learners might no longer stay away from schools as often as they did since they wanted to use the devices and learn with them. The participants were hopeful that the introduction of mobile devices in class might result in a fun and engaging learning environment where academic performance is enhanced. Learners may be eager to attend classes and be actively participating and collaborating with others. While academic performance is enhanced, the teacher's job becomes easier as improved school attendance, discipline in class and academic performance lead to a positive performance expectancy.

4.3.3 Effort Expectancy

According to Mutlu and Der (2017, p. 173), effort expectancy (EE) is "the degree of ease of technology use" and includes variables like *perceived ease of use* and *complexity*. Figure 4.30 illustrates effort expectancy and its related variables.

Figure 4.30

Effort Expectancy and related variables (adapted from Venkatesh et al., 2003)



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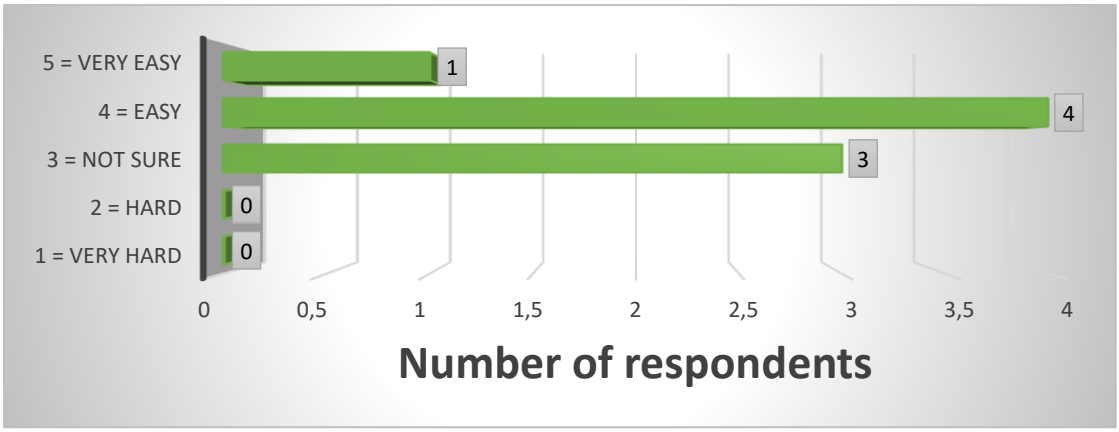
Perceived Ease of Use

The participants were asked to rate how easy it would be to introduce mobile devices in the classroom and how easy it would be to use them as a teaching and learning tool to determine perceived ease of use. Even though $SVQF_1$, $SVQF_6$ and $SVQM_1$ indicated that they are "not sure" on how to rate the introduction of mobile devices into the classroom (see Figure 4.31), most of the respondents ($SVQF_2$, $SVQF_3$, $SVQF_4$ and $SVQM_2$) indicated that it is *easy* or *very easy* ($SVQF_5$).

Figure 4.31

Introducing mobile devices



According to Bidin and Ziden (2013), usability is one feature that motivates learners and teachers to use mobile devices. Consequently, when asked about the challenges of introducing mobile devices in the classroom, SVIF6 stated that

> Most leaners are not familiar with the gadgets, so when you bring them in the classroom, some they want to play and not do educational things … But if you as a teacher give them instructions and manage it carefully, your lesson is going to be productive. ($SVIF_6$)

Furthermore, $SVIM_1$, attributed the challenge to communication when he stated:

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> A lot of applications on the mobile devices are in English, so the problem is for us to introduce English to the learners in instruction. It is very difficult, so the biggest challenge is actually giving instructions, because they all come in English. But it's something that I believe that we can achieve in the future. ($SVIM_1$)

Despite the tablet's novelty and possible language barriers, the perception is that the majority of teachers are positive and in favour of the use of mobile devices for teaching purposes, as $SVIF_6$ indicated that:

> It's only like, let me say 80% they [teachers] like it, and only a few that they are tired, closer to the pension.

This viewpoint implies that many teachers are keen to use their mobile devices for teaching purpose. This is not only true for the teachers but also for the learners. For participant $SVIF_1$ the influence is positive as she stated excitedly that:

> Yes, they share; they work together as a team. Like, in my class I only have 15 tablets, but they know that each learner must get a chance to touch and use that tablet.

However, for $SVIM_1$, the picture was still gloomy as implied in his answer that:

> Currently, from the scale of 100%, I would say 40%, a lot of them [teachers] still feel threatened about the mobile use of ICT within the classroom. I think they now feel like you're now giving more tasks for them to do, because they have to learn something different from what they're used to. ($SVIM_1$)

In response (see Figure 4.32), $SVQF_2$, $SVQF_3$, $SVQF_4$, $SVQF_5$ and $SVQM_2$ felt it would be *easy* for learners to use mobile devices in the classroom, while $SVQF_1$ responded *very easy*. $SVQF_1$ and $SVQF_6$ were *not sure*.

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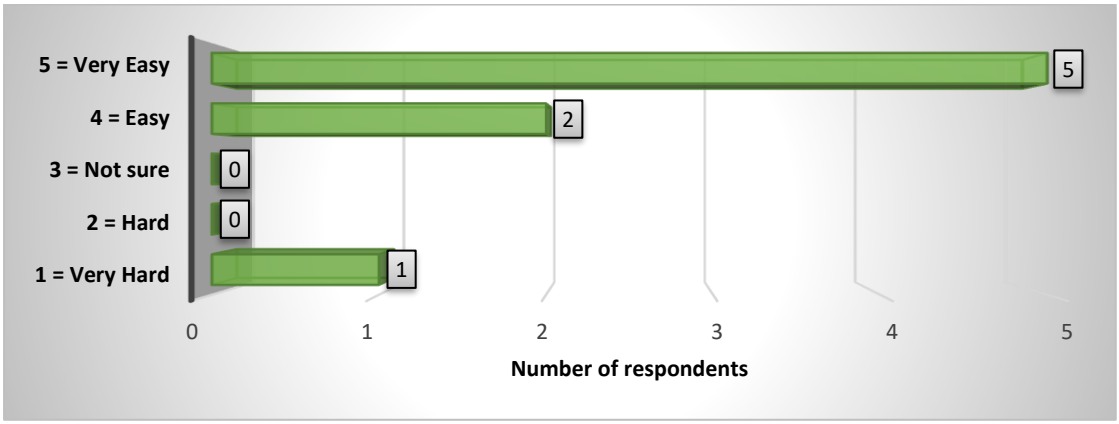
Figure 4.32

Ease of use of Mobile Devices



The ease of use and positive attitude of the participants were evident and would, in all likelihood, influence their use of mobile devices in their teaching. Khokhar (2016) confirmed this statement, suggesting that teachers' outlook towards ICT and their opinion regarding its usefulness and ease of use are crucial in their use of these devices for teaching and assessment activities in the classroom.

In this study, both the teachers and their learners were keen to use mobile devices in the classroom. While it seems that the perception was that mobile devices are easy to use, the applications were somehow challenging due to the language barrier. Most applications are available in English, which posed a challenge, but it is one problem that participants might overcome when implementing with clear instructions in the language used in the classroom. It may also have the unintended benefit of improving the learners' grasp of the English language. Some features of the mobile devices fascinated learners, which exacerbated the discipline challenge in class. Nevertheless, the participants took full advantage of the mobile devices and introduced more educational games, indirectly facilitating learning.

Complexity

Complexity refers to how difficult it is to understand and use technology in the classroom (Tan, 2013; Thompson et al., 1991). Educators have been eager to include the use of mobile devices in teaching and learning activities for a while now (Lefoe et

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al., 2009). In contrast with Lefoe et al. (2009), the participants in this study mentioned that they (the participants) did not integrate technology to its full potential as yet, because they struggled to establish a balance between the traditional and the digital ways of teaching. Another challenge was that budgets are provided for the provisioning of technology and not necessarily in equal amounts for the professional development of teachers (Lefoe et al., 2009). The participants supported the need for professional development initiatives that extend over a more extended period, thus providing learning opportunities in a "just-in-time" fashion. Although they all had access to technology and indicated that they had a good level of ICT skills, some of them are convinced that it is difficult to use mobile devices in their classroom. Therefore, some participants still struggled to integrate the technology into their classrooms. This lack of confidence could be why they shy away from using mobile devices rather than embracing them.

$SVIM_1$ attributed how using mobile devices affected their daily tasks to the participants' lack of skills when he postulated that:

> It goes back again to educators being used to the traditional way of teaching. Now, it's also for them playing catch up - they are trying to use this traditional method and trying to learn the digital way of implementing the devices in the classroom to such an extent that both usually become very difficult to balance. ($SVIM_1$)

Conversely, as illustrated by Figure 4.33, $SVQF_1$ indicated having *advanced* computer skills, whilst $SVQF_2$, $SVQF_3$, $SVQF_4$, $SVQF_5$ and $SVQF_6$ described their *skills* as *intermediate.* Only $SVQM_1$ and $SVQM_2$ indicated that they had *beginner* level skills. Therefore, it is interesting that, when confronted with this notion in the interview, the participants indicated that they did not yet have the confidence required to use mobile technologies in their classrooms fully.

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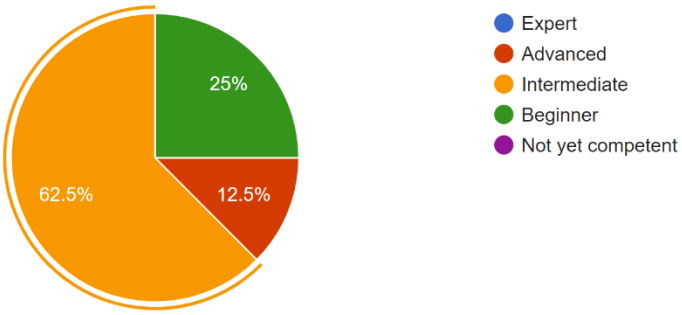
Figure 4.33

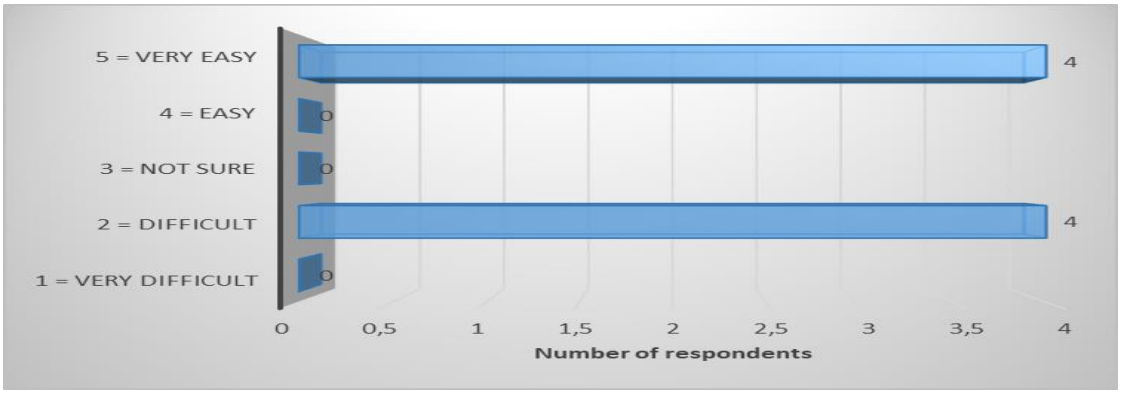
ICT Skills



Furthermore, when answering the question about how difficult it is to use mobile devices in class, the responses ranged between Very *Easy* (SVQF$_{2,}$ SVQF $_{3,}$ SVQF $_{4,}$ and SVQF $_{5}$) and *Difficult* (SVQF$_{1,}$ SVQF $_{6}$ and SVQM$_{1,2}$), as illustrated by Figure 4.34. Once again, it seems as if there is a discrepancy between the teachers' perceptions of their own ability and the actual levels of difficulty they experience when they start implementing the technologies in their classrooms.

Figure 4.34

Difficulty in using Mobile Devices



This lack of confidence that teachers have in their own ability may be attributed to failure by authorities to plan for intensified staff development to effectively assimilate the use of mobile devices within the curriculum (Guma et al., 2013; Lefoe et al., 2009). Similarly, Teo (2009) believes that for teachers who perceive mobile devices as useful

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and easy to use, continuous professional development is essential in keeping them well-informed of the latest progress, skills, and knowledge related to new educational technologies, not to experience setbacks.

Participants' ability to adapt their pedagogical ways and use mobile devices were still a challenge, mainly due to a lack of adequate professional development. Governments, education authorities and schools have made huge investments by resourcing schools with computer equipment (Pelgrum, 2001), but little investment has been provided for professional development (Lefoe et al., 2009). Mundy et al. (2012) indicate that despite schools being provided with modern technology, this is mostly used for administrative purpose. They (Mundy et al., 2012) attribute this to teachers lacking the proficiency to take advantage of these new technologies. Van Praag and Sanchez (2014) suggest that the cause of this inability to use the devices as learning instruments is the absence of comprehensive instruction regarding the use of mobile technologies. Furthermore, Mundy et al. (2012, p. 1) add that "teachers lack the technological proficiency needed to take advantage of these new technologies, making them unable to bring these technologies into the classroom and leading to many standing unused in the classroom".

The study established that the difficulty in understanding and using technology in the classroom is the complexity of the task. Therefore, prioritising staff development could bear favourable outcomes by boosting the participants' morale and confidence to implement mobile devices into their teaching activities. Ertmer et al. (2012) conclude that teachers believe that one has to be confident in their own abilities to use technology and be committed to its use. However, Hsu (2010) found that professional development, which led to better-trained teachers on the use of technology, enabled teachers to integrate technologies into teaching effectively. The participants in this study possessed skills that could be harnessed as prior knowledge to build upon and enhance their mobile devices' implementation as teaching tools.

The participants were clear that although they had good ICT skills, they were uncertain if it would be easy to use mobile devices. This lack of trust might be because of a lack of training and exposure. The ability to adapt their pedagogical ways and use mobile

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devices were seen as a challenge, mainly due to a lack of adequate professional development.

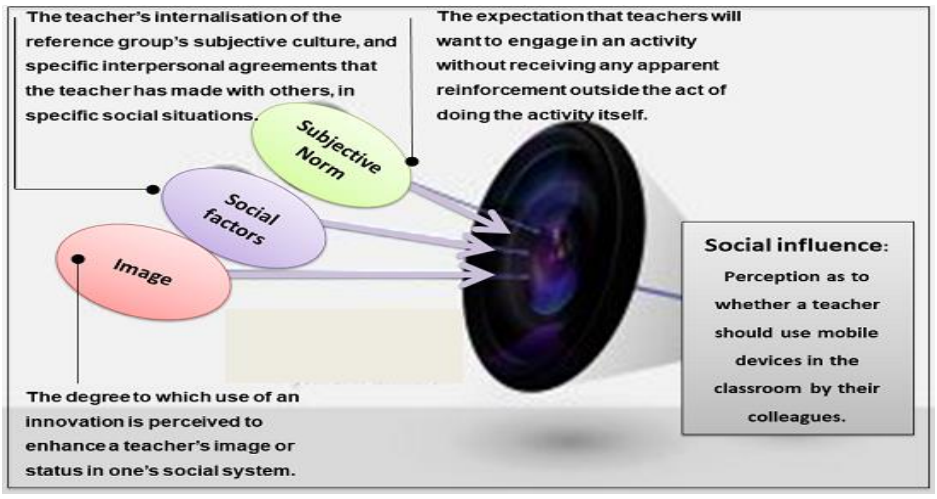
The pace at which teachers embrace change will continue to differ based on their exposure to professional development that may influence their attitude towards mobile devices and possibly their perceived ease of use of the mobile devices. Furthermore, the responses revealed that there is continued doubt and lack of confidence in self-efficacy in using mobile devices, even though the willingness is there. It was promising to find that some participants out rightly embraced the change.

4.3.4 Social influence (SI)

Social influence is one of the UTAUT constructs that relate to teachers associating the importance of using mobile devices with the facilitating conditions, such as helpdesks and training programmes, and the experiences of other individuals in using the mobile devices (Mutlu & Der, 2017). Social influence includes variables such as *subjective norms*, *social factors* and *image*. Figure 4.35 illustrate the related variables for social influence.

Figure 4.35

Social Influence and related variables



Adapted from Venkatesh et al. (2003)

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Subjective Norm

Lefoe et al. (2009) suggest that inclusive staff development and assistance are crucial traits in ensuring efficient use of educational technologies, coupled with a formidable emphasis on pedagogy within the curriculum. In response to whether colleagues are encouraging each other with regards to the use of mobile devices for teaching and learning, $SVIF_1$ indicated positively that:

> Yes, they're encouraging one another because most of them after school they come to my office and ask me which apps they can use for maybe their homework or which apps they can use for the activities that they want to do the following day. ($SVIF_1$)

The interaction and engagement of the participants after school encouraged others to use technology. While seeking help and sharing resources, they empowered each other with knowledge and skills, and in doing so, they built an informal community of practice. Not only is the shared information encouraging, but it also demonstrated that teachers are curious and interested to know how the technology and applications work and how they can be applied in their lessons. Seeking assistance from others who seem to be more competent is essential in dealing with frustrations when implementing technology. "Teachers with lower levels of self-efficacy about computers become more frustrated and more anxious and hesitate to use computers when they encounter obstacles" (Sang et al., 2010, p. 3). Hence, Hennessy (2010) believes the scarcity of proficient teachers and the low levels of teachers' ICT expertise and competence are regarded as the main impediments to successfully establishing technology in schools.

The sentiments of $SVIF_2$, that "Oh, no, they encourage us to use the mobile device more often so that these learners, they can get used to these things", seem to indicate a contrasting situation at other schools. At the implementing school, those with knowledge and competence share it with others, while simultaneously encouraging them, thus creating a culture conducive to implementing and using mobile devices for teaching.

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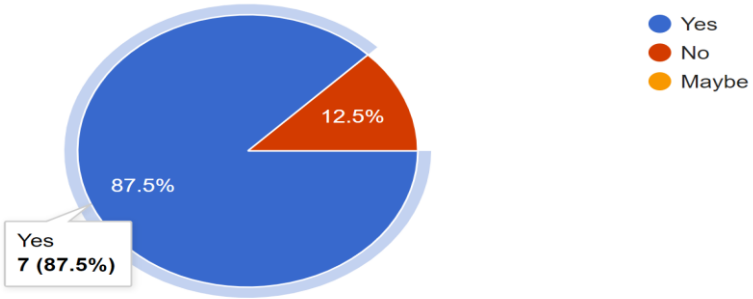
It is to be assumed that with “they”, $SVIF_2$ was referring to either colleagues, school management, or even district officials, and by “things” she meant either applications or mobile devices. All respondents selected *Yes* to whether the culture of innovation exists at the school.

SVQF4 mentioned that she is not influenced by her peers' motivation levels when it came to the use of mobile devices in the classroom. However, improved mobile technologies are facilitating the effective incorporation of such communities as online communities of practice in teacher professional development. (See Figure 4.36).

Figure 4.36

Influenced by other staff members' level of motivation



While “No” may mean the respondents are self-efficient and therefore not necessarily influenced by their colleagues, there seemed to be a culture of encouragement and motivation at this school, either directly or indirectly. As indicated before, the pace at which teachers embraced change may differ. Still, the keenness displayed by colleagues was enough to influence those falling behind to adapt or attempt to emulate them. The encouragement and motivation improved and enhanced the culture of innovation at the school leading to the successful implementation of mobile devices as teaching tools.

Social Factors

According to Guerrero et al. (2006, p. 268) “new collaboration contexts are being supported by mobile computing devices”. In responding to the likelihood of mobile devices promoting collaboration among teachers, most participants responded *likely*

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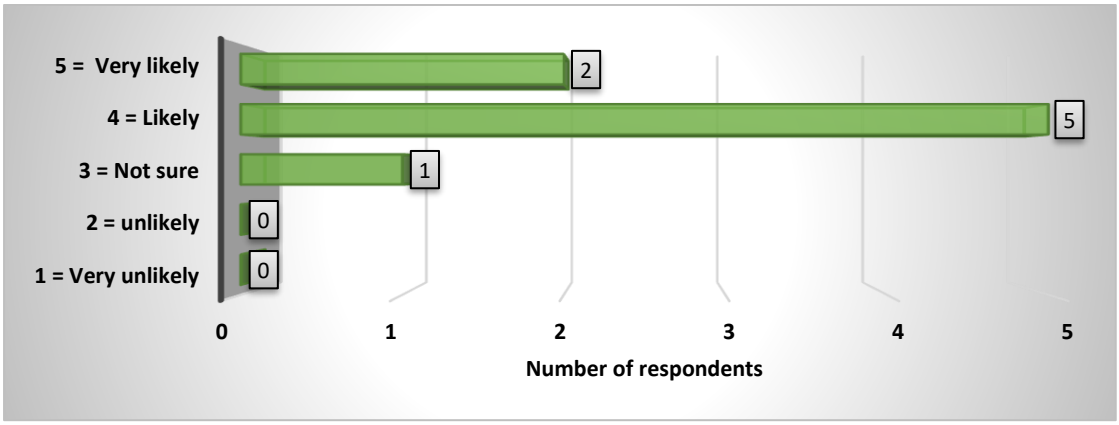
(SVQF$_1$, SVQF$_2$, SVQF$_3$, SVQF$_5$ and SVQM$_1$), or *very likely* (SVQF$_4$, SVQF $_6$), while only SVQM$_2$ responded *Not sure*, as illustrated by Figure 4.37.

Figure 4.37

Mobile devices promote collaboration



In McAleavy et al.'s (2018) view, school-based, staff-led and on the job training through classroom-based coaching and mentoring for staff is necessary to establish working communities where professional learning can be shared. SVIF$_2$ also supported this viewpoint by mentioning that sometimes a meeting was held where those who had difficulties with mobile devices were offered assistance from among the other teachers.

Collaborative learning is defined as the practice of developing and maintaining a joint perspective of a task (Roschelle & Teasley, 1995). It is believed that learning in groups becomes effective when group members attempt to develop a common understanding regardless of their differences (Dillenbourg & Crivelli, 2011).

SVIF$_2$ added that they attended workshops organised by the district and the school every now and then. These workshops implied that they collaborated informally at their school and in a more structured way by attending these official workshops. During the workshops, they collaborated with other teachers and obtained ideas on implementing the technology, sharing challenges and solutions, and trying out new apps. In support, Dillenbourg and Crivelli (2011) explain that during the implementation of mobile learning, the real advantages of collaborative learning are

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determined by the value of the efforts and exchanges amongst group members. $SVIM_2$ concurred and stated:

> Very much, because we help each other, we help each other. We collaborate, we assist. If I don't know something, if I don't know how to use a particular device, I call a teacher, who knows and then she is going to help. We ask the one who knows, and then she is going to help us. ($SVIM_2$)

His comment shows that even if there is only one champion, it can already make a difference in a school. If one person is empowered, they become the "resource" for others and may also have an inspirational effect towards motivating colleagues to use mobile devices.
$SVIF_4$ agreed by stating:

> They are really encouraging because if someone doesn't know how to use a certain tablet or how to search for something, we help each other so that we can reach the goal.

Lucero et al. (2016) suggest that whilst people may use mobile devices as resources in their natural social milieu, the devices also enable them to curate their collected materials separately and collaboratively. In addition, Naismith et al. (2004) suggest that due to their abilities and extensive environment of use, mobile devices have an affinity to promote collaboration. The use of mobile devices has seen an increase in teachers' networking due to the power offered by its functionalities that allows them to share information and communicate virtually.

The mobile devices also enabled the participants to share ideas and collaborate on work-related issues, thus building a culture of cooperation in their school. This assistive attitude led to progress as they lifted each other's skills levels, competency, motivation, and morale. The end result was a success in implementing mobile devices across the school without leaving anyone behind, thus becoming a community of practice. According to Masrom and Ismail (2010, p. 02), "the term 'community of practice' defines an informal network or group of individuals who share information, as

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well as solutions to genuine problems" and in this Unit of Analysis, the evidence thereof was abundant.

Image

In response to the extent to which mobile devices promote a positive outlook on learning, $SVIM_2$ indicated that:

> Learners used to bunk classes. When it is your period, they will go to the toilet outside, and after the period is over, you will see them coming. But now, when you bring along these mobile devices, they like them very much - they will never run away from class. When they know he's coming with this; then they come to class; they want to see them [the mobile devices] and use them. (SVIM2)

Jones and Issroff (2007, p. 248) suggest that mobile devices may be motivating learners to learn because of the devices' ability to offer them "control over their learning goals, ownership, learning in context, continuity between contexts, fun and communication". In addition, Mockus et al. (2011) encourage educators and learning designers to consider strengthening learner motivation by taking advantage of the influence and potential of customised learning offered by mobile devices. In agreement with mobile devices promoting a positive outlook on learning, $SVIF_4$ added that:

> No, for me it is a good thing because … today, life is about technology and children like working with technology. It's much easier for them to learn and it makes class more interesting, so that they can enjoy school at the same time as learning and enjoying. ($SVIF_4$)

Siddiqui et al. (2014) believe that it is a status symbol to have a mobile device. In relation to the extent to which the use of mobile devices in class improves one's status or image at school, the majority (six) of the participants selected *very much* (SVQF3) or *much* (SVQF1, SVQF 2, SVQF 4 and SVQM1, SVQM 2), while one each selected *not sure* (SVQF6) and *little* (SVQF8) (see Figure 4.38).

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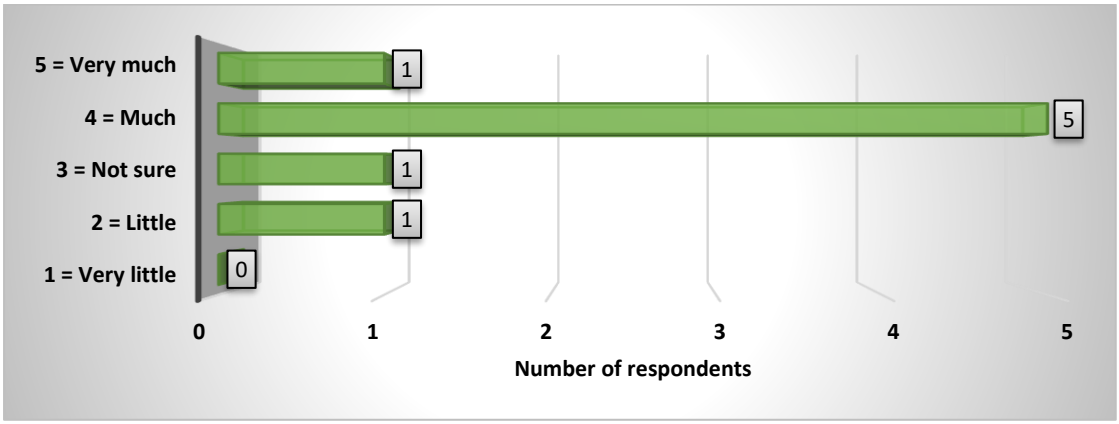
Figure 4.38

Use of mobile devices and status



As mobile devices can be seen as a status symbol, learners seem to want to be associated with them. In this study, the mobile devices created a sense of curiosity that moved the learners to attend class more regularly. The introduction of mobile devices in class seemed to have boosted the status of the teacher as they regained the respect of their learners. The teachers also experienced their teaching activities as fun, resulting in a situation where their learners also enjoyed being in their classrooms. The situation made the teachers feel valued, and it all seems to be credited to the introduction and use of mobile devices.

4.3.5 Facilitating conditions (FC)

Facilitating Conditions (FC) refer to the beliefs that organisational and technical infrastructure exists and will support the users during use (Mutlu & Der, 2017). It includes variables like *perceived behavioural control*, *facilitating conditions* and *compatibility* (Venkatesh et al., 2003). Figure 4.39 illustrates the facilitating conditions and related variables.

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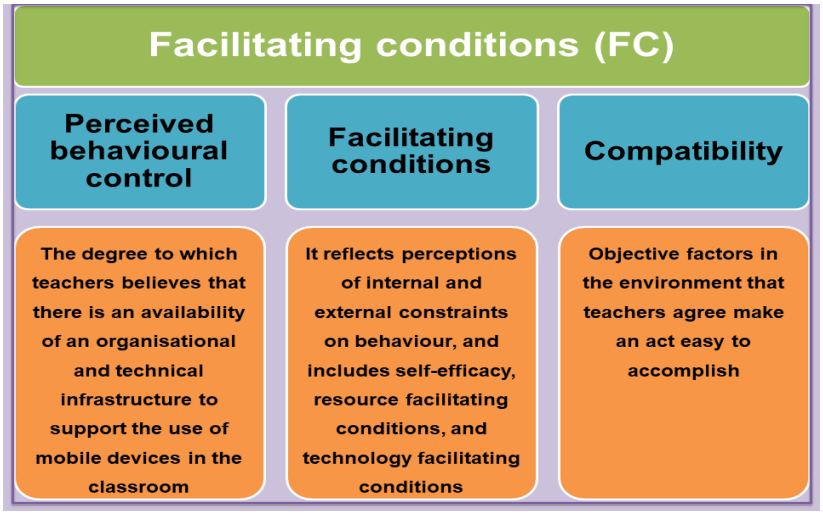
Figure 4.39

Facilitating conditions and related variables



Adapted from Venkatesh et al. (2003)

We already knew from Unit of Analysis 1 that the teachers regarded these mobile technologies as useful, and they thought that they were relatively easy to use. Hence, we anticipated that, except for the matter of timeous and continued professional development, facilitating conditions may have played a rather substantive role in their decision to use mobile devices in class or not.

Perceived behavioural control

Perceived behaviour control refers to the restraint measures that users feel may regulate their behaviour (Lai, 2017). Research tells us that the delay in an all-inclusive policy for mobile device use, lack of supporting infrastructure, vague strategies and lack of support from top management are all obstacles to the adoption of mobile devices (Ruxwana et al., 2018). Batchelor (2007, p. 14) indicates that in South Africa, “mobile phones do not play an active role in formal education” due to the devices being regarded as a safety hazard and disruptive. She (Batchelor, 2007) also mentions that contemporary policies often forbid its use in class. Currently, the situation has changed slightly in South Africa, with the publishing of “Action Plan 2019” (Department of Basic Education, 2015). Goal 16 of the plan specifies the intention to “Improve the professionalism, teaching skills, subject knowledge and computer literacy of teachers

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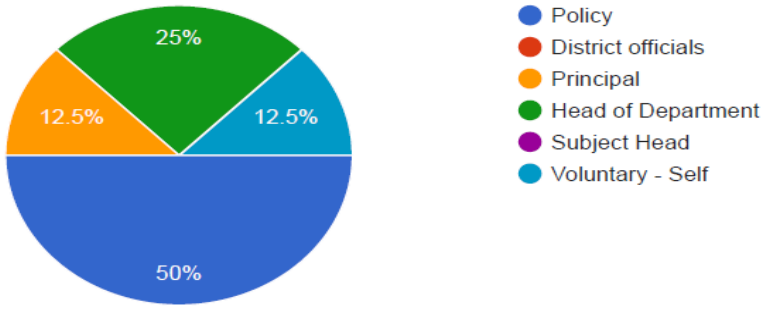
throughout their entire careers", and goal 20 specifies a need for increased "access amongst learners to a wide range of media, including computers, which enrich their education" respectively (Department of Basic Education, 2015, p. 4). Respondents agreed that the lack of schools based supporting policies on the use of mobile devices in the classroom is one of the main factors that hindered the use of mobile devices in schools. Figure 4.40 depicts additional factors that contributed to the use of mobile devices for teaching and learning in the classroom.

Figure 4.40

Factors contributing to mobile device use



Several participants ($SVQF_1$, $SVQF_3$, $SVQM_1$ & $SVQM_2$) attributed their use of mobile devices to government policy obligations, whereas others ($SVQF_2$ & $SVQF_5$) gave credit to the Head of Department for inspiring and encouraging them to use mobile devices. $SVIM_1$ agreed when he said:

> Okay, I get support from the HOD and my colleagues. We sometimes have a meeting, and we ask those who experience challenges with the devices … Then amongst us, we would be given direction and we take it from there. ($SVIM_1$)

$SVIM_1$ further indicated:

> Yes, once in a while, we get invited to a workshop by the district and then from within the school.

$SVQF_6$ was encouraged by her principal, whilst $SVIF_1$ also indicated that:

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> I can say the assistance that I get is from the principal. Because now, we've got Wi-Fi and we bought some laptops. So, I think everything is almost up to standard. Officials, no, don't get any support from them. They don't visit; they don't come; it is school based. ($SVIF_1$)

Not everyone indicated that their behaviour was due to the available support from district officials. $SVQF_4$ believed the teachers at the school were self-encouraged and that they supported each other. Furthermore, $SVIF_3$ added that:

> We are helping each other, and we collaborate. If I don't know how to use a particular device, I call a teacher who knows and then she's going to help. At school level, we ask the one who knows and then he/she is going to help us. ($SVIF_3$)

Dwivedi et al. (2019) supported the teachers' perceptions, who reported that implementing mobile devices is not a matter of choice since it is decreed by "policy" in many cases. However, the preparedness and collaboration between the teachers who participated in Unit of Analysis 2 and the support they received from their school's management served as a catalytic factor towards their embracing change in pedagogical ways. These circumstances ultimately drove their acceptance and implementation of mobile devices. The eagerness of the learners may also have been a motivating factor. The prerequisite skills were there since all of the teachers could use mobile devices, and their general computer skills were at a high level.

The reality of this group of teachers and the conditions under which the teachers in Unit of Analysis 1 had to work, were distinctly different. There is, therefore, some concern as to how one school managed to implement the use of mobile devices so well, whilst others ran into one problem after the other. One reason why this school used the mobile devices might be because they were stored on the school premises. Some schools had their mobile technology locked away in a strong room in the principal's office (for safety and security purposes). In other schools, the devices were not even stored on the school property, but at a local police station to ensure they were not stolen. The high risk of theft seemed to have led insurance companies to

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refuse to insure the school's device. It does not come as a surprise, therefore, that the teachers at such schools never implemented the mobile devices at all.

Through the school governing body, the observed school's success in implementing mobile devices, was to involve the community. They launched a massive campaign to spread awareness that saw many community members participating in ensuring the safety of the gadgets, by patrolling the area around the school, even during school holidays. Additional security measures at the school included installing closed-circuit television equipment and an armed response contract.

Lamey (2018) indicates that all technological breakthroughs have a purpose and whenever they are upgraded, they combine existing technologies into a more advanced creation than previously used. Therefore, there is a need to keeping up with fast-moving technology, which can sometimes seem like a huge effort or a moving target. Three years after the devices were procured, they have already aged significantly and have not been used at all but are already totally outdated. The schools that locked away their devices weighed the risk of losing the devices against the value they could add to the classroom. They seem to fear the risk of losing the devices more than they want to try to use them and benefit their learners before they get stolen. They are thus safe and sound, but they are, in fact, old and unused, or if used, they are likely to be broken or stolen.

Facilitating Conditions

Facilitating conditions referred to "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 430). None of the respondents agreed that there were enough mobile devices at the school to enable their optimal use in the classroom. Ruxwana and Msibi (2018) postulate that mobile technologies offer the potential for training that can be adapted to the varied needs of the individual learner. To support individuals' needs, however, it is important that each learner has access to their own device, or at least be in a position where they can use a device on their own. In addition, Pelgrum (2001) cautions that the inconvenience of not having enough access

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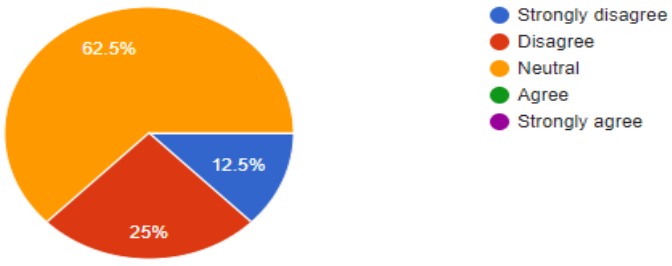
to technological equipment may become an impediment to the successful integration of new technologies in the classroom.

SVQF4 strongly disagreed (See Figure 4.41) when asked if their schools had sufficient devices to support learning. SVQF2 and SVQF6 disagreed, whilst most of the respondents (SVQF1, SVQF3, SVQF5, SVQM1 and SVQM2) selected “Neutral”. This indicated the need for teachers to be supplied with more devices or rather for the school to encourage learners who have their own mobile devices to bring them to school to help alleviate the challenge of the shortage. However, this suggestion does not consider the parents' socio-economic situation, even though Ford and Botha (2010, p. 4) found that “mobile technology has permeated into all levels of society – into rural areas, classrooms and boardrooms”. Furthermore, the finding does not elucidate the types of mobile devices that permeated society, with a possibility of the devices not being “smart” devices or having functionalities that would be relevant and conducive to learning.

Figure 4.41

Enough Mobile Devices at the School



During the interview, $SVQF_6$ expressed the frustration they experienced with the limited number of available mobile devices when she said:

> If there were enough devices, I think we would be able to access them conveniently because maybe if I want to use them and someone else already took them, he’s going to use them. They are not readily available … I just have to wait for tomorrow, and then only I can get them. ($SVQF_6$)

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In some schools the teacher to learner ratio was exceptionally high. There were instances where the ratio was as high as 1:47, which made learner control difficult, especially when they used mobile devices in class. Not having enough devices for each learner to have their own in class pose discipline and classroom management challenges for the teachers (Goundar, 2014). In addition, the limited number of available mobile devices created frustration when teachers needed to use them. To have to haul the mobile devices to classrooms and back to storage is a source of frustration for teachers and a barrier to the actual use of the devices. The challenge in gaining access to the ICT devices and having to book them in advance, is a point of concern for most teachers (Silica, 2012). Furthermore, there are multiple examples where “a teacher would have no access to ICT materials because most of these were shared with other teachers” (Ghavifekr et al., 2016, p. 42).

The need for more devices must be fulfilled to not discourage the teachers who are enthusiastic about embracing the use of technology in their classrooms. The importance of adequate resources and suitable infrastructure like Wi-Fi for Internet access cannot be overemphasised. It might also be beneficial that policy allows educational websites to be zero-rated to enable access without much need for data.

Compatibility

Compatibility refers to “the degree to which an innovation is seen to be compatible with existing beliefs, values, experiences and needs of adopters” (Venkatesh et al., 2003, p. 431). According to Al-Jabri and Sohail (2012), conformance with a user’s lifestyle can boost a speedy adoption rate, thereby making compatibility a fundamental aspect of innovation. Sahin (2006) agrees that for the degree of acceptance of innovation to grow and doubt to diminish, the technology must be compatible with a teacher’s needs. In the current study, all respondents indicated that they have the knowledge, resources and technical support to use mobile devices.

$SVIF_1$ excitedly stated that teachers are prepared to use mobile devices for teaching and learning when she said:

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> Colleagues are eager to learn; they really want to see themselves using these gadgets in their classrooms. Like for now we only have one projector, so they have to book it a week before. Because we are 21 with one projector, it is a challenge, but they are eager to learn, and they are willing to use these gadgets in their classroom. ($SVIF_1$)

The teachers' mobile devices were compatible with their own personal lifestyles, and they all claim that it was easy to use; hence the teachers were excited to use the mobile devices in class. The elements like voluntariness, perceived usefulness, culture of innovation and compatibility got 100% agreement from the respondents. This agreement implied that access to mobile devices could advantage learners from disadvantaged backgrounds and positively impact those who already knew how to use them. The use of mobile devices has the potential to increase learners' and teachers' levels of motivation, as well as to improve their performance. Self-efficacy and confidence levels may improve, which will undoubtedly have a ripple effect to improve effective teaching and learning.

4.4 CONCLUSION

The chapter discussed and analysed the findings derived from the data collected during Unit of Analysis 1 and 2. For Unit of Analysis 1, data was collected using questionnaires and observations before and after the series of three teacher professional development workshops. The researcher administered a pre-and post-workshop questionnaire, with the latter questionnaire being adapted from the Technology Acceptance Model (Davis, 1989).

The pre-workshop questionnaire was employed to profile the workshop participants by collecting demographic data and data related to their knowledge and use of technological devices. Most participants were female, had more than ten years of experience and older than 40 years. The participants indicated that they had owned devices, knew how they work, used them regularly, accessed the internet, had experimented with educational apps and had adequate ICT skills.

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The post-workshop questionnaire sought to evaluate the workshop's effectiveness in equipping the teachers with the requisite skills by soliciting their *perceived usefulness* and *perceived ease of use* with regards to utilising mobile devices in teaching and learning. The fact that mobile devices are ubiquitous due to their size, enabling access to functionalities anywhere, anytime without constraints, was motivation enough for the teachers. The data showed that participants found the mobile devices “useful” in both their personal and professional lives, even before the series of workshops, but definitely so afterwards. This group of teachers showed a high level of confidence in their own ability to master teaching with mobile devices. They were encouraged to take advantage of mobile devices to make teaching efficient and learning more effective while increasing their job performance. The response was positive, and the teachers displayed high levels of motivation and intent to implement and integrate mobile devices in their daily activities of teaching.

Unit of Analysis 2, which collected data using a questionnaire and interviews, came about after observations and school visits. On these school visits, it was discovered that only one school was truly implementing that which they have been exposed to in the workshops. The study then employed the UTAUT to zoom into the school and establish what these teachers were doing differently from the other schools. The questionnaire and interviews sought to gather information on variables relating to *moderating factors, performance expectancy*, *effort expectancy*, *social influence* and *facilitating conditions*. It was discovered that teachers’ age and gender had no bearing on their behavioural intent. Instead, their attitude, boosted by pre-existing knowledge and skills acquired from the workshop, motivated them to integrate mobile devices into teaching. Furthermore, the learners’ enthusiasm and eagerness boosted their morale and status, thus increasing their confidence to continue and as a result further boosted their competence. Although the scarcity of resources became a factor, it did not dampen their spirits; moreover, that policy also dictated the use of mobile devices.

Even though the district was putting pressure on teachers to use the devices given to schools, the teachers' voluntariness played an important role, which gave a positive outlook and willingness to change to the new way of teaching, thus incorporating and integrating mobile devices into their teaching. The introduction of mobile devices in class has resulted in a fun and engaging learning environment that enhanced

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academic performance. The learners were seen to be eager to attend classes and to participate and collaborate with others actively. While academic performance was enhanced, the teachers' jobs became easier. There were signs of improved school attendance, discipline in class, the ability to communicate with learners' parents and ultimately improved academic performance.

In this study, teachers with knowledge and competence shared it with others whilst encouraging them, thus creating a culture conducive to implementing and using mobile devices for teaching. Besides teachers identifying with their mobile devices as a status symbol, access to the mobile devices contributed to the lives of learners from disadvantaged backgrounds and had a positive impact on those who already knew how to use them.

Chapter 5 summarises the research project in its totality, shares discussions about and reflections on the study. The chapter will also attempt to highlight the contribution of this study to the body of knowledge and conclude with some recommendations for policy and further research.

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5. CHAPTER 5: SUMMARY, DISCUSSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter summarises the results in relation to what can be learned from this study, provides concluding remarks, recommendations for policymakers and practice, and recommendations for further research. This study explored the influence of the series of three workshops as teacher professional development interventions and explain the actual use of mobile devices by the teachers for teaching and learning.

5.2 SUMMARY

Over the past few years the South African National Department of Basic Education (DBE), the Provincial Educational Departments (PEDs), together with partners that included corporate entities and sister departments, were providing schools with connectivity (WIFI and network infrastructure) and ICT equipment that included laptops, smartboards and tablets (Mdlongwa, 2012; Pholotho & Mtsweni, 2016). Digital literacy training that entailed productivity applications like word processing, spreadsheet and presentation applications was provided to teachers in the schools. Yet, the infrastructure and equipment were not used optimally. This study, therefore, echoes Cuban (2001) who advocates in his 'oversold-under used' study, that educational technology equipment was provided, but not used.

In an attempt to explain the above-mentioned phenomenon, a literature review revealed that the education sector is not immune to the challenges brought about by ICTs (Livingstone, 2016; Willemse et al., 2014). These challenges led policymakers in Africa to transform and align secondary education and existing schooling systems with the fast-growing pressure of globalisation and the technology-driven world (Farrell et al., 2007). In addition, the advancement in ICTs that challenged the education sector led to the requirement by NEPAD for African countries to articulate policies for the utilisation and support of ICT infrastructure to facilitate citizens' access and use of the infrastructure (Nyagowa et al., 2012). It is crucial to recognise that teachers'

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eagerness, proficiency in the use of ICT and confidence levels play a critical role in the implementation of ICTs in education (Shimasaki, 2015).

Mobile learning is recognised as a technological method that enables learning through mobile devices, anywhere and anytime (Stošić & Bogdanović, 2013; Traxler, 2007). Mobile devices can be used to strengthen individual learning, facilitate real-life learning, reinforce interactive, cooperative learning among learners, and afford learners learning opportunities in the comfort of their own space (Willemse et al., 2014).

The literature further defined barriers influencing ICT integration into teaching and learning (Bingimlas, 2009; Nikolopoulou et al., 2021; Unluer, 2011). These barriers influencing ICT integration are, among others, unsuitable teacher training, teacher's lack of motivation and self-confidence in using ICTs (Mashile, 2016). In addition, Khan et al. (2012) identified a lack of ICT proficiencies, non-existence or inferior ICT infrastructure, restricted access to ICT infrastructure, and a lack of appropriate educational software. Similarly, Yalin et al. (2007) indicate that the inflexible structure of traditional education systems, traditional assessment and limited organisational structure are also barriers influencing ICT integration. Through a review of the literature, one of the main barriers that stands out as an impediment to the full integration of mobile technologies in the classroom was the lack of teachers' skills to use technology (Khan et al., 2012; Mashile, 2016; Masrom & Ismail, 2010). It was recognised that for the teachers to integrate mobile technologies in the classroom fully, they had to be equipped with the relevant skills to use technology. The following questions had to be responded to, to enable the study to explore the research topic:

- To what extent can a professional development programme influence the teachers' actual use of mobile devices in class?
- How can the actual implementation of mobile devices in a rural school be explained?

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The researcher undertook an interpretive, qualitative single case study with two embedded units of analysis, namely Unit of Analysis 1 and Unit of Analysis 2. The convenient purposive sample for Unit of Analysis 1 was from teachers in the Bojanala district whose schools received mobile devices from the government. The district official selected teachers to attend the series of workshops from schools that were not fully utilising mobile devices in teaching and learning. These teachers were capacitated through a series of workshops on integrating mobile devices into teaching and learning, which comprised of Unit of Analysis 1. TAM was used as a theoretical framework (Davis, 1989). Data was collected through observations, pre- and post-questionnaires, which were qualitatively analysed to reveal the findings sought by the study according to the questions.

Three schools whose teachers participated in the series of workshops were observed, and it was found that only one school was implementing mobile devices into their classes. Therefore, the convenient purposive sample for Unit of Analysis 2 was teachers (including those who did not attend the series of workshops) at this observed school from Bojanala district. The focus on this specific school, to dig deeper and find out what made it possible for them to implement the mobile devices, comprised of Unit of analysis 2. The UTAUT model (Venkatesh et al., 2003) was employed as a theoretical model in this unit of analysis. Data was collected through questionnaires, observations, and semi-structured interviews. This data was qualitatively analysed to reveal the findings sought by the study according to the research questions.

The findings will be further discussed as part of the methodological reflection, substantive reflection, and scientific reflection of the study.

5.3 DISCUSSION

5.3.1 Methodological reflection

The study explored the influence of a series of workshops on the teachers' actual use of mobile devices for teaching and learning purposes. The study further explored how the actual and continuous use of mobile devices in a particular rural school could be explained. A variety of theories that explained their intent to use the technology were

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considered. The decision was originally to use the technology acceptance model (TAM), because it supported the assumption that when technology is easy to use and perceived as useful, users will use it. Based on that assumption, the teacher professional development workshops were developed as interventions. Data was collected by means of observation and questionnaires and interviews.

Since I was interested in the authentic experience of teachers using technology in the classroom, the study adopted an interpretive paradigm that allowed me to use a qualitative approach. This qualitative approach proved to be effective for data collection in this study, because it offered the opportunity to use the single case study method. I was able to generate rich, detailed data in a natural setting to represent the participants' views.

In Unit of Analysis 1, qualitative data was collected through questionnaires and observations (Annexures C, D and E). Davis' (1989) instrument (See Annexure D) was adapted and validated for the constructs perceived usefulness and perceived ease of use. The questionnaires used in this study were developed using "Google Forms" and were administered electronically through a WhatsApp group called "Mobile Learning", created specifically for the research. The questionnaires allowed respondents to elaborate on their experience of using their own mobile devices. During data analysis, it was discovered that the respondents found mobile devices to be useful and easy to use. The role of external factors, such as the ability to read books, listen to audio, and possibly take pictures, influenced their adoption and attitudes towards using mobile devices in class. This is also true because they already experimented with certain educational applications on their mobile devices. Based on the data, I was positive that they would use the devices for teaching and learning. That is why it was important to go and see if they really implemented mobile devices in their daily teaching and learning activities.

To realise valuable gains from mobile devices and stimulate enthusiasm from learners, teachers had to integrate these devices and apps into their daily activities of teaching and learning. After the positive response from the teachers, I was convinced that they would use the devices. Therefore, I planned a visit to the schools to check how the

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devices were used. However, only one group of teachers actively introduced technology into their classes.

To explain this phenomenon, I decided to continue with the research, but I then based my study on the Unified Theory of Acceptance and Use of Technology (UTAUT). The objective was to probe further, and TAM was found not fit for the purpose and was deemed unsuitable for providing insight into what enabled the teachers from the observed school to implement and apply the knowledge gained from the workshops they attended, as described in Unit of Analysis 1. UTAUT introduced additional variables, allowing a better understanding of all the factors that influence teachers' use of technology and the role play in this regard. The identified factors included performance expectancy (perceived usefulness, extrinsic motivation, job-fit, relative advantage and outcome expectations) and effort expectancy (perceived ease of use and complexity). Additional factors that played a role included social influence (subjective norm, social factors, and image), facilitating conditions (perceived behavioural control and compatibility,) and some moderating factors (gender, age, experience, and voluntariness of use). As such, I based my second questionnaire and interviews on the UTAUT variables.

I had to adapt the single case study to the use of a single-case design with multiple embedded units of analysis to enable me to explore the differences. This method facilitated a deeper understanding of the elements that influenced the teachers' behavioural intent and actual use of mobile devices in class. For instance, the interviews allowed the teachers to express themselves better and give a clear account of the effects of their contexts and the challenges they encountered whilst trying to integrate the mobile devices into their teaching.

The questionnaires were ideally suited to this study because they enabled me to determine who used the technology, what it was being used for, what hindrances they encountered, and when and where the devices were being used in the classroom. Thus, the use of qualitative methods helped in affording a voice to the participants and ensured that the findings were based on their real-life experiences.

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The adoption of the TAM and UTAUT models as a conceptual framework for the study through a qualitative approach offered a lens through which the research could study the phenomenon under investigation. Consequently, having been a teacher by profession and having studied computer-integrated education myself, the study enhanced my comprehension of research methods and critical skills. I understood the role that context plays in qualitative research better as I realised the effect the teachers' context had on their use of mobile devices for teaching and learning purposes. In addition, factors like the security requirements of the mobile devices led to the devices being stored off-site (away from the school) and impacted the availability of the devices directly. These factors were beyond the teachers' control, and I further realised that the time allocated for the workshops was not enough for all participants to thoroughly grasp and develop the skills needed to implement mobile devices in the classroom. The use of virtual platforms would have to be incorporated into the intervention for continued learning and support, thus enabling me to ensure that teachers are well prepared.

The ability/opportunity to observe the teachers as they used the mobile devices during the teacher professional development workshops allowed me to explain real-life intervention, thus linking programme implementation with its after-effects. Therefore, I took care to provide thick and rich descriptions of the two case studies to ensure that the study would be replicable by another researcher in a different context.

5.3.2 Substantive reflection

Upon reviewing existing literature and comparing this study to other studies on mobile learning, I discovered that most of the research about the acceptance and use of mobile devices in teaching and learning is built on the use of TPACK (Nelson & Hawk, 2020; Wilson et al., 2020), TAM (Al-Emran et al., 2018; Camilleri & Montebello, 2011; Edmunds et al., 2012; Joo et al., 2014; Liu et al., 2010; Sánchez-Prieto et al., 2017) and UTAUT (Alshahrani & Walker, 2017; Dwivedi et al., 2019; Fuad & Hsu, 2018; Gupta et al., 2016; Palau-Saumell et al., 2019; Thongsri et al., 2018a; Venkatesh et al., 2016).

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Initially, TAM was employed as the theoretical model underpinning this study's intention to gain insight into the elements that influenced the teachers' behavioural intent and actual use of mobile devices in class. However, TAM was deemed unsuitable for providing insight into why teachers from the observed school implemented and applied the knowledge gained from the series of workshops they attended, while the teachers from other schools did not. Therefore, the researcher employed Venkatesh et al.'s Unified Theory of Acceptance and use of Technology (UTAUT) (Venkatesh et al., 2003). It provided a wider lens to understand the teachers' implementation at the specific school. Most studies on mobile learning are fixated predominantly on the ability of mobile devices to enhance learning, and how teachers can use the mobile devices to reinforce that learning (Aubusson et al., 2016; Swan et al., 2005). However, this study delved into why the teachers did not use mobile devices. This study, furthermore, explored whether one could influence the teachers' perceived ease of use and perceptions of usefulness of mobile devices, their attitude, and their behavioural intent with a series of workshops. The practical hands-on experience was intended to inspire and motivate teachers towards a behavioural intent to implement the devices in teaching and learning.

Although there are many similar projects worldwide (Abuhmaid, 2011; Omidinia, 2011; Orhun, 2003; Thornton & Houser, 2011), in South Africa, projects like the South African Digital Partnership (Kofi, 2007), the Western Cape's Khanya Technology in Education project (Ford & Botha, 2010), Gauteng Online in the Gauteng Province (Karangwa, 2012), the connectivity project in Northern Cape (Bhero, 2012) and Intel's "Teach to the future" (Ramorola, 2010), were undertaken as the groundwork to support ICT integration in schools. These projects differed from the current study in that they were meant as digital literacy projects and lacked continued support that ensured teachers' competency. Despite these projects, several setbacks were experienced that culminated in ICT infrastructure not being used optimally. Among others, lack of personal contact between teachers and learners, lack of dedication from teachers and learners to use the ICT resources, the high cost of installation, the reliability and quality of the ICT resources, the lack of professional development for teachers, and the unavailability of technical support hampered teachers' actual use of mobile technologies in the classroom (Kofi, 2007).

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Despite the similarities between this study and other more recent studies, there were also clear differences. For example, the Vodacom Mobile Education Programme is a teacher development programme focused on ICT literacy and the effective use and integration of digital content in the classroom (Vodacom, 2014). In that project, teachers were provided with the ICT infrastructure and tools, and the programme intended to improve the quality of instruction. On the other hand, the current study aimed to explore whether the professional development intervention influenced teachers' behavioural intent and actual use of mobile devices for teaching and learning and explain why they did use the mobile technology.

The Information and Communication Technology for Rural Education (ICT4RED) project focused on equipping participating teachers with a toolkit called Teacher Tablet Toolkit (Botha & Herselman, 2015). The toolkit consisted of technology hardware (mobile devices), pragmatic pedagogical and technological knowledge and skills, and practice-based experience. The difference between the ICT4RED and the current study was that teachers already had the mobile devices at their schools; however, they were not optimally used for teaching and learning, whilst in the ICT4RED study, the participants were only just supplied with devices. Both studies created a learning environment that emulated the classroom context and afforded participants a practical hands-on experience that learners could be exposed to when mobile devices were implemented in teaching and learning.

Similar to this study, Lawrence and Tar (2018) discovered that teachers who participated in their study demonstrated a positive attitude and readiness towards the use of ICTs in teaching and learning. Unfortunately, it is not known whether the teachers in that study continued using ICTs afterwards. The participants' perception of the ease of use and usefulness of mobile devices were reinforced by the continued support from senior management in the school and the learners' eagerness to learn with mobile devices, thus contributing to the motivation and enthusiasm to implement (Lawrence & Tar, 2018).

Similarly, Crompton et al. (2016) recognised support and time as the two main elements required by teachers to implement mobile devices effectively and efficiently in teaching and learning. As demonstrated by this study, once-off on-site training isn't

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sufficient, instead continued support besides that offered by senior management is necessary. Furthermore, there may not be enough time to cover all the aspects required to acquire skills during training sessions; thus, allocating time for continued professional development is essential.

The results of this study suggested that teachers are dedicated and willing to integrate technology. The schools were already supplied with the technology, so issues relating to cost and availability were ruled out. What seemed to contribute to the technologies not being optimally used, were, in part, the lack of continued, just-in-time professional development, support of school management and a lack of technical support. In addition, some contextual factors, such as the security of the devices, played a crucial role, as at some schools, the mobile devices were kept at the police station, or were locked away for fear of them being stolen.

5.3.3 Scientific Reflection

This section of the chapter elucidates a new understanding of the problem after considering the findings. It is important to note that the findings connect to the study's introduction (as presented in chapter one) through the research questions that were asked and through previous studies reviewed in chapter two.

The research aimed to influence teachers' opinions on the usefulness and ease of use of mobile devices, and to further explore how the actual and continuous use of mobile devices in a particular school can be explained. Furthermore, the study sought to comprehend how these perceptions influenced their attitudes, behavioural intent, and actual use of mobile technologies in class. For ease of reference, it is important to note that this chapter combines all the results received from both Unit of Analysis 1 and 2 and attempts to answer the research questions as elaborated in the following sections.

Influence of a TPD on the teachers' actual use of mobile devices in class

In both Units of analysis 1 and 2, the study set out to establish the extent to which the moderating factors, such as the teachers' age, gender, experience, and self-initiative, influenced their attitudes, behavioural intent, and actual use of mobile devices in class.

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According to Ahmad (2014), moderating variables of gender, age, experience, and voluntariness of use are assumed to intercede the impact of the four essential variables on usage intention and behaviour. The current study's responses indicated that most teachers have been teaching for a long time and were older, signalling a propensity towards preferring traditional teaching methods (Hsu et al., 2007). As these teachers were older, it was interesting to find that they managed some level of success in their implementation of the mobile devices. Looking at the notion of voluntariness, the study showed that these older teachers demonstrated a positive outlook and willingness to change to the new teaching method to incorporate and integrate mobile devices into their teaching. Their responses also signalled a preparedness to change their traditional pedagogical ways and take advantage of the anytime, anywhere functionalities and learning resources brought about by introducing mobile devices. Thus, the study found the exact opposite of what Umar and Yusoff (2014, p. 984) claim when indicating that “junior teachers use ICT significantly more frequently than their senior colleagues”. I expected resistance from the older teachers; however, they cooperated with enthusiasm and implemented mobile devices in their classrooms to measure success at the visited school.

In this study, the teachers’ age and gender had no bearing on their behavioural intent. Instead, their attitude, boosted by pre-existing knowledge and new skills acquired from the workshop, motivated them to integrate mobile devices into teaching. Furthermore, enthusiasm and eagerness to experiment boosted the teachers’ morale and status, thus increasing their confidence to continue and further heightening their willingness to experiment. Consequently, their competence improved.

Study results showed that policy issues had little impact on mobile device use. Even though the district was putting pressure on teachers to use the devices given to schools, the teachers’ inherent voluntariness played an important role, as teachers were enthusiastic and eager to implement the mobile devices. The high morale and newfound confidence due to improved competence resulted in a positive outlook and willingness to change to the new way of teaching, thus incorporating and integrating mobile devices into their teaching and learning practices.

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The study set out to establish the extent to which the teachers' perceptions about the usefulness, ease of use, performance expectancy, and effort expectancy of mobile devices influenced their attitudes, behavioural intent, and actual use of mobile devices in class.

The teachers who partook in this study have expressed positive perceptions about mobile devices' usefulness and ease of use. These positive perceptions influenced their attitude, behavioural intent, and actual use of mobile devices in class as discovered in Chapter 4, Unit of Analysis 1. Since this study found that most of the teachers possessed one or more mobile devices for personal use, it was assumed that they would know how to use the devices. I therefore assumed that the impediment to the integration of mobile devices into teaching and learning lay in either the difficulty of designing lessons to fit mobile devices or the difficulty of adapting already inherent pedagogical and content knowledge to suit the affordances of mobile devices.

It was found that the availability of mobile devices provided an opportunity for the teachers to enhance teaching and learning by accessing useful online educational material and resources and searching for relevant learning material that could be useful in their classrooms. The teachers were already in possession of and were using mobile devices to send and receive emails, text messages, use applications like Google Hangout, and social media such as Facebook. They were also taking pictures, playing music and watching videos with their mobile devices. Therefore, the study found that the teachers already felt comfortable using their mobile devices for personal use, thus linking to positive perceptions about their own ability as teachers to use the devices in an educational setting.

The devices owned by the teachers had numerous functionalities that are critically needed for use in class. They could communicate, search for information, play videos and audio tracks, and access various educational and communication apps. Teachers accessed the internet through their mobile phones, laptop computers, tablets, and desktop computers at the school. Some accessed the internet at the library, some at an internet café and some at home through a desktop computer. These modes of internet access should be sufficient to motivate teachers to integrate mobile devices in the classroom. It is worth pointing out the key pedagogical value of technology

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integration in the classroom is not just the access to the internet that provides access to online educational content, but also the potential for interaction with experts and peers, which teachers could do because their devices were powerful enough for these interactions. Innovative mobile technologies are available, and they can prove quite powerful if they encourage creative discovery or reinforce foundational knowledge.

It was hoped that the professional development activities would be a stimulus towards ensuring that the mobile devices are integrated into teaching and learning. According to Sharma (2017), even though this digital era demands that teachers are equipped with relevant skills to operate technology, there didn't seem to be an automatic transfer of skills into the teaching and learning environment. However, demonstrating using mobile technologies to enhance teaching and learning in the classroom to the teachers became easy (in Unit of Analysis 1). It was also not difficult to guide the teachers on using mobile technologies to develop learning materials relevant to the ever-changing educational system spearheaded by the evolution of the internet and new media. Furthermore, the teacher professional development workshop series ensured that teachers built enough confidence to use mobile devices while fostering collaboration among the participating teachers. Their familiarity with the devices for personal use gave them the courage to explore freely during the series of workshops. The confidence heightened awareness of the mobile devices' usefulness, and ease of use and resulted in the successful integration of technology in the classroom. The fact that these mobile devices are ubiquitous due to their size, enabling access to functionalities anywhere, anytime without constraints, was motivation enough for teachers.

The data showed that the participants found the mobile devices useful in both their personal and professional lives, even before the series of workshops, but definitely so afterwards. The devices enabled the participants to realise that they can create fun, engaging, and exciting learning for learners, whilst accommodating those with different learning styles. Through mobile devices, feedback to learners and communication with parents were easy. Even though the teachers reported mobile devices as easy to use, some applications were challenging to master due to a language barrier. Most applications are available in English, which poses a severe challenge to some learners accustomed to the vernacular. However, teachers may be able to overcome the language barrier when implementing the use of mobile devices in the classroom. The

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Internet interfaces are mainly tailored to English (Mdlongwa, 2012), which is usually also the language of instruction for most school subjects; this could eventually lead to a better understanding of the content. Nevertheless, teachers confirmed that learners tend to learn more when they see things practically, and the technology enabled them to learn practically. Their perceptions of the ease of use and usefulness of mobile devices may be the reason for their willingness to attempt integrating mobile devices in the classroom. Thus, the teachers believed that integrating mobile devices into the classroom activities would be very likely to make teaching more meaningful and exciting.

The teachers confirmed that the interactivity in the classroom motivated learners to become critical thinkers in the classroom and to start exploring more innovative ways of learning with online resources. They believed that mobile devices could be used in the classroom to download educational games to enable the learners to interact with the subject content and use different kinds of web searches. The inclusion of games in teaching and learning inspired learners to learn. Clearly, the teachers thought the mobile devices had an extrinsic motivational effect on their learners.

Interestingly, the surveyed teachers shared similar sentiments that the adoption of technology in education would eventually change the role of the educator. In addition, teachers believed that mobile devices were effective in education because they could give immediate feedback regarding learners' performance in real-time and an indication of how far the learner has achieved certain levels of learning. It was clear that the integration of mobile devices in the classroom has brought about quite a number of advantages regarding teaching and learning compared to the traditional way of teaching, such as the use of a board and chalk. Furthermore, teachers believed that there was a high likelihood that disadvantaged learners would improve due to the integration of mobile devices in the classroom. For example, due to technology adoption in the school, there was discipline and improved attendance, as learners no longer bunked classes since they wanted to use the devices and learn with them. This attitude is attributed to the fact that technology has brought about a far-reaching transformation in teaching and learning methods. Another important point worth noting is that teachers felt that classroom management was challenging at first when mobile

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devices were introduced in the class. They believed that this was because learners were seeing and touching the technology for the first time in their lives.

Actual implementation of mobile devices in a rural school

Teachers with knowledge and competence of using mobile devices shared it with others while encouraging them. They thus created a culture conducive to the implementation and use of mobile devices for teaching. Some teachers were encouraged by other teachers as they kept on exploring a variety of mobile applications. There was a clear view that mobile devices would very likely promote collaboration among the teachers, thereby encouraging those lacking behind to adapt or emulate other teachers.

The notion of having a mobile device that one could use to share knowledge, explore, and collaborate could also enhance their status and earn them respect from their peers. This sharing of knowledge, exploring, and collaboration improved the culture of innovation in the school and led to the successful implementation of mobile devices as teaching tools in many classrooms. The assistive attitude led to progress as the teachers lifted each other's skill levels, competency, motivation, and morale. The end result was the successful implementation of mobile devices across the school without leaving anyone behind. Besides teachers identifying with their mobile devices as a status symbol, because the devices are compatible with their personal lifestyle, prioritising staff development could bear favourable outcomes. Teachers typically possess skills that could be harnessed as prior knowledge to build upon and boost the teachers' morale and confidence to implement mobile devices into their teaching activities.

Even though the use of mobile devices was attributed to policy imperatives, teachers praised the Head of Department (HOD) for encouraging them to integrate technology in the classroom. The collaboration, encouragement, and support they received from their school's management through the HOD served as a catalytic factor towards embracing change in pedagogical ways and ultimately implementing the mobile devices in class. In providing leadership by example and serving as a champion and

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super-user of mobile devices, the HOD positively impacted how other teachers viewed mobile devices and motivated them to emulate her.

Teachers had the pedagogical and content knowledge, resources like the internet and mobile devices, but they lacked technical support to integrate mobile devices into the classroom teaching and learning. For example, the technical skills of connecting mobile devices to a network and enabling them to access a server might be challenging to teachers who do not have the know-how. Teachers were eager to acquire the necessary skills to operate mobile devices to enhance teaching and learning in the classroom. They (the teachers) were excited about the educational value of mobile devices in education and could not wait to integrate them into their teaching processes. However, it emerged that the quality and quantity of the mobile devices were insufficient as they could not cater for all the teachers and learners in a class.

The study found that even if teachers could be capacitated through focused and hands-on teacher professional development initiatives, there were issues beyond the control of trainers and facilitators of workshops that were hindering the implementation of mobile devices in teaching and learning. The facilitating conditions of timely and continued technical support and the safety, security, and insurance of the devices would continue to create a barrier unless addressed in full. A refined approach should consider ongoing training and support, systems for first-line troubleshooting, and safety and security measures for mobile devices. These aspects, when addressed, could potentially lead to improved adoption rates. For example, the government could commission the manufacturing of embossed education-specific devices that are not necessarily attractive or useful commercially. In addition, schools need the presence of an ICT champion who walks ahead and acts as a mentor to others.

5.4 RECOMMENDATIONS

The main purpose of this section of the chapter is to provide recommendations based on the findings of this study. The recommendations presented in this chapter are for policy and practice and further research.

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5.4.1 Recommendations for policy and practice

Based on the results obtained from the teachers, the study provides the following recommendations.

The National Department of Basic Education (DBE) should consider:

- Developing a strategy and strengthening the ICT policies to guide the provincial education departments and schools on integrating technology into the classroom in the drive to enhance teaching and learning. The strategy should emphasise a standardised structure that accommodates learning with technologies. In addition, the strategy should provide recommendations for annual budgets for hardware and software. Despite the initial investment in devices, all students in a single classroom do not yet have individualised access to a device. Also, the strategy should set out plans for maintenance and replacement as technology ages rather quickly. Policymakers need to remember that even teachers who deem themselves capable users of ICTs still struggle to integrate technology into their classrooms. This means that a significant portion of the budget available for integrating technology in schools needs to be ring-fenced for continued professional development initiatives.
- Empowering teachers through subject-specific professional development and continued technical support, ensuring that all the teachers have the relevant skills to operate and integrate all forms of technology supplied to or adopted by the schools to enhance teaching and learning. Furthermore, they should ensure that school-level support is available to ensure that teachers who get stuck can receive just-in-time assistance and encouragement.
- Ensuring that learning outcomes comprise 21st-century skills when technology is integrated into the classroom.
- Equipping all the teachers in the country with the knowledge of developing educational resources that can be used through technology, including mobile devices and mobile applications. The recommended budget for training should not be focused on adding more training, but be directed towards providing regular, just-in-time work sessions that allow time for lesson plans to be developed that incorporate all the technologies offered by the school.

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- Ensuring that teachers have stable and ready access to the internet even beyond school hours to prepare lessons beyond official school working hours.
- Providing the relevant technical support and maintenance for the infrastructure to ensure that the technology for enhancing teaching and learning runs smoothly and is sustainable in the long run.
- Commissioning the manufacturing of embossed education-specific devices, that are not attractive or useful commercially, to prevent theft and ensure security of the devices. Alternatively, new technology that tracks devices can be built into the devices provisioned to schools, to enable easy retrieval of the devices if stolen.

5.4.2 Recommendations for further study

This section of the chapter presents recommendations for future research and includes some of the limitations of the study. This future research section builds on some of the findings of the study. In addition, these suggestions for future research seeks to address some of the shortcomings of this study and acknowledge that educational technology is not the only way to go to improve teaching practice. Whilst a teacher professional development programme and its influence on the teachers' actual use of mobile devices in class and the actual implementation of mobile devices in a rural school were the focus of this study, such an inventory is insufficient to reveal the complete degree to which mobile devices have been diffused into the schools. It would be interesting to also look at the phenomenon of the use of mobile devices in the specific school through the lens of technology, content and pedagogy. Three areas that are recommended for further research are discussed below.

Standards

There do not seem to be clear standards and strategies provided concerning the kind of ICT training that needs to be provided to teachers to integrate mobile devices into the classroom effectively. Furthermore, provinces need to be advised on relevant infrastructure and tools for education. Therefore, further research in this area would be of value.

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Satisfaction levels of learners, principals, and departmental officials

The target population in this study was only the teachers in selected schools. It is worth noting that it would be interesting and valuable to understand the opinions of the learners, parents, principals, and departmental officials, as they are also important stakeholders. Including these categories of participants could have provided much more insight into the ICT situation in schools. As a result, the study only relied on the views of a few teachers in the schools, when the actual personnel responsible for the integration of technology in the classroom were the principals, whose opinions might have been insightful. Therefore, it is recommended that future research focus on the insights, experiences, and opinions of principals and departmental officials to paint a more holistic picture of ICT integration in the classroom.

Scope of study

Due to the diversity of the basic education sector in the Republic of South Africa, this study restricted its scope to selected schools in the Bojanala district of the Northwest province. It is important to note that financial and time constraints made it impossible to target all the schools in the country. Therefore, future studies should concentrate on these logistically excluded areas or ensure they are included in future studies. Furthermore, the role that higher education institutions play in assisting in the basic education sector also needs to be considered.

ICT policy

It cannot be denied that the ICT sector is a vibrant field with new technologies that emerge daily. Therefore, National ICT policies should address this expansion of knowledge and abilities through systematic updates. As a result, future studies are needed to examine the current state and implementation endeavours of national ICT policies that would direct and influence technology integration in schools.

5.5 CONCLUSION

This thesis has attempted to answer the following two research questions:

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- To what extent can a professional development programme influence the teachers' actual use of mobile devices in class?
- How can the actual implementation of mobile devices in a rural school be explained?

Firstly, the study discovered that age, experience, and gender do not play a crucial role in the teachers' actual use. Instead, it indicated that voluntariness influenced the teacher's behavioural intent to integrate mobile devices into the classroom. Secondly, teachers found mobile devices useful and easy to use, thus motivating them to demonstrate a high level of confidence in their ability to master teaching with mobile devices. Lastly, lacking facilitating conditions of continued professional development, access to on-site technical support, and concerns about the safety and security of the devices would continue to act as barriers to success unless addressed. It is imperative to look at finer issues like continuous subject-specific training and support, frontline troubleshooting mechanisms, and security measures that are inclusive of insurance for mobile devices.

The study has indicated that TAM as a model was worthwhile as the usefulness and ease of use of mobile devices determined intent but unfortunately was not adequate to explore the complexity of the phenomenon where only a few teachers used the technology in their classrooms. TAM did not adequately reveal other extenuating circumstances that hinder the implementation of mobile devices into teaching and learning. Teachers did have personal experience with mobile devices, understood and saw their usefulness and ease of use, but continued to struggle to integrate them into their teaching and learning practices, even though they had the necessary pedagogical and content knowledge. Supplying schools with mobile devices and offering once-off training and even additional workshops on their use did not result in optimally used devices. Policy imperatives were also not enough to ensure successful implementation.

Further probing with UTAUT shed more light on the phenomenon and revealed the lack of continued subject-specific training and support (through workshops or peer support). This shortcoming can be skills-wise or technical by nature. With subject-specific training and support available, peer support plays an imperative role,

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demanding that there be an identification of ICT champions, who will be the first line of support and mentors for their colleagues when the need arises. Lastly, security that is inclusive of insurance for the mobile devices is imperative to ensure safety, instead of locking the devices away for fear of theft. It is, therefore, important to note that even the best professional development initiative is not enough to ensure actual use if the underlying facilitating conditions are left unattended.

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REFERENCES

Abbitt, J. T., & Klett, M. D. (2008). Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service educators. *Electronic Journal for the Integration of Technology in Education*, *6*, 28–42. https://doi.org/10.7813/2075-4124.2013/5-5/b.14

Abu-Dalbouh, H. M. (2013). A questionnaire approach based on the technology acceptance model for mobile tracking on patient progress applications. *Journal of Computer Science*, *9*(6), 763–770. https://doi.org/10.3844/jcssp.2013.763.770

Abuhmaid, A. (2011). ICT training courses for teacher professional development in Jordan. *Turkish Online Journal of Educational Technology*, *10*(4), 195–210. https://eric.ed.gov/?id=EJ946628

Acarli, D. S., & Sağlam, Y. (2015). Investigation of Pre-service Teachers' Intentions to Use of Social Media in Teaching Activities within the Framework of Technology Acceptance Model. *Procedia - Social and Behavioral Sciences*, *176*, 709–713. https://doi.org/10.1016/j.sbspro.2015.01.530

Adomi, E. E., & Kpangban, E. (2010). Application of ICTs in Nigerian Secondary Schools. *Library Philosophy and Practice (e-Journal)*, *March*, 345. http://digitalcommons.unl.edu/libphilprac/345

Ahmad, M. I. (2014). Unified Theory of Acceptance and Use of Technology (UTAUT): A Decade of Validation and Development. *In: Fourth International Conference on ICT in Our Lives 2014*, *1*, 1–13. https://doi.org/10.1590/0034-7612140185

Ajibade, P. (2019). Technology acceptance model limitations and criticisms: Exploring the practical applications and use in technology-related studies, mixed-method, and qualitative researches. *Library Philosophy and Practice*, *2019*. https://core.ac.uk/download/pdf/189486068.pdf

Ajzen, I. (2011). The Theory of Planned Behaviour: Reactions and reflections.

© University of Pretoria

Psychology and Health, *26*(9), 1113–1127. https://doi.org/10.1201/9780203494172.ch92

Akhshabi, M., Khalatbari, J., & Akhshabi, M. (2011). An experiment on conducting mobile learning activities on the virtual university. *Procedia - Social and Behavioral Sciences*, *28*, 384–389. https://doi.org/10.1016/j.sbspro.2011.11.073

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior*, *56*, 93–102. https://doi.org/10.1016/j.chb.2015.11.033

Al-Emran, M., Mezhuyev, V., & Kamaludin, A. (2018). Technology Acceptance Model in M-learning context: A systematic review. *Computers and Education*, *125*, 389–412. https://doi.org/10.1016/j.compedu.2018.06.008

Alhumaid, K. (2019). Four Ways Technology Has Negatively Changed Education Dr. Khadija Alhumaid. 10–20. https://doi.org/10.2478/jesr-2019-0049

Al-Hunaiyyan, A., Alhajri, R. A., & Al-Sharhan, S. (2018). Perceptions and challenges of mobile learning in Kuwait. *Journal of King Saud University - Computer and Information Sciences*, *30*(2), 279–289. https://doi.org/10.1016/j.jksuci.2016.12.001

Al-Jabri, I. M., & Sohail, M. S. (2012). Mobile banking adoption: Application of diffusion of innovation theory. *Journal of Electronic Commerce Research*, *13*(4), 379–391. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2523623

Alhassan, R. (2016). Mobile Learning as a Method of Ubiquitous Learning: Students' Attitudes, Readiness, and Possible Barriers to Implementation in Higher Education. *Journal of Education and Learning*, *5*(1), 176. https://doi.org/10.5539/jel.v5n1p176

Allen, M. (2017). *The SAGE Encyclopedia of Communication Research Methods*. SAGE Publications, Inc. https://doi.org/10.4135/9781483381411

© University of Pretoria

Almekhlafi, A. G. (2006). The Effect of Computer Assisted Language Learning (CALL) on United Arab Emira ... *Computer Assisted Language Learning*, *17*(2), 121–142. https://search-proquest-com.ezproxy.jyu.fi/docview/211267664?accountid=11774

Almekhlafi, A. G., & Almeqdadi, F. A. (2010). Teachers' perceptions of technology integration in the United Arab Emirates school classrooms. *Educational Technology & Society*, *13*(1), 165–175. https://eric.ed.gov/?id=EJ880086

Alshahrani, H., & Walker, D. (2017). Validity, Reliability, Predictors, Moderation: The UTAUT Model Revisited. *General Linear Model Journal*, *43*(2), 23–34. https://doi.org/10.31523/glmj.043002.003

Alshenqeeti, H. (2014). Interviewing as a Data Collection Method: A Critical Review. *English Linguistics Research*, *3*(1), 39–45. https://doi.org/10.5430/elr.v3n1p39

Ammenwerth, E. (2019). Technology Acceptance Models in health informatics: TAM and UTAUT. Studies in Health Technology and Informatics, 263, 64–71. https://doi.org/10.3233/SHTI190111

Ansah, E. Wi. (2017). Does using a Likert-scale (1 -5) to measure perception make the study quantitative? Researchgate. https://www.researchgate.net/post/Does-using-a-Likert-scale-1-5-to-measure-perception-make-the-study-quantitative/58d93efef7b67e76572d05b3/citation/download

Attuquayefio, S. N., & Addo, H. (2014). Using the UTAUT model to analyze students ' ICT adoption. *International Journal of Education and Development using ICT, 10*(3). https://www.learntechlib.org/p/148478/.

Aubusson, P., Schuck, S., & Burden, K. (2016). *Mobile learning for teacher professional learning : benefits , obstacles and issues*. *7769*. https://doi.org/10.1080/09687760903247641

Audenhove, L. Van, Brussel, V. U., Brussel, V. U., Craffert, L., & Grove, W. (2018). South Africa' s e-Skills Policy. From e-Skills to Media Literacy *?* In *2018 IST-Africa*

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Week Conference (IST-Africa) (pp. Page-1). IEEE

Aviram, A., & Talmi, D. (2005). The Impact of Information and Communication Technology on Education: The Missing Discourse between Three Different Paradigms. *E-Learning and Digital Media*, *2*(2), 169–191. https://doi.org/10.2304/elea.2005.2.2.5

Ayeni, A. J., & Amanekwe, A. P. (2018). Teachers' Instructional Workload Management and Students' Academic Performance in Public and Private Secondary Schools in Akoko North-East Local Government, Ondo State, Nigeria. *American International Journal of Education and Linguistics Research*, *1*(1), 9–23. https://doi.org/10.46545/aijelr.v1i1.24

Babbie, E. (2010). *The Practice of Social Research* (12th ed.). Wadsworth Cengage Learning.

Babbie, E., & Mouton, J. (2001). *The Practice of Social Research*. Oxford University Press.

Balanskat, A., Blamire, R., & Kefala, S. (2006). The ICT Impact Report. *European Schoolnet*, *1*, 1-71. http://colccti.colfinder.org/sites/default/files/ict_impact_report_0.pdf

Bass, J. M., Lero, S. B., & Noll, J. (2018). Experience of Industry Case Studies: A Comparison of Multi-Case and Embedded Case Study Methods. Proceedings - International Conference on Software Engineering, 13–20. https://doi.org/10.1145/3193965.3193967

Bassey, M. (2007). Case study research in educational settings. In P. Sikes (Ed.), *Teacher Development* (Vol. 4, Issue 3). Open University Press. https://doi.org/10.1080/13664530000200293

Batchelor, J. (2007). *Mobile information communication and technology use in secondary schools : A feasibility study*. (Doctoral dissertation, University of Pretoria).

© University of Pretoria

Baydas, O., & Goktas, Y. (2016). Influential factors on preservice teachers' intentions to use ICT in future lessons. *Computers in Human Behavior*, *56*, 170–178. https://doi.org/10.1016/j.chb.2015.11.030

Beecher, C. (2019). *Mobile technology to increase parent engagement Mobile technology to increase parent engagement*. *IxD&A, 28*, 49-68. http://www.mifav.uniroma2.it/inevent/events/idea2010/doc/28_3.pdf

Benbasat, I., & Barki, H. (2007). Quo vadis, TAM? *Journal of the Association for Information Systems*, *8*(4), 211–218. https://pdfs.semanticscholar.org/0766/d655ec78d789f9c8aa1ce849c858b29546ad.pdf

Bere, A., & Rambe, P. (2016). An empirical analysis of the determinants of mobile instant messaging appropriation in university learning. *Journal of Computing in Higher Education*, *28*(2), 172–198. https://doi.org/10.1007/s12528-016-9112-2

Bernacki, M. L., Greene, J. A., & Crompton, H. (2020). Mobile technology, learning, and achievement: Advances in understanding and measuring the role of mobile technology in education. Contemporary Educational Psychology, 60(November 2019). https://doi.org/10.1016/j.cedpsych.2019.101827

Bhattacherjee, A. (2012). *Social research – Principles, methods and practice*. http://scholarcommons.usf.edu/oa_textbooks/3

Bhero, S. (2012). *Barriers to Information and Communication Technology use*. (Doctoral dissertation, University of Johannesburg).

Bidin, S., & Ziden, A. A. (2013). Adoption and Application of Mobile Learning in the Education Industry. *Procedia - Social and Behavioral Sciences*, *90*(InCULT 2012), 720–729. https://doi.org/10.1016/j.sbspro.2013.07.145

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: a review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education*, *5*(3), 235–245.

© University of Pretoria

https://doi.org/10.12973/ejmste/75275

Bitsch, V. (2005). Qualitative Research : A Grounded Theory Example and Evaluation Criteria. *Journal of agribusiness, 23*(345-2016-15096), 75-91. https://doi.org/10.22004/ag.econ.59612

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2011). *Business research methods* (Third European). McGraw-Hill Higher Education.

Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher*, *33*(8), 1–49. https://stacks.stanford.edu/file/druid:vc541fv0664/Borko-PD_and_Teacher_Learning.pdf

Botha, A., & Herselman, M. (2015). A Teacher Tablet Toolkit to meet the challenges posed by 21st century rural teaching and learning environments. *South African Journal of Education*, *35*(4), 1–19. https://doi.org/10.15700/saje.v35n4a1218

Broos, A. (2005). Gender and Information and Communication Technologies (ICT) Anxiety: Male Self-Assurance and Female Hesitation. *CyberPsychology & Behavior*, *8*(1), 21-31. https://UnivofPretoria.on.worldcat.org/oclc/4598334346.

Buabeng-Andoh, C. (2012). Factors influencing teachers ' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development Using Information and Communication Technology*, *8*(1), 136–155. https://doi.org/10.4018/ijicte.2015040101

Bulmer, M. (2004). *Benchmarks in social research methods*. SAGE Publications Ltd.

Burger, P. (2006). Embedded Case Study Methods. Integrating Quantitative and Qualitative Knowledge20061Roland W. Scholz and Olaf Tietje. Embedded Case Study Methods. Integrating Quantitative and Qualitative Knowledge. Thousand Oaks, CA: Sage 2002. International Journal of Sustainability in Higher Education, 7(3), 352–356. https://doi.org/10.1108/14676370610677892

© University of Pretoria

Burns, M. (2010). How to Help Teachers Use Technology in the Classroom: The 5J Approach. *ELearn*, *9*, 1–7. https://doi.org/10.1145/1858579.1865476

Cacciattolo, M., Vicars, M., & McKenna, T. (2015). Behind closed doors: Negotiating the ethical borgs in qualitative inquiry. *Qualitative Research Journal*, *15*(1), 98–108. https://doi.org/10.1108/QRJ-11-2014-0058

Campbell, C. (2014). *Teachers using mobile devices to receive immediate feedback and improve learners ' language learning*. Progressio, 36(2), 38-52

Camilleri, V., & Montebello, M. (2011). Virtual world presence for pre-service teachers: Does the TAM model apply? *Proceedings - 2011 3rd International Conferenceon Games and Virtual Worlds for Serious Applications, VS-Games 2011*, 156–159. https://doi.org/10.1109/VS-GAMES.2011.49

Caudill, J. G. (2007). Mobile Computing : Parallel developments. *International Review of Research in Open and Distance Learning*, *8*(2), 13. http://works.bepress.com/cgi/viewcontent.cgi?article=1003&context=jason_caudill

Chaka, J. G., & Govender, I. (2017). Students' perceptions and readiness towards mobile learning in colleges of education: a Nigerian perspective. *South African Journal of Education*, *37*(1), 1–12. https://doi.org/10.15700/saje.v37n1a1282

Chakraborty, S., Nandi, S., & Chattopadhyay, S. (2016). Alleviating Hidden and Exposed Nodes in High-Throughput Wireless Mesh Networks. *IEEE Transactions on Wireless Communications*, *15*(2), 928–937. https://doi.org/10.1109/TWC.2015.2480398

Charalambos, V., & Glass, G. V. (2007). Teacher professional development and ICT: Strategies and models. *Teachers College Record*, *109*(14), 87–102. https://doi.org/10.1111/j.1744-7984.2007.00116.x

Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior.

© University of Pretoria

Computers and Education, *59*(3), 1054–1064. https://doi.org/10.1016/j.compedu.2012.04.015

Chou, C. C., Block, L., & Jesness, R. (2012). a Case study of Mobile Learning Pilot Project in K-12 schools. *Journal of Educational Technology Development and Exchange*, *5*(2). https://doi.org/10.18785/jetde.0502.02

Christensen, R., & Knezek, G. (2018). Readiness for integrating mobile learning in the classroom: Challenges, preferences and possibilities. Computers in Human Behavior, 78, 379–388. https://doi.org/10.1016/j.chb.2017.07.046

Christenson, S. L., & Reschly, A. L. (2012). Handbook of Research on Student Engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement.* Springer US. https://doi.org/10.1007/978-1-4614-2018-7

Chuttur, M. (2009). Overview of the Technology Acceptance Model: Origins , Developments and Future Directions. *Sprouts: Working Papers on Information Systems*, *9*(37), 1–23. https://doi.org/10.1021/jf001443p

Cisco. (2013). The Mobile Learning Phenomenon In Education Accelerating the delivery of personalized learning. *Cisco Redrock Reports*.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education*. Routledge Falmer.

Collis, J. & Hussey, R. (2009). Business Research: A Practical Guide for undergraduate and postgraduate students, 3rd ed. Palgrave, MacMillan

Connelly, L. M. (2016). Trustworthiness in qualitative research. *MEDSURG Nursing*, *25*(6), 435–436. https://doi.org/10.4324/9780203386071-22

Cox, J. (2013). Tenured Teachers & Technology Integration In The Classroom. *Contemporary Issues in Education Research (CIER)*, *6*(2), 209. https://doi.org/10.19030/cier.v6i2.7730

© University of Pretoria

Creswell, J. W. (2009). *Research design: Qualitatyive, Quantitative and Mixed Method Approaches* (2nd ed.). SAGE Publications.

Creswell, J. W., & Creswell, J. D. (2017). *Research Design Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications, Inc. https://us.sagepub.com/en-us/nam/research-design/book255675

Crompton, H., Olszewski, B., & Bielefeldt, T. (2016). The mobile learning training needs of educators in technology-enabled environments. *Professional Development in Education*, *42*(3), 482–501. https://doi.org/10.1080/19415257.2014.1001033

Cuban, L. (2001). Oversold and Underused (NV-1 onl). Harvard University Press. https://doi.org/10.4159/9780674030107

Davis, F. (1989). Perceived Usefulness, Perceived Ease Of Use, And User Accep. *MIS Quarterly*, 319.

Davis, N., Preston, C., & Sahin, I. (2009). ICT teacher training: Evidence for multilevel evaluation from a national initiative. *British Journal of Educational Technology*, *40*(1), 135–148. https://doi.org/10.1111/j.1467-8535.2007.00808.x

Daymon, C., & Holloway, I. (2011). *Qualitative research methods in public relations and marketing communications* (2nd ed.). Routledge.

Department of Basic Education (DBE). (2015). *Basic Education improves learning and teaching system*.. https://www.gov.za/speeches/ict-workshop-brings-education-sector-one-step-closer-realising-ict-improvement-goals-4-mar

De Kock, R., & Futcher, L. A. (2016). Mobile device usage in higher education institutions in South Africa. In *2016 Information Security for South Africa (ISSA)* (pp. 27-34). IEEE. https://doi.org/10.1109/ISSA.2016.7802925

Dede, C., Bellanca, J., & Brandt, R. (2010). 21st century skills: Rethinking how students learn. In *Comparing Frameworks for 21st Century Skills*, 51–76.

© University of Pretoria

Denscombe, M. (2008). Communities of Practice. *International Encyclopedia of the Social & Behavioral Sciences: Second Edition*, 328–331. https://doi.org/10.1016/B978-0-08-097086-8.92051-8

Department of Basic Education (DBE). (2015). *Action Plan to 2019 Towards the Realisation of Schooling 2030: Taking forward South Africa's National Development Plan 2030*. https://www.education.gov.za/Portals/0/Documents/Publications/Action%20Plan%202019.pdf

Department of Basic Educatio (DBE). (2016). *Basic Education improves learning and teaching system*.. https://www.gov.za/speeches/ict-workshop-brings-education-sector-one-step-closer-realising-ict-improvement-goals-4-mar

Department of Communications. (2014). Government Gazette Staatskoerant. *Government Gazette*, *583*(37261), 1–4. http://www.greengazette.co.za/pages/national-gazette-37230-of-17-january-2014-vol-583_20140117-GGN-37230-003

Department of Planning, Monitoring and Education (PME). (2015). *Operation Phakisa: ICT in Education Lab*. https://www.operationphakisa.gov.za/operations/Education%20Lab/Pages/default.aspx

De Vos, A., Delport, C., Fouche, C., & Strydom, H. (2011). *Research at grassroots: A primer for the social science and human professions.* Van Schaik Publishers

Dexter, S., Doering, A. H., & Riedel, E. (2006). Content area specific technology integration: A model for educating teachers. *Journal of Technology and Teacher Education*, *14*(2), 325–345. http://www.editlib.org/d/5676/%5Cnpapers3://publication/uuid/80A1ED0C-E5E5-4C8F-BA31-A8674587494D

Dias, L., & Victor, A. (2017). Teaching and Learning with Mobile Devices in the 21st

© University of Pretoria

Century Digital World: Benefits and Challenges. *European Journal of Multidisciplinary Studies*, *5*(1), 339. https://doi.org/10.26417/ejms.v5i1.p339-344

Dillenbourg, P., & Crivelli, Z. (2011). A Model of Collaborative Learning Scripts Instantiated with Mobile Technologies. *Combining E-Learning and M-Learning*, 56–68. https://doi.org/10.4018/978-1-60960-481-3.ch004

Dlodlo, N., Foko, T., Mvelase, P., & Mathaba, S. (2012). *The state of affairs in Internet of Things research*. *Electronic Journal of Information Systems Evaluation, 15*(3), 244-258. http://hdl.handle.net/10204/6438

Donner, J. (2008). *Research Approaches to Mobile Use in the Developing World : A Review of the Literature*. 140–159. https://doi.org/10.1080/01972240802019970

Dube, B. A., Nhamo, E., & Magonde, S. (2018). Factors affecting ICT integration in the Teaching and Learning of Physical Education in South Africa: A Case of Johannesburg East Cluster Primary Schools in the Gauteng Province. *International Journal of Sport, Exercise and Health Research*, *2*(1), 88–92. https://doi.org/10.31254/sportmed.2103

Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Information Systems Frontiers*, *21*(3), 719–734. https://doi.org/10.1007/s10796-017-9774-y

Easterby-Smith, M. (viaf)91860022, Thorpe, R. (viaf)51762137, & Jackson, P. R. (2012). *Management research : Mark Easterby-Smith, Richard Thorpe and Paul Jackson* (4th ed.). SAGE. http://lib.ugent.be/catalog/rug01:002064464

Edmunds, R., Thorpe, M., & Conole, G. (2012). Student attitudes towards and use of ICT in course study, work and social activity: A technology acceptance model approach. *British Journal of Educational Technology*, *43*(1), 71–84. https://doi.org/10.1111/j.1467-8535.2010.01142.x

Ekanayake, S. Y., & Wishart, J. (2015). Integrating mobile phones into teaching and

© University of Pretoria

learning: A case study of teacher training through professional development workshops. *British Journal of Educational Technology*, *46*(1), 173–189. https://doi.org/10.1111/bjet.12131

Ellingson, L. L. (2008). *Engaging Crystallization in Qualitative Research: An Introduction*. SAGE. https://books.google.co.za/books?id=UfIgAQAAQBAJ

Ellingson, L. L. (2014). "The truth must dazzle gradually": Enriching relationship research using a crystallization framework. Journal of Social and Personal Relationships, 31(4), 442–450. https://doi.org/10.1177/0265407514523553

Erişti, S. D., & Kurt, A. A. (2012). Teachers' Views about Effective Use of Technology in Classrooms. *Turkish Online Journal of Qualitative Inquiry*, *3*(2), 30–41. https://doi.org/10.17569/tojqi.51671

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers and Education*, *59*(2), 423–435. https://doi.org/10.1016/j.compedu.2012.02.001

Farrell, G., Isaacs, S., & Trucano, M. (2007). The NEPAD e-Schools Demonstration Project : A Work in Progress. In *THE COMMONWEALTH OF LEARNING. http://oasis.col.org/handle/11599/161*

Fatimah, A. S., & Santiana, S. (2017). Teaching in 21St Century: Students-Teachers' Perceptions of Technology Use in the Classroom. *Script Journal: Journal of Linguistic and English Teaching*, *2*(2), 125. https://doi.org/10.24903/sj.v2i2.132

Fishbein, M. (1979). A theory of reasoned action: Some applications and implications. *Nebraska Symposium on Motivation*, *27*, 65–116. https://doi.org/10.1002/9781405186407.wbiecr017

Flanagan, J. (1954). Psychological bulletin. The critical incident technique. *Psychological Bulletin*, *59*(4), 257–272. http://www.ncbi.nlm.nih.gov/pubmed/19586159

© University of Pretoria

Flick, U. (2011). What Is Qualitative Research ? In *Designing Qualitative Research* (pp. 2–15). SAGE.

Foko, T. (2009). The use of mobile technologies in enhancing learning in South Africa and the challenges of increasing digital divide. *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, : AACE, 2009.. 2535–2540.

Ford, M., & Botha, A. (2010). A pragmatic framework for integrating ICT into Education in South Africa. *IST-Africa*, 1–10. www.ist-africa.org/conference2010

Ford, M., Botha, A., & Rerselman, M. (2014). ICT4RED 12 - Component implementation framework: A conceptual framework for integrating mobile technology into resource-constrained rural schools. *2014 IST-Africa Conference and Exhibition, IST-Africa 2014*. https://doi.org/10.1109/ISTAFRICA.2014.6880597

Fuad, A., & Hsu, C. Y. (2018). UTAUT for HSS: Initial framework to study health IT adoption in the developing countries. *F1000Research*, *7*, 1–7. https://doi.org/10.12688/f1000research.13798.1

Fulantelli, G., Taibi, D., & Arrigo, M. (2015). A framework to support educational decision making in mobile learning. *Computers in Human Behavior*, *47*, 50–59. https://doi.org/10.1016/j.chb.2014.05.045

Gagné, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2005). *Principles of Instructional Design,* (5th ed.). Thomson/Wadsworth.

Gautram, P. (2018). What The Advantages And Disadvantages Of Mobile Learning Are. *ELearning Industry.* https://elearningindustry.com/advantages-and-disadvantages-of-mobile-learning

Geddes, S. (2004). Mobile learning in the 21 st century : benefit for learners. *Knowledge Tree: An E-Journal of Flexible Learning in VET*, *6*, 13.

© University of Pretoria

http://pandora.nla.gov.au/pan/33606/20050928-0000/www.flexiblelearning.net.au/knowledgetree/edition06/html/pra_simon_geddes.html

Geertsema, M., & Campbell, C. (2014). *Teachers using mobile devices to receive immediate feedback and improve learners ' language learning*. *36*(2), 38–52.

Ghavifekr, S., Kunjappan, T., & Ramasamy, L. (2016). Teaching and Learning with ICT Tools: Issues and Challenges from Teachers' Perceptions. *Malaysian Online Journal of Educational Technology*, *4*(2), 38–57. https://eric.ed.gov/?id=EJ1096028

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science*, *1*(2), 175–191. https://doi.org/10.21890/ijres.23596

Goundar, S. (2014). The Distraction of Technology in the Classroom. *Journal of Education & Human Development*, *3*(1), 211–229. www.aripd.org/jehd

Greener, D. S. (2008). *Business Research Methods*. Dr Sue Greener & Ventus Publishing.

Grimus, M., & Ebner, M. (2015). Learning and teaching with mobile devices: An approach in higher secondary education in Ghana. *International Journal of Mobile and Blended Learning*, *7*(2), 17–32. https://doi.org/10.4018/ijmbl.2015040102

Grix, J. (2019). *The Foundations of Research* (3rd ed.). MacMillan Education.

Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communications & Technology Journal*, *29*(2), 75-91. https://doi.org/10.1002/ev.223

Guba, E. G., & Lincoln, T. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Ed.), In *Handbook of qualitative research* (pp. 105–117). Sage.

© University of Pretoria

Gudmundsdottir, G. B. (2010). When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language. *Information Technology for Development*, *16*(3), 174–190. https://doi.org/10.1080/02681102.2010.498409

Guerrero, L. A., Ochoa, S. F., Pino, J. A., & Collazos, C. A. (2006). Selecting computing devices to support mobile collaboration. *Group Decision and Negotiation*, *15*(3), 243–271. https://doi.org/10.1007/s10726-006-9020-3

Guma, A., Haolader.F.A, & Khushi, M. (2013). The Role of ICT to Make Teaching-Learning Effective in Higher Institutions of Learning in Uganda. *International Journal of Innovative Research in Science, Engineering and Technology*, *2*(8), 4061–4073. https://www.iomcworld.org/innovative-research-science-engineering-technology.html

Gumbo, L., & Mawire, P. R. (2013). Harnessing and Utilizing Information and Communication Technology (ICT) As an Aid in Teaching English As a Second Language (Esl): A Case Study of Midlands State University (MSU). *Research Journal in Engineering and Applied Sciences*, *2*(5), 402–408. http://journalseek.net/cgi-bin/journalseek/journalsearch.cgi?field=issn&query=2276-8467

Gupta, K. P., Singh, S., & Bhas kar, P. (2016). Citizen adoption of e-government: A literature review and conceptual framework. *Electronic Government*, *12*(2), 160–185. https://doi.org/10.1504/EG.2016.076134

Guy, R. (2010). Mobile learning defined. In R. Guy (Ed.), *Mobile Learning: Pilot Projects and Initiatives* (pp. 1–8). Informing Science Press.

Hartman, R. J., Townsend, M. B., & Jackson, M. (2019). Educators' perceptions of technology integration into the classroom: a descriptive case study. *Journal of Research in Innovative Teaching & Learning*, *12*(3), 236–249. https://doi.org/10.1108/jrit-03-2019-0044

© University of Pretoria

Hastie, M., Hung, I. C., Chen, N. S., & Kinshuk. (2010). A blended synchronous learning model for educational international collaboration. *Innovations in Education and Teaching International*, *47*(1), 9–24. https://doi.org/10.1080/14703290903525812

Hattie, J. (2008). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. In *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Routledge. https://doi.org/10.4324/9780203887332

Hennessy, S., Harrison, D., & Wamakote, L. (2010). Teacher factors influencing classroom use of ICT in Sub-Saharan Africa. *Itupale Online Journal of African studies*, *2*(1), 39-54. https://www.researchgate.net/publication/228399541_Teacher_factors_influencing_classroom_use_of_ICT_in_Sub-Saharan_Afric

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, *55*(3), 223–252. https://doi.org/10.1007/s11423-006-9022-5

Holden, R. J., & Karsh, B.-T. (2011). the Technology Acceptance Model : Its Past and Its Future in Health Care. *J Biomed Inform*, *43*(1), 1–30. https://doi.org/10.1016/j.jbi.2009.07.002.THE

Hong, H., Koh, E., Loh, J., Tan, C. M., & Tan, H. M. (2016). Exploring Parental Involvement in Smartphone-Enabled Learning. In C. S. Chai, C. P. Lim, & C. M. Tan (Eds.), *Future Learning in Primary Schools : A Singapore Perspective* (pp. 159–176). Springer. https://doi.org/10.1007/978-981-287-579-2_11

Howard, S. K., & Mozejko, A. (2015). Teachers: technology, change and resistance. *Teaching and Digital Technologies: Big Issues and Critical Questions*, 307–317. http://ro.uow.edu.au/sspapers/1830

Hoye, S. R. (2017). *Teachers' Perceptions of the Use of Technology in the Classroom*

© University of Pretoria

and the Effect of Technology on Student Achievement (PhD thesis). ProQuest Dissertations Publishing. https://search.proquest.com/docview/2014475053

Hsu, S. (2010). The relationship between teacher's technology integration ability and usage. *Journal of Educational Computing Research*, *43*(3), 309–325. https://doi.org/10.2190/EC.43.3.c

Hsu, Y.-S., Wu, H.-K., & Hwang, F.-K. (2007). Factors Influencing Junior High School Teachers' Computer-Based Instructional Practices Regarding Their Instructional Evolution Stages. *Educational Technology & Society, 10 (4)*, 118–130. https://www.jstor.org/stable/10.2307/jeductechsoci.10.4.118

Huang, Y. M., Kuo, Y. H., Lin, Y. T., & Cheng, S. C. (2008). Toward interactive mobile synchronous learning environment with context-awareness service. *Computers and Education*, *51*(3), 1205–1226. https://doi.org/10.1016/j.compedu.2007.11.009

Hur, J. W., Shen, Y. W., Kale, U., & Cullen, T. A. (2015). An Exploration of Pre-Service Teachers' Intention to Use Mobile Devices for Teaching. *International Journal of Mobile and Blended Learning*, *7*(3), 1–17. https://doi.org/10.4018/IJMBL.2015070101

Hussain, A., & Mkpojiogu, E. O. C. (2015). The effect of responsive web design on the user experience with laptop and smartphone devices. *Jurnal Teknologi*, *77*(4), 41–47. https://doi.org/10.11113/jt.v77.6041

ICASA. (2010). *Universal Service and Access Obligations* (Notice 807 of 2010). 66. https://static.pmg.org.za/docs/100817review.pdf

Ilomäki, L., & Lakkala, M. (2018). Digital technology and practices for school improvement: innovative digital school model. *Research and Practice in Technology Enhanced Learning*, *13*(1). https://doi.org/10.1186/s41039-018-0094-8

Imtiaz, M. A., & Maarop, N. (2014). A Review of Technology Acceptance Studies in

© University of Pretoria

the Field of Education. *Jurnal Teknologi*, *69*(2), 27–32. https://doi.org/10.11113/jt.v69.3101

Jantjies, M., & Joy, M. (2015). International Forum of Educational Technology & Society Mobile Enhanced Learning in a South African Context. *Mobile Enhanced Learning in a South African Context*, *18*(1), 308–320. https://doi.org/10.5339/qproc.2013.mlearn.14

Johnston, K. A. (2013). A Guide to Educating Different Generations in South Africa. *Issues in Informing Science and Information Technology*, *10*, 261–273. https://doi.org/10.28945/1810

Jones, A., & Issroff, K. (2007). Motivation and mobile devices: exploring the role of appropriation and coping strategies. *Alt-J*, *15*(3), 247–258. https://doi.org/10.1080/09687760701673675

Joo, Y. J., Lee, H. W., & Ham, Y. (2014). Integrating user interface and personal innovativeness into the TAM for mobile learning in Cyber University. *Journal of Computing in Higher Education*, *26*(2), 143–158. https://doi.org/10.1007/s12528-014-9081-2

Jung, I. (2005). ICT-Pedagogy Integration in Teacher Training: Application Cases Worldwide. Educational Technology & Society, 8 (2), 94-101. https://www.jstor.org/journal/jeductechsoci

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*, *19*(1), 115–127. https://doi.org/10.1007/s10639-012-9207-y

Kambourakis, G., Kontoni, D. P. N., & Sapounas, I. (2004). Introducing attribute certificates to secure distributed E-learning or M-learning services. *IASTED International Conference on Web-Based Education*, *January*, 436–440. http://ben.upc.es/butlleti/innsbruck/416-174.pdf

© University of Pretoria

Karangwa, E. (2012). *Policy insights from an assessment of NEPAD e-schools in Rwanda: a case study of three NEPAD schools in Rwanda* (Doctoral dissertation, University of Witwatersrand).

Kárpáti, A., Török, B., & Szirmai, A. L. (2008). *E-Teaching Readiness of Teachers the Effects of Personality Traits and Ict Skills on Changes in Teaching Style of Experienced Educators*. In *Proceedings of the VIIth Research Workshop of EDEN* (Vol. 6, p. 8).

Karsenti, T., Harper-Merrett, T., Traoré, D., Mbangwan, M., & Touré, K. (2009). The Panafrican research agenda on the pedagogical integration of ICTs. "https://depot.erudit.org/id/003376dd

Keengwe, J., Onchwari, G., & Wachira, P. (2008). Computer technology integration and student learning: Barriers and promise. *Journal of Science Education and Technology*, *17*(6), 560–565. https://doi.org/10.1007/s10956-008-9123-5

Keskin, N. O., & Metcalf, D. (2011). The current perspectives, theories and practices of mobile learning. *Turkish Online Journal of Educational Technology*, *10*(2), 202–208. https://eric.ed.gov/?id=EJ932239

Key, R., Kohl, A.-K., Elflein, J., Puri-Mirza, A., Sapun, P., & Cherowbrier, J. (2017). *Number of smartphone users from 2016 to 2021(in billions)*. Statista. https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Khan, M. S. H., Hasan, M., & Clement, K. C. (2012). Barriers To the Introduction of Ict Into Education in Developing Countries: the Example of Bangladesh. *International Journal of Instruction July*, *5*(2), 1694–609. https://doi.org/DOI 10.1007/s11423-009-9132-y

Khokhar, A. J. (2016). Students and Teachers Perceptions of ICT Use in Classroom: Pakistani Classrooms. *The Asian Conference on Technology in the Classroom*.

King, M. B., & Newmann, F. M. (2001). Building school capacity through professional

© University of Pretoria

development conceptual and empirical consderations. *The International Journal of Educational Management*, *15*(2), 1–10. https://doi.org/10.1108/09513540110383818

Kivunja, C., & Kuyini, A. B. (2017). *Understanding and Applying Research Paradigms in Educational Contexts*. *6*(5), 26–41. https://doi.org/10.5430/ijhe.v6n5p26

Khan, M. S. H., Hasan, M., & Clement, K. C. (2012). Barriers To the Introduction of ICT Into Education in Developing Countries: the Example of Bangladesh. International *Journal of Instruction July,* 5(2), 1694–609.)10.1007/s11423-009-9132-y

Kleiman, B. G. M. (2001). Myths and Realities About Technology in K-12 Schools. *The Online Journal of the Leadership and the New Technologies Community*, *14*, 1–8. http://www.sfu.ca/educ260/documents/myths.pdf

Kofi, E. (2007). *the Integration of Information and Communication Technology Into Rural Schools of South Africa : A Case Study of Schools in Malamulele.* (Doctoral dissertation, Stellenbosch: University of Stellenbosch).

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers and Education*, *59*(4), 1109–1121. https://doi.org/10.1016/j.compedu.2012.05.014

Kotrlik, J. W., & Redmann, D. H. (2005). Extent of Technology Integration in Instruction by Adult Basic Education Teachers. *Adult Education Quarterly*, *55*(3), 200–219. https://doi.org/10.1177/0741713605274630

Kreutzer, T. (2009). Generation Mobile: Online and Digital Media Usage on Mobile Phones among Low-Income Urban Youth in South Africa. *Centre for Film and Media Studies, University of Cape Town*, *February*, 106. http://tinokreutzer.org/mobile/MobileOnlineMedia-SurveyResults-2009.pdf

Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *ReCALL*,

© University of Pretoria

21(2), 157–165. https://doi.org/10.1017/S0958344009000202

Kukulska-Hulme, A., Pettit, J., Bradley, L., Carvalho, A. A., Herrington, A., Kennedy, D. M., & Walker, A. (2011). Mature Students Using Mobile Devices in Life and Learning. *International Journal of Mobile and Blended Learning*, *3*(1), 18–52. https://doi.org/10.4018/jmbl.2011010102

Kuşkonmaz, H. (2011). *Determining teacher's perception of mobile learning at secondary schools. (Unpublished Master's Thesis). Bahçeşehir University, Turkey.)*

Lai, P. (2017). the Literature Review of Technology Adoption Models and Theories for the Novelty Technology. *Journal of Information Systems and Technology Management*, *14*(1), 21–38. https://doi.org/10.4301/S1807-17752017000100002

Lam, Y., & Lawrence, G. (2002). Teacher-student role redefinition during a computer-based second language project: Are computers catalysts for empowering change? *International Journal of Phytoremediation*, *21*(1), 295–315. https://doi.org/10.1076/call.15.3.295.8185

Lamey, D. (2018). The evolution of Technology: Past, Present and Future. *DiscoverTec*. https://www.discovertec.com/blog/evolution-of-technology

Laouris, Y. (2005). We need an educationally relevant definition of mobile learning. *Proceedings of the 4th World Conference on Mobile Learning*, *June*, 290–294.

Laugasson, E., Quaicoe, J. S., Jeladze, E., & Jesmin, T. (2016). Bridging Digital Divide in Schools in Developing Countries: Perceptions of Teachers of Free Software Opportunities. In P. Zaphiris & A. Ioannou (Eds.), *Learning and Collaboration Technologies* (pp. 695–706). Springer International Publishing.

Lawrence, D. (2016). Students' Experiences of Using Mobile Phones for Afrikaans Vocabulary Development. *Journal for Language Teaching*, *50* (1), 79–101. https://doi.org/10.4314/jlt.v50i1.4

© University of Pretoria

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, *55*(1), 79–105. https://doi.org/10.1080/09523987.2018.1439712

Lefoe, G. E., Olney, I. W., Wright, R., & Herrignton, A. (2009). Faculty development for new technologies : Putting mobile learning in the hands of the teachers. In A. Herrignton, J. Herrington, J. Mantei, I. Olney, & B. Ferry (Eds.), *New technologies, new pedagogies: Mobile learning in higher education* (pp. 14–27). University of Wollong.

Liaw, S.-S., Huang, H.-M., & Chen, G.-D. (2007). Surveying instructor and learner attitudes toward E-learning. *Computers & Education*, *49*, 1066–1080. https://doi.org/10.1016/j.compedu.2006.01.001

Liu, H., Lin, C. H., Zhang, D., & Zheng, B. (2016). Language teachers' perceptions of external and internal factors in their instructional (non-) use of technology. *Preparing Foreign Language Teachers for Next-Generation Education*, 56–73. https://doi.org/10.4018/978-1-5225-0483-2.ch004

Liu, I. F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C. H. (2010). Extending the TAM model to explore the factors that affect Intention to Use an Online Learning Community. *Computers and Education*, *54*(2), 600–610. https://doi.org/10.1016/j.compedu.2009.09.009

Livingstone, S. (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education*, *38*(1), 9–24. https://doi.org/10.1080/03054985.2011.577938

Livingstone, S. (2016). Critical reflections on the benefits of ICT in education. *Digital Technologies in the Lives of Young People*, *38*(1), 9–24. https://doi.org/10.1080/03054985.2011.577938

Lucero, A., Porcheron, M., & Fischer, J. E. (2016). Collaborative use of mobile devices to curate sources of inspiration. *Proceedings of the 18th International Conference*

© University of Pretoria

on Human-Computer Interaction with Mobile Devices and Services Adjunct, MobileHCI 2016, 611–616. https://doi.org/10.1145/2957265.2961830

Lundgren, B., Scheckle, E., &; Zinn, D. (2015). Teachers' professional development: Awareness of literacy practices. South African Journal of Education, 35(1), 1–11. https://doi.org/10.15700/201503062347

Ma, W. W., Andersson, R., & Streith, K. (2005). Examining user acceptance of computer technology: an empirical study of student teachers. *Journal of Computer Assisted Learning*, *21*(6), 387–395. https://doi.org/10.1111/j.1365-2729.2005.00145.x

Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues in Educational Research*, *16*(2), 193-205. www.academia.edu

Martin, A., & Roodt, G. (2008). Perception of organisational commitment, job satisfaction and turnover intentions in a post-merger South African tertiary institution. *SA Journal of Industrial Psychology*, *34*(1), 23–31. https://doi.org/10.4102/sajip.v34i1.415

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers and Education*, *68*, 76–85. https://doi.org/10.1016/j.compedu.2013.04.021

Mashile, T. Z. (2016). *Technology integration and the digital divide : Understanding factors that impact on educators ' ability to integrate technology in South African classrooms*. (Doctoral dissertation, University of Pretoria).

Masrom, M., & Ismail, Z. (2010). Benefits and Barriers to the Use of Mobilr Learning in Education: Review of Literature. In R. Guy (Ed.), *Mobile Learning: Pilot Projects and Initiatives* (pp. 9–26). Informing Science Press.

Mauthner, M., Birch, M., Jessop, J., Miller, T., Birch, M., & Miller, T. (2012). Encouraging Participation: Ethics and Responsibilities. *Ethics in Qualitative*

© University of Pretoria

Research, 92–106. https://doi.org/10.4135/9781849209090.n5

Mbatha, B. (2016). Pushing the agenda of the information society: ICT diffusion in selected multipurpose community telecentres in South Africa. *Information Development TA - TT -*, *32*(4), 937–952. https://doi.org/10.1177/0266666915575544 LK - https://UnivofPretoria.on.worldcat.org/oclc/6782185182

Mbatha, B., & Manana, P. (2012). Students' perceptions on the use of Facebook in an ODL landscape. *Progressio*, *34*, 13–26. https://doi.org/10.1007/978-3-642-39262-7_52

Mbatha, B., Ocholla, D. N., & Le Roux, J. (2011). Some implications of Information and Communication Technologies on public service work environments in South Africa. *Information Development TA - TT -*, *27*(2), 47–62. https://doi.org/10.1017/CBO9781107415324.004

McAleavy, T., Hall-Chen, A., Horrocks, S., & Riggall, A. (2018). Technology-Supported Professional Development for Teachers: Lessons from Developing Countries. In *Education Development Trust*. https://eric.ed.gov/?id=ED593386

McLeod, S. A. (2019, August 03). Likert scale. Simply Psychology. https://www.simplypsychology.org/likert-scale.html

Mdlongwa, T. (2012). Information and Communication Technology (ICT) as a Means of Enhancing Education in Schools in South Africa : Challenges, Benefits and Recommendations. *AISA Policy Brief*, *80*, 1–8. http://www.ai.org.za/publications/titles-published-20102011/policy-briefs

Mehdipour, Y., & Zerehkafi, H. (2013). Mobile Learning for Education: Benefits and Challenges. *International Journal of Computational Engineering Research*, *3*(6), 93-101 (251-259). https://doi.org/10.1080/87567555.2011.604802

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

© University of Pretoria

782. https://doi.org/10.1111/j.1467-8535.2012.01352.x

Merriam, S. B. (2009). *Qualitative Research: A Guide to Design and Implementation*. Jossey-Bass.

Mishra, R. K. (2013). Vygotskian Perspective of Teaching-Learning. *Innovation: International Journal of Applied Research*, *1*(1), 21-28. *https://ijar.publicationsupport.com/*

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. 108(6), 1017–1054. http://one2oneheights.pbworks.com/f/MISHRA_PUNYA.pdf

Mockus, L., Dawson, H., Edel-Malizia, S., Shaffer, D., An, J., & Swaggerty, A. (2011). The impact of mobile access on motivation: Distance education student perceptions. *World Campus Learning Design*, *4*(5), 1-34. https://www.learningdesign.psu.edu/

Moghavvemi, S., Salleh, N. A. M., & Abessi, M. (2013). Determinants of IT-related innovation acceptance and use behavior: Theoretical integration of unified theory of acceptance and use of technology and entrepreneurial potential model. *Social Technologies*, *3*(2), 243–260. https://doi.org/10.13165/st-13-3-2-01

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192–222. https://doi.org/10.1287/isre.2.3.192

Moore, K., & Iida, S. (2010). Students' perception of supplementary, online activities for Japanese language learning: Groupwork, quiz and discussion tools. *Australasian Journal of Educational Technology*, *26*(7). https://doi.org/10.14742/ajet.1028

Morrow, S. L. (2005). Quality and trustworthiness in qualitative research in counseling psychology. *Journal of Counseling Psychology*, *52*(2), 250–260. https://doi.org/10.1037/0022-0167.52.2.250

© University of Pretoria

Mostakhdemin-Hosseini, A., & Mustajarvi, J. (2003). Framework for mobile learning system based on education component. In *Proceedings of the International Conference on Theory and Applications of Mathematics and Informatics – ICTAMI 2003, Alba Iulia*, 191–196.

Mouza, C., & Barrett-Greenly, T. (2015). Bridging the app gap: An examination of a professional development initiative on mobile learning in urban schools. *Computers and Education*, *88*, 1–14. https://doi.org/10.1016/j.compedu.2015.04.009

Mundy, M. A., Kupczynski, L., & Kee, R. (2012). Teacher's perceptions of technology use in the schools. *SAGE Open*, *2*(1), 1–8. https://doi.org/10.1177/2158244012440813

Mutlu, M., & Der, A. (2017). Unified theory of acceptance and use of technology: The adoption of mobile messaging application. *Megatrend Revija*, *14*(1), 169–186. https://doi.org/10.5937/megrev1701169m

Mwalongo, A. (2010). Teacher's Knowledge, Beliefs and Pedagogical Practices in Integrating Icts in Different Curriculum Areas in Secondary Schools: A Case Study of Pakistan (Report). *Journal of Educational Research*, *13*(1), 12. https://www.tandfonline.com/toc/vjer20/current

Myers, M. D. (2009). *Qualitative research in business & management*. SAGE Publications Ltd.

Mzekandaba, S. (2015). *Poor teacher training stifles ICT in education*. ITWEB. http://www.itweb.co.za/index.php?option=com_content&view=article&id=146880:Poor-teacher-training-stifles-ICT-in-education&catid=86

Naidoo, G. M., Madida, M., & Rugbeer, H. (2019). Conceptual framework for ICT integration in rural secondary schools in South Africa. *Journal of Gender, Information and Development in Africa*, *8*(3), 187–212. https://doi.org/10.31920/2050-4284/2019/8n3a9

© University of Pretoria

Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. (2004). Literature Review in Mobile Technologies and Learning: Report 11. *Educational Technology*. http://www.futurelab.org.uk/resources/documents/lit_reviews/Mobile_Review.pdf

Ndlovu, N. S. (2015). *The pedagogical integration of ICTs by seven South African township secondary school teachers*. (Doctoral Dissertation, University of Witwatersrand.)

Nelson, M. J., & Hawk, N. A. (2020). The impact of field experiences on prospective preservice teachers' technology integration beliefs and intentions. Teaching and Teacher Education, 89, 103006. https://doi.org/10.1016/j.tate.2019.103006

Newmann, F. M. (1993). Student engagement and achievement in American secondary schools. In *Choice Reviews Online* (Vol. 30, Issue 07). https://doi.org/10.5860/choice.30-3945

Ng, W. (2012). Author' s personal copy Computers & Education Can we teach digital natives digital literacy ? *Computers and Education*, *59*, 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Nicolle, P., & Lou, Y. (2008). Technology adoption into teaching and learning by mainstream university faculty: A mixed methodology study revealing the how, when, why, and why not. *Journal of Educational Computing Research*, *39*(3), 235–265. https://doi.org/10.2190/EC.39.3.c

Nikolopoulou, K., Gialamas, V., Lavidas, K., & Komis, V. (2021). Teachers' Readiness to Adopt Mobile Learning in Classrooms: A Study in Greece. Technology, Knowledge and Learning, 26(1), 53–77. https://doi.org/10.1007/s10758-020-09453-7

Nistor, N. (2014). When technology acceptance models won't work: Non-significant intention-behavior effects. *Computers in Human Behavior*, *34*, 299–300. https://doi.org/10.1016/j.chb.2014.02.052

Noaks, L., & Wincup, E. (2004). *Criminological Research*.

© University of Pretoria

https://doi.org/10.4135/9781849208789

North, D., Johnston, K., & Ophoff, J. (2014). Issues in Informing Science and Information Technology The Use of Mobile Phones by South African University Students. *Issues in Informing Science and Information Technology*, *11*, 115–138. http://iisit.org/Vol11/IISITv11p115-138North0469.pdf

Nyagowa, H. O., Ocholla, D. N., & Mutula, S. M. (2012). *Evaluation of Success of NEPAD's Pilot e-Schools in Kenya* .University of Zululand. lis.uzulu.ac.za

O'Dea, S. (2020). Smartphone Users Worldwide-2016-2021. *Mobile Statistics Report, 2020-2024, Statista Research Department*. https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

Odendaal, N. (2017 January 20).. Operation Phakisa making strides in ICT in education. *Engineering News*. http://www.engineeringnews.co.za/article/operation-phakisa-making-strides-in-ict-in-education-2017-01-20

Oduaran, A. (2015). Continuing Professional Development in the Service of the Nation: The Case of Nigeria. *Journal of Social Sciences*, *42*(3), 275–287. https://doi.org/10.1080/09718923.2015.11893415

Omidinia. (2011). Review of E-Learning and ICT Infrastructure in Developing Countries (Case Study of Iran). *American Journal of Economics and Business Administration*, *3*(1), 120–125. https://doi.org/10.3844/ajebasp.2011.120.125

Orhun, E. (2003). Computer-Based Cognitive Tools in Teacher Training: The COG-TECH Projects. *Turkish Online Journal of Educational Technology - TOJET*, *2*(3), 35–40. http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1101996&site=ehost-live

Oye, N. D., A. Iahad, N., & Ab.Rahim, N. Z. (2012). The Impact of UTAUT Model and

© University of Pretoria

ICT Theoretical Framework on University Academic Staff: Focus on Adamawa State University, Nigeria. *International Journal of Computers & Technology*, *2*(2), 103–111. https://doi.org/10.24297/ijct.v2i2b.2640

Ozdamli, F., & Cavus, N. (2011). Basic elements and characteristics of mobile learning. *Procedia - Social and Behavioral Sciences*, *28*(December), 937–942. https://doi.org/10.1016/j.sbspro.2011.11.173

Pachler, N., Bachmair, B., & Cook, J. (2014). *Mobile learning : structures , agency , practices Mobile Learning*. Springer.

Padayachee, K. (2017). A snapshot survey of ICT integration in South African schools. *South African Computer Journal*, *29*(2), 36–65. https://doi.org/10.18489/sacj.v29i2.463

Palau-Saumell, R., Forgas-Coll, S., Sánchez-García, J., & Robres, E. (2019). User Acceptance of Mobile Apps for Restaurants: An Expanded and Extended UTAUT-2. *Sustainability*, *11*(4), 1210. https://doi.org/10.3390/su11041210

Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *International Review of Research in Open and Distance Learning*, *12*(2), 78–102. https://doi.org/10.19173/irrodl.v12i2.791

Peled, Y., Blau, I., & Grinberg, R. (2022). Crosschecking teachers' perspectives on learning in a one-to-one environment with their actual classroom behavior – a longitudinal study. Education and Information Technologies, 0123456789. https://doi.org/10.1007/s10639-021-10809-4

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers and Education*, *37*(2), 163–178. https://doi.org/10.1016/S0360-1315(01)00045-8

Perrotta, C. (2017). Beyond rational choice: How teacher engagement with technology is mediated by culture and emotions. *Education and Information Technologies*,

© University of Pretoria

22(3), 789–804. https://doi.org/10.1007/s10639-015-9457-6

Petrova, K., & Li, C. (2009). Focus and setting in mobile learning research: A review of the literature. *Innovation and Knowledge Management in Twin Track Economies Challenges and Solutions - Proceedings of the 11th International Business Information Management Association Conference, IBIMA 2009*, *1–3*, 1456–1463. openrepository.aut.ac.nz

Pholotho, T., & Mtsweni, J. (2016). Barriers to electronic access and delivery of educational information in resource constrained public schools: A case of Greater Tubatse Municipality. *2016 IST-Africa Conference, IST-Africa 2016*, 1–9. https://doi.org/10.1109/istafrica.2016.7530626

Pimmer, C., & Pachler, N. (2014). Mobile Learning in the Workplace: Unlocking the Value of Mobile Technology for Work-Based Education. In M. Ally & A. Tsinakos (Eds.), *Increasing Access Mobile Learning Increasing Access Mobile Learning* (p. 231). Commonwealth of Learning and Athabasca University.

Pinkwart, N., Hoppe, H. U., Milrad, M., & Perez, J. (2003). use of Personal Digital Assistants. *Journal of Computer Assisted Learning*, *19*(April), 383–391. https://doi.org/10.1046/j.0266-4909.2003.00039.x

Polit, D. F., & Beck, C. T. (2006). *Essentials of nursing research: Methods, Appraisal and utilisation*. Lippincott.

Porter, G., Hampshire, K., Milner, J., Munthali, A., Robson, E., de Lannoy, A., Bango, A., Gunguluza, N., Mashiri, M., Tanle, A., & Abane, A. (2016). Mobile Phones and Education in Sub-Saharan Africa: From Youth Practice to Public Policy. *Journal of International Development*, *28*(1), 22–39. https://doi.org/10.1002/jid.3116

Potter, A. J., & Rockinson-Szapkiw, S. L. (2007). *TECHNOLOGY INTEGRATION FOR INSTRUCTIONAL IMPROVEMENT : THE IMPACT OF PROFESSIONAL DEVELOPMENT*. 22–28. https://doi.org/10.1002/pfi

Prensky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the Horizon*, *9*(5),

© University of Pretoria

1–6. https://doi.org/10.1108/10748120110424816

Prensky, M. (2005). What Can You Learn From A Cell Phone ? – Almost Anything ! *Cell*, *1*(5), 1–9. https://doi.org/10.4135/9781483387765.n23

Rahimi, B., Nadri, H., Afshar, H. L., & Timpka, T. (2018). A systematic review of the technology acceptance model in health informatics. *Applied Clinical Informatics*, *9*(3), 604–634. https://doi.org/10.1055/s-0038-1668091

Rahmat, M. K., & Au, W. K. (2013). Visual Art Education Teachers' Continuance Intention to Integrate ICT: A Model Development. *Procedia - Social and Behavioral Sciences*, *90*(InCULT 2012), 356–364. https://doi.org/10.1016/j.sbspro.2013.07.103

Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research*, *3*(S1), 33. https://doi.org/10.21839/jaar.2018.v3is1.165

Ramayah, T., & Ignatius, J. (2005). Impact of Perceived usefulness , Perceived ease of use and Perceived Enjoyment on Intention to Shop Online. *ICFAI Journal of Systems Management (IJSM)*, 1–16. http://ramayah.com/journalarticlespdf/impactpeu.pdf

Ramayah, T., Ma'ruf, J. J., Jantan, M., & Mohamad, O. (2002). Technology Acceptance Model: Is it applicable to users and non-users of Internet banking. In *The proceedings of the international Seminar, Indonesia-Malaysia, the role of harmonization of Economics and business discipline in global competitiveness, Banda Aceh, Indonesia* (pp. 14-15).

Ramorola, M. Z. (2010). A study of effective technology integration into teaching and learning: A case study. (Dissertation, University of South Africa).

Ramorola, M. Z. (2014). Information and Communication Technology Integration: Where to Start, Infrastructure or Capacity Building? *Procedia - Social and Behavioral Sciences*, *116*, 3649–3658.

© University of Pretoria

https://doi.org/10.1016/j.sbspro.2014.01.818

Raphael, C., & Mtebe, J. (2017). Pre-Service Teachers' Self-Efficacy Beliefs towards Educational Technologies Integration in Tanzania. *Journal of Learning for Development*, *4*(2), 196–210. https://eric.ed.gov/?id=EJ1149184

Remenyi, D. (1992). Researching information systems: Data analysis methodology using content and correspondence analysis. *Journal of Information Technology*, *7*(2), 76–86. https://doi.org/10.1057/jit.1992.12

Riege, A. M. (2003). Validity and reliability tests in case study research: A literature review with "hands-on" applications for each research phase. *Qualitative Market Research: An International Journal*, *6*(2), 75–86. https://doi.org/10.1108/13522750310470055

Rieger, R., & Gay, G. (1997). *Using mobile computing to enhance field study*. *April*, 218–226. https://doi.org/10.3115/1599773.1599800

Roschelle, J., & Teasley, S. D. (1995). The Construction of Shared Knowledge in Collaborative Problem Solving. *Computer Supported Collaborative Learning*, 69–97. https://doi.org/10.1007/978-3-642-85098-1_5

Rosen, L. D., & Maguire, P. (1990). Myths and realities of computerphobia: A meta-analysis. *Anxiety Research*, *3*(3), 175–191. https://doi.org/10.1080/08917779008248751

Ruxwana, N., Msibi, M., & Mahlangu, T. (2018). A South African university's readiness assessment for bringing your own device for teaching and learning. *SA Journal of Information Management*, *20*(1), 1–6. https://doi.org/10.4102/sajim.v20i1.926

Sadaf, A., Newby, T. J., & Ertmer, P. A. (2012). Exploring pre-service teachers' beliefs about using Web 2.0 technologies in K-12 classroom. *Computers and Education*, *59*(3), 937–945. https://doi.org/10.1016/j.compedu.2012.04.001

Sánchez-Prieto, J. C., Migueláñez, S. O., & García-Peñalvo, F. J. (2014). ICTs

© University of Pretoria

Integration in Education: Mobile Learning and the Technology Acceptance Model (TAM). *Proceedings of the Second International Conference on Technological Ecosystems for Enhancing Multiculturality*, 683–687. https://doi.org/10.1145/2669711.2669974

Sánchez-Prieto , J. C., Migueláñez , S., & García-Peñalvo , F. J. (2017). Proceedings of the 2nd European Conference for the Scholarship of Teaching and Learning. In Technology Acceptance Among Teachers : An SLR on TAM and Teachers (pp. 232–238). Lund; EuroSoTL 2017.

Sandholtz, J. H., & Reilly, B. (2004). Teachers, Not Technicians: Rethinking Technical Expectations for Teachers. *Teachers College Record*, *106*(3), 147. https://doi.org/10.1111/j.1467-9620.2004.00348.x

Sang, G., Valcke, M., Braak, J. van, & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers and Education*, *54*(1), 103–112. https://doi.org/10.1016/j.compedu.2009.07.010

Sangra, A., & Gonzalez-Sanmamed, M. (2010). The role of information and communication technologies in improving teaching and learning processes in primary and secondary schools. *ALT-J: Research in Learning Technology*, *18*(3), 207–220. https://doi.org/10.1080/09687769.2010.529108

Santos, I. M. (2015). Mobile Devices in Higher Education Classrooms. *Human-Computer Interaction*, *February*, 1932–1949. https://doi.org/10.4018/978-1-4666-8789-9.ch096

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods For Business Students* (5th ed.). Pearson Education Limited.

Schindler, L. A., Burkholder, G. J., Morad, O. A., & Marsh, C. (2017). Computer-based technology and student engagement: a critical review of the literature. *International Journal of Educational Technology in Higher Education*, *14*(1).

© University of Pretoria

https://doi.org/10.1186/s41239-017-0063-0

Schmidt, D. a., Baran, E., Thompson, A. D., Koehler, M. J., Shin, T. S., & Mishra, P. (2009). Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. *Journal of Research on Technology in Education*, *42*(2), 123–149. https://doi.org/10.1007/978-1-60761-303-9

SchoolNetSA. (2003). *Intel Teach® Skills for Success*. https://www.schoolnet.org.za/atwork/intelttf.htm

Schwandt, T. A. (2014). On the Mutually Informing Relationship Between Practice and Theory in Evaluation. American Journal of Evaluation, 35(2), 231–236. https://doi.org/10.1177/1098214013503703

Sek, Y.-W., Lau, S.-H., Teoh, K.-K., And, C.-Y. L., & Parumo, S. Bin. (2011). Prediction of User Acceptance and Adoption of Smart Phone for Learning with Technology Acceptance Model. *Journal of Applied Sciences*, *10*(20), 2395–2402. http://docsdrive.com/pdfs/ansinet/jas/2010/2395-2402.pdf

Selwyn, N. (2010). Schools and schooling in the digital age: A critical analysis. In Schools and Schooling in the Digital Age: A Critical Analysis. https://doi.org/10.4324/9780203840795

Shah, S. R., & Al-bargi, A. (2013). *Research Paradigms: Researchers' Worldviews, Theoretical Frameworks and Study Designs*. *4*, 252–265. https://doi.org/10.5296/jsel.v4i1.9045

Shahid, F., Aleem, M., Islam, M. A., Iqbal, M. A., & Yousaf, M. M. (2019). A review of technological tools in teaching and learning computer science. *Eurasia Journal of Mathematics, Science and Technology Education*, *15*(11). https://doi.org/10.29333/ejmste/109611

Sharma, M. M. M. (2017). Teacher in a Digital Era. *Global Journal of Computer Science and Technology*, *17*(3), 11–14.

© University of Pretoria

https://computerresearch.org/index.php/computer

Sharples, M. (2006). How can we address the conflicts between personal informal learning and traditional classroom education. In M. Sharples (Ed.), *Big Issues in Mobile Learning: Report of a workshop by the Kaleidoscope Network of Excellence* (pp. 21–23). University of Nottingham. https://doi.org/10.1007/978-1-4020-9827-7

Sharples, M., Arnedillo-Sanchez, I., Milrad, M., & Vavoula, G. (2013). Mobile Learning Small Devices, Big Issues. In G. Hechavarría, Rodney; López (Ed.), *Technology-Enhanced Learning: Principles and Products* (Vol. 53, Issue 9, pp. 1689–1699). Springer. https://doi.org/10.1017/CBO9781107415324.004

Sharples, M., Taylor, J., Vavoula, G., Sharples, M., Taylor, J., Vavoula, G., Theory, A., Sharples, M., Taylor, J., & Vavoula, G. (2007). A Theory of Learning for the Mobile Age A Theory of Learning for the Mobile Age. In R. Andrews & C. Haythornthwaite (Eds.), *The Sage Handbook of Elearning Research* (pp. 221–247). SAGE.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63–75. https://doi.org/10.3233/EFI-2004-22201

Shimasaki, N. (2015). Integrating ICT into classroom pedagogies: An overview of barriers within the modern classroom. *Journal of Initial Teacher Inquiry*, *1*, 28–30. ir.canterbury.ac.nz

Shohel, M. M. C., & Power, T. (2010). *Introducing mobile technology for enhancing teaching and learning in Bangladesh : teacher perspectives*. *25*(3), 201–215. https://doi.org/10.1080/02680513.2010.511953

Shuler, C. (2009). *Pockets of potential Using Mobile Technologies to Promote Children's Learning*. https://hal.archives-ouvertes.fr/hal-00696254/

Siddiqui, S. I., Jabeen, S., & Mumtaz, M. (2014). Whether cell phone is a necessity or a luxurious item? *Middle - East Journal of Scientific Research*, *19*(1), 61–65.

© University of Pretoria

https://doi.org/10.5829/idosi.mejsr.2014.19.1.11900

Silica, C. (2012). *The Challenges and Benefits to Teachers' Practices in Constructivist Learning Environments Supported by Technology* (Vol. 130, Issue 2) [McGill University, Montreal]. https://doi.org/10.1016/j.jaci.2012.05.050

Skenderi, B., & Skenderi, D. (2011). Increasing Productivity with Use of IT and Identifying Own Train needs. *IFAC-PapersOnLine*, *49*(29), 310–314. https://doi.org/10.1016/j.ifacol.2016.11.085

Sophonhiranrak, S. (2021). Features, barriers, and influencing factors of mobile learning in higher education: A systematic review. Heliyon, 7(4), e06696. https://doi.org/10.1016/j.heliyon.2021.e06696

Sousa-Vieira, M. E., López-Ardao, J. C., Fernández-Veiga, M., Rodríguez-Pérez, M., & Herrería-Alonso, S. (2016). An open-source platform for using gamification and social learning methodologies in engineering education: Design and experience. *Computer Applications in Engineering Education*, *24*(5), 813–826. https://doi.org/10.1002/cae.21746

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. Cogent Education, 5(1), 1–21. https://doi.org/10.1080/2331186X.2018.1519143

Stake, R., & Kerr, D. (1995). Rene magritte, constructivism, and the researcher as interpreter. *Educational Theory*, *45*(1). https://doi.org/10.1111/j.1741-5446.1995.00055.x

Steyn, G., & van Niekerk, L. (2005). Professional development of teachers: Critical success factors. *Koers-Bulletin for Christian …*, *70*(1), 125–149. http://www.koersjournal.org.za/index.php/koers/article/view/262

Stols, G., Ferreira, R., Pelser, A., Olivier, W. A., Van der Merwe, A., De Villiers, C., & Venter, S. (2015). Perceptions and needs of South African Mathematics teachers concerning their use of technology for instruction. *South African Journal of*

© University of Pretoria

Education, *35*(4), 1–13. https://doi.org/10.15700/saje.v35n4a1209

Stošić, L., & Bogdanović, M. (2013). M-learning - A new form of learning and education. *International Journal of Cognitive Research in Science, Engineering and Education*, *1*(2), 114–118. https://doi.org/10.1109/tnnls.2015.2513365

Straub, E. T. (2009). Understanding Technology Adoption: Theory and Future Directions for Informal Learning. *Review of Educational Research*, *79*(2), 625–649. https://doi.org/10.3102/0034654308325896

Sun, S., Lee, P., Lee, A., & Law, R. (2016). Perception of Attributes and Readiness for Educational Technology: Hospitality Management Students' Perspectives. *Journal of Hospitality and Tourism Education*, *28*(3), 142–154. https://doi.org/10.1080/10963758.2016.1189832

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers and Education*, *94*, 252–275. https://doi.org/10.1016/j.compedu.2015.11.008

Swan, K., Van 'T Hooft, M., Kratcoski, A., & Unger, D. (2005). Uses and effects of mobile computing devices in k-8 classrooms. *Journal of Research on Technology in Education*, *38*(1), 99–112. https://doi.org/10.1080/15391523.2005.10782451

Taleb, Z., & Sohrabi, A. (2012). Learning on the Move: The use of Mobile Technology to Support Learning for University Students. *Procedia - Social and Behavioral Sciences*, *69*(Iceepsy), 1102–1109. https://doi.org/10.1016/j.sbspro.2012.12.038

Tan, P. J. B. (2013). Applying the UTAUT to understand factors affecting the use of english e-learning websites in Taiwan. *SAGE Open*, *3*(4). https://doi.org/10.1177/2158244013503837

Tapscott, D. (2009). *Grown Up Digital: How the Net Generation is Changing Your World*. McGraw-Hill Education. https://books.google.co.za/books?id=W8AfAQAAIAAJ

© University of Pretoria

Tarling, I., & Ng'ambi, D. (2016). Teachers pedagogical change framework: A diagnostic tool for changing teachers' uses of emerging technologies. *British Journal of Educational Technology*, *47*(3), 554–572. https://doi.org/10.1111/bjet.12454

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(2), 144–176. https://doi.org/10.1287/isre.6.2.144

Tenai, N. K. (2017). *Teacher factors influencing integration of information communication technology in teaching of english language in secondary schools in Eldoret-East Sub-County, Kenya* (Doctoral dissertation, Strathmore University). .

Teo, T. (2009). Modelling technology acceptance in education: A study of pre-service teachers. *Computers and Education*, *52*(2), 302–312. https://doi.org/10.1016/j.compedu.2008.08.006

Teo, T. (2012). Examining the intention to use technology among pre-service teachers: an integration of the Technology Acceptance Model and Theory of Planned Behavior. *Interactive Learning Environments*, *20*(1), 3–18. https://doi.org/10.1080/10494821003714632

Teo, T. (2014). Unpacking teachers' acceptance of technology: Tests of measurement invariance and latent mean differences. *Computers and Education*, *75*, 127–135. https://doi.org/10.1016/j.compedu.2014.01.014

Terre Blanche, M., & Durrheim, K. (1999). *Research in Practice: Applied Methods for the Social Sciences*. University of Cape Town Press.

Thomes, J. (2019). *Mobile Learning: Advantages And Disadvantages*. ELearning Industry. https://elearningindustry.com/mobile-learning-advantages-disadvantages

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal Computing: Toward

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a Conceptual Model of Utilization. *MIS Quarterly*, *15*(1), 125–143. https://doi.org/10.2307/249443

Thongsri, N., Shen, L., Bao, Y., & Alharbi, I. M. (2018a). Integrating UTAUT and UGT to explain behavioural intention to use M-learning: A developing country's perspective. *Journal of Systems and Information Technology*, *20*(3), 278–297. https://doi.org/10.1108/JSIT-11-2017-0107

Thongsri, N., Shen, L., Bao, Y., & Alharbi, M. I. (2018b). Integrating UTAUT and UGT to explain behavioural intention to use M-learning: A developing country's perspective. *Journal of Systems and Information Technology*, *20*(3), 278–297. https://doi.org/10.1108/JSIT-11-2017-0107

Thornton, P., & Houser, C. (2011). Using mobile phones in education. *The 2nd IEEE International Workshop on Wireless and Mobile Technologies in Education, 2004. Proceedings.*, *55*(4), 3–10. https://doi.org/10.1177/0263211x000281005

Timperley, H., & Robinson, V. (2000). Workload and the Professional Culture of Teachers. *Educational Management & Administration*, *28*(1), 47–62. https://doi.org/10.1177/0263211x000281005

Totter, A., Grote, G., & Stütz, D. (2005). ICT and schools: Identification of factors influencing the use of new media in vocational training schools. In *Proceedings of the 5th European Conference on e-Learning* (p. 469)

Traxler, J. (2005). Defining mobile learning. Learning, September 2004, 261–266.

Traxler, J. (2007). Defining, discussing, and evaluating mobile learning: The moving finger writes and having writ... *International Review of Research in Open and Distance Learning*, *8*(2). https://doi.org/10.19173/irrodl.v8i2.346

Traxler, J. (2013). Mobile Learning in International Development. In A. Tsinakos & M. Ally (Eds.), *Global Mobile Learning Implementations and Trends* (pp. 45–60). Commonwealth of Learning and Athabasca University.

© University of Pretoria

Traxler, J. & Kukulska-Hulme, A., (2005). *Mobile learning : A handbook for educators and trainers*. Routledge.

Traxler, J., & Leach, J. (2006). Innovative and sustainable mobile learning in Africa. *Proceedings - Fourth IEEE International Workshop on Wireless, Mobile and Ubiquitous Technology in Education, WMUTE 2006*, 98–102. https://doi.org/10.1109/WMTE.2006.261354

Uchendu, C. C. (2015). Capacity Building Practices In Secondary Schools : Implication For Teachers ' Professional Development In Cross River State , Nigeria. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, *6*(7), 300–304. https://journals.co.za/journal/sl.jeteraps

Umar, I. N., & Yusoff, M. T. M. (2014). A study on Malaysian Teachers' Level of ICT Skills and Practices, and its Impact on Teaching and Learning. *Procedia - Social and Behavioral Sciences*, *116*, 979–984. https://doi.org/10.1016/j.sbspro.2014.01.331

UNESCO. (2016). *ICT in education statistics : Shifting from regional reporting to global monitoring: Progress made, challenges encountered, and the way forward*. https://genbase.iiep.unesco.org/epidoc/notice34742

Unluer, S. (2011). Barriers in the Integration of ICT At the School for the Handicapped. *Problems of Education in the 21st Century*, *33*, 92–110. http://www.scientiasocialis.lt/pec/node/files/pdf/vol33/92-110.Unluer_Vol.33.pdf

Uvarov, A., & Varlamova, J. (2019). *Anytime, anywhere learning for improved education results in Russia*. gcedclearinghouse.org

Uzunboylu, H., & Ozdamli, F. (2011). Teacher perception for m-learning: scale development and teachers' perceptions. *Journal of Computer Assisted Learning*, *27*(6), 544–556. https://doi.org/10.1111/j.1365-2729.2011.00415.x

Valtonen, T. (2015). *An insight into collaborative learning with ICT: Teachers' and students' perspectives* (Issue 12). Itä-Suomen yliopisto. erepo.uef.fi

© University of Pretoria

van de Vijver, F. J. R., & Leung, K. (2017). Chapter 3 - Methods and Design. *Method and Data Analysis*, *2013*, 1–30. https://mda.gesis.org/index.php/mda

Van Praag, B., & Sanchez, H. S. (2014). Mobile technology in second language classrooms: Insights into its uses, pedagogical implications, and teacher beliefs. *ReCALL*, *27*(3), 288–303. https://doi.org/10.1017/S0958344015000075

Vandeyar, T. (2015). Policy intermediaries and the reform of e-Education in South Africa. *British Journal of Educational Technology*, *46*(2), 1–26. http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1467-8535

Venkatesh, V., & Davis, F. D. (2000). Theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2016). Unified theory of acceptance and use of technology: A synthesis and the road ahead. *Journal of the Association for Information Systems*, *17*(5), 328–376. https://doi.org/10.17705/1jais.00428

Vodacom (Pty) Limited. (2014). *Vodacom Mobile Education Programme*. Big Media. http://www.digitalclassroom.co.za/digitalclassroom/mobile-education-programme

Wachiuri, R. N. (2015). Effects of Teachers' Experience and Training on Implementation of Information Communication Technology in Public Secondary Schools in Nyeri, Central District, Kenya. *IOSR Journal Of Humanities And Social Science Ver. VII*, *20*(3), 26–38. https://doi.org/10.9790/0837-20372638

Wagner, E. D., & Wilson, P. (2005). Disconnected: Why learning professionals need to care about mobile learning. *T+ D, American Society for Training and Development*, *43*(12), 40–43. https://astdnefl.org/

© University of Pretoria

Wajszczyk, R. (2014). A study of the impact of technology in early education [Uppsala University]. In *Uptec It 14*. http://www.diva-portal.org/smash/record.jsf?pid=diva2:737018

Wang, M., Shen, R., Novak, D., & Pan, X. (2009). The impact of mobile learning on students' learning behaviours and performance: Report from a large blended classroom. *British Journal of Educational Technology*, *40*(4), 673–695. https://doi.org/10.1111/j.1467-8535.2008.00846.x

Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International*, *45*(4), 411–419. https://doi.org/10.1080/14703290802377307

Watson, D. (2001). Pedagogy before technology: re-thinking the relationship between ICT and teaching. *Education and Information Technologies*, *6*(4), 251–266. https://www.springer.com/journal/10639

Waxman, H. C., Boriack, A. W., Lee, Y.-H., & MacNeil, A. (2020). Principals' Perceptions of the Importance of Technology in Schools. *Contemporary Educational Technology*, *4*(3), 187–196. https://doi.org/10.30935/cedtech/6102

Willemse, J. J., Jooste, K., & Bozalek, V. (2014). Perceptions of students and educators on the potential use of mobile devices in an undergraduate nursing module. *African Journal for Physical, Health Education, Recreation and Dance*, *1*(1), 179–196. https://journals.co.za/journal/ajpherd

Willig, C. (2013). *Introducing Qualitative Research in Psychology* (3rd ed.). Open University Press.

Wilson, A. (2015). A guide to phenomenological research. Nursing Standard (Royal College of Nursing (Great Britain) : 1987), 29(34), 38–43. https://doi.org/10.7748/ns.29.34.38.e8821

Wilson, M. L., Ritzhaupt, A. D., & Cheng, L. (2020). The impact of teacher education courses for technology integration on pre-service teacher knowledge: A meta-

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analysis study. Computers and Education, 156(December 2019), 103941. https://doi.org/10.1016/j.compedu.2020.103941

Wozney, L., Venkatesh, V., & Abrami, P. (2006). Implementing computer technologies-teachers' perceptions and practices. *Journal of Technology and Teacher Education*, *14*(1), 173–207. earntechlib.org

Yalin, H. I., Karadeniz, S., & Sahin, S. (2007). Barriers to Information and Communication Technologies Integration into Elementary Schools in Turkey. *Journal of Applied Sciences*, *7*(24), 4036–4039. https://doi.org/10.3923/jas.2007.4036.4039

Yamagata-lynch, L. C. (2020). *View of Blending online asynchronous and synchronous learning | The International Review of Research in Open and Distributed Learning*. *15*(2). http://www.irrodl.org/index.php/irrodl/article/view/1778/2837

Yin, R. K. (2011). *Qualitative research from Start to Finish*. The Guilford Press.

Zach, L. (2006). Using a multiple-case studies design to investigate the information-seeking behavior of arts administrators. Library Trends, 55(1), 4–21. https://doi.org/10.1353/lib.2006.0055

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6. ANNEXURES

6.1 Annexure A: Permission letter

The Head of Department

NW Department of Education and Sports Development

Garona Building

Mmabatho

For Attention: Ms Constance Moroeng, moroengc@nwpg.gov.za

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

Dear Ms Moroeng

My name is **Rannosi Francis Motene**, and I am a PhD student at the Science, Mathematics and Technology department of the University of Pretoria's Education Faculty. The research I wish to conduct for my Doctoral Thesis involves "the professional development of teachers on the use of mobile technologies for teaching and learning." The project aims to expose teachers to authentic mobile learning activities that demonstrate the usefulness and ease of use of mobile devices in class. Whilst letting teachers personally experience the affordances of mobile device, the research aims to explore:

1. How teachers' perceptions about the usefulness of mobile technologies influence their attitude, behavioural intent and actual use of mobile technologies in class?
2. How teachers' perceptions with regard to the ease of use of mobile technologies in class influence their attitude, behavioural intent and actual use of mobile technologies in class?

This project will be conducted under the supervision of Professor Linda Van Ryneveld, Head: Comprehensive Online Education Services, Hatfield Campus, University of Pretoria, 012 420 5570, email: linda.vanryneveld@up.ac.za.

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I am hereby seeking your consent to conduct the research in schools recently provided with technological devices by the Department of Basic Education. These schools are in the Bojanala District, the list of which will be provided by Mr Neo Mothobi (Chief Education Specialist: Curriculum Innovation and e-Learning, Department of Basic Education, Tel: 012 357 4250, email: mothobi.n@dbe.gov.za.

Attached, kindly receive the ethical clearance from the University of Pretoria. If you require any further information, please do not hesitate to contact me or Prof Linda Van Ryneveld. Mr Mothobi can also provide further clarity on the schools and participants to be included in the research.

Yours Sincerely,

RF Motene (Mr)
University of Pretoria

Prof Linda Van Ryneveld
University of Pretoria

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6.2 Annexure B: Information leaflet and informed consent form

FACULTY OF EDUCATION

DEPARTMENT OF SCIENCE MATHEMATICS AND TECHNOLOGY EDUCATION

INFORMATION LEAFLET AND INFORMED CONSENT

PROJECT TITLE: Professional development of teachers on the use of mobile devices for teaching and learning

Primary investigator: Mr Rannosi Francis Motene (Student Number: 25354052)
(Department of Science, Mathematics and Technology Education)
Study leader: Prof Linda Van Ryneveld, Department of Science, Mathematics and Technology Education, University of Pretoria.

Dear Research participant,

You are invited to participate in a research study that forms part of my formal PhD in Computer Integrated Education studies. This information leaflet will help you to decide if you would like to participate. Before you agree to take part, you should fully understand what is involved. You should not agree to take part unless you are completely satisfied with all aspects of the study.

WHAT IS THE STUDY ALL ABOUT?

The aim of the study is to find out how a programme, that will train and teach teachers on the use of mobile devices in class, influence teachers' actual use of mobile devices in teaching and learning. The main research question is:

> *To what extent can a professional development programme for teachers influence their actual use of mobile devices into their teaching practices?*

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The three sub-questions are:

1. *How do teachers' age, gender, experience and self-initiative influence their attitudes, behavioural intent and actual use of mobile devices in class?*
2. *How do teachers' perceptions about the usefulness and ease of use of mobile devices influence their attitude, behavioural intent and actual use of mobile devices in class?*
3. *How do teachers' perceptions with regard to their status and facilitating conditions influence their attitudes, behavioural intent and actual use of mobile devices in class?*

WHAT WILL YOU BE REQUIRED TO DO IN THE STUDY?

A case study design will be employed to gain insight into, and a deeper understanding, of how mobile devices are used and experienced by the teachers at the selected site. The teachers will be trained on how to use mobile devices as resourceful tools for teaching and learning using various elements of gamification. The implementation of the game-based intervention will be for two days during the autumn recess (March school holidays) and thereafter one afternoon a month for three days. The intervention will be built based on identified content for teaching. All training will be conducted at your school.

A pre- and post-test questionnaire (adapted from Davis, 1989) will be used to collect data, as well as personal interviews, which will be recorded. Observations during the implementation of the intervention to collect data will also be noted in a research journal. Respondents will be asked to rate their opinion of perceived ease of use and perceived usefulness using a 5-point Likert scale ranging from 1 = Strongly disagree, 2 = Disagree, 3 = Neither disagree nor agree, 4 = Agree, 5 = Strongly agree. For intention to use mobile devices in teaching and learning, opinions were rated using a 5-point Likert scale ranging from1=Very Unlikely, 2=Likely, 3=Neither unlikely nor likely, 4=Likely and

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5=Very Likely.

If you decide to take part in the study, you will be required to do the following:

- To sign this informed consent form
- To read what is written on this document. It should not take more than 30 minutes to complete it.

WHAT ARE THE POTENTIAL BENEFITS THAT MAY COME FROM THE STUDY?

The main objectives of the study are:

1. To provide teachers with practical experience of mobile devices to enable them to devise steps towards integration in their own teaching practices.
2. To explore teachers'
    a. perceived usefulness
    b. perceived ease of use, and
    c. acceptance of mobile devices in a teaching and learning context.

The study will explore how an exciting and personally meaningful professional development programme can be created for teachers that will enable them to use mobile devices in their classes. The professional development programme will expose teachers to authentic mobile learning activities that demonstrate the usefulness of the device in class. The programme will also aim to influence teachers' perceptions about the ease of use of mobile devices for teaching and learning purposes, by letting them personally experience the affordances of mobile devices.

WILL YOU RECEIVE ANY FINANCIAL COMPENSATION OR INCENTIVE FOR PARTICIPATING

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IN THE STUDY?

Please note that you **will not** be paid to participate in the study.

WHAT ARE YOUR RIGHTS AS A PARTICIPANT IN THIS STUDY?

Your participation in this study is entirely voluntary, meaning that you can decide if you want to take part or not. You have the right to withdraw at any stage without any penalty or future disadvantage whatsoever. You don't even have to provide the reason/s for your decision. Your withdrawal will in no way influence your employment.

HOW WILL CONFIDENTIALITY AND ANONYMITY BE ENSURED IN THE STUDY?

The University of Pretoria's ethics requirements and protocols will be adhered to. Permission will be sought from relevant authorities within the Department of Basic Education. Participants will be issued with consent forms which will indicate that their participation is voluntary. It will be explained to them that their answers will remain anonymous and their identities, and the identity of their school, will not be revealed. All material, notes, recordings and transcripts will be kept safely at the University with only the supervisor, the researcher and the examination panel having access to them. All information obtained during this study is strictly confidential. All the data that you provide during the study will be handled confidentially. Your answers will remain anonymous and identities, and the identity of the school, will not be revealed. All material, notes, recordings and transcripts will be kept safely at the University with only the supervisor, the researcher and the examination panel having access to them. All the data sheets that have been collected will be stored in a secure place for three years, after which they will be destroyed and not shared with any other person without your permission.

IS THE RESEARCHER QUALIFIED TO CARRY OUT THE STUDY?

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The researcher is a PhD in Computer Integrated Education student at the Department of Science, Mathematics and Technology Education of the University of Pretoria and received special training to do the research. The researcher comes from the same geographical region as you. This means that he/she deeply understand your cultural context and can fluently speak the local languages.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

Yes. The Faculty Research and Innovation Committee and the Research Ethics Committee of the University of Pretoria have approved the formal study proposal. All parts of the study will be conducted according to internationally accepted ethical principles.

WHO CAN YOU CONTACT FOR ADDITIONAL INFORMATION REGARDING THE STUDY?

The primary investigator, Mr Rannosi Francis Motene, can be contacted during office hours on his cellular phone at 072 311-8421 or on his email address: u25354052@tuks.co.za. The study leader, Prof Linda Van Ryneveld, can be contacted during office hours at Tel (012) 420-5570, or on her email address: linda.vanryneveld@up.ac.za

DECLARATION: CONFLICT OF INTEREST

There is no conflict of interest.

A FINAL WORD

Your co-operation and participation in the study will be greatly appreciated. Please sign the underneath informed consent if you agree to partake in the study. In such a case, you will receive a copy of the signed informed consent from the researcher.

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INFORMED CONSENT

I hereby confirm that I have been adequately informed by the researcher about the nature, conduct, benefits and risks of the study. I have also received, read and understood the above written information. I am aware that the results of the study, including personal details regarding my age and educational level will be anonymously processed into a research report. I understand that my participation is voluntary and that I may, at any stage, without prejudice, withdraw my consent and participation in the study. I had sufficient opportunity to ask questions and of my own free will, declare myself prepared to participate in the study.

Research participant's name: _____ (Please print)

Research participant's signature: _____

Date: _____

Researcher's name: Rannosi Francis Motene

Researcher's signature: _____

Date: _____

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6.3 Annexure C: Participants questionnaire

Participant questionnaire

Demographic information

* Required

1. **Email address** *

Introduction

You will be participating in the study conducted to capacitate teachers to use mobile devices and integrate them in teaching and learning. Please complete the following survey to the best of your ability. There are neither »right« nor »wrong« answers, nor does it matter how other people would answer the questions. Please answer all questions and don't skip any. Only your own opinion is important. You do not have to give your name, so no one will find out what your answers were. We cannot and do not want to find out who answered what. Select your response by ticking ✓ the appropriate block. The survey may contain questions of a sensitive nature which will be used to collect demographic information only.

2. **Are you Male or Female?** *
Check all that apply.

☐ Female

☐ Male

3. **Select your age category by ticking ✓ the appropriate block.**
Check all that apply.

- ☐ 20 - 29
- ☐ 30 - 39
- ☐ 40 - 49
- ☐ 50 - 59
- ☐ 60 - 69

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4. **How long have you been in the teaching profession?**
Check all that apply.

- [ ] 0 - 9 years
- [ ] 10 - 19 years
- [ ] 20 - 29 years
- [ ] 30 - 39 years
- [ ] 40 - 49 years

Knowledge and use of technological devices

Please tell us about some technological devices :

5. **Which of the following devices do you own? (Multiple choice – you can select several items by ticking the appropriate box) Tick ✓ the appropriate block.**
Tick all technological devices that you own.
Check all that apply.

- [ ] Desktop computer
- [ ] Laptop computer
- [ ] Tablet
- [ ] Mobile phone
- [ ] Kindle
- [ ] Digital camera
- [ ] iPod/MP3 player
- [ ] A video game console (e.g. PlayStation, Xbox, Wii,...)
- [ ] Other: _____

6. **Which of the following devices do you use? (Multiple choice – you can select several items by ticking the appropriate box) Tick ✓ the appropriate block.**
Tick all technological devices that you use.
Check all that apply.

- [ ] Desktop computer
- [ ] Laptop computer
- [ ] Tablet
- [ ] Mobile phone
- [ ] Kindle
- [ ] Digital camera
- [ ] iPod/MP3 player
- [ ] A video game console (e.g. PlayStation, Xbox, Wii,...)
- [ ] Other: _____

7. **If you ticked 'Other' in the previous question, please provide more information.**

_____

_____

_____

_____

_____

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8. **Does your mobile device, have the functionality to ...?**
Send and receive email?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

9. **Does your mobile device, have the functionality to ...?**
Send and receive text messages?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

10. **Does your mobile device, have the functionality to ...?**
Send instant messages to someone (e.g. WhatsApp; Google Hangout, Facebook, etc.)?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

11. **Does your mobile device, have the functionality to ...?**
Access the internet or websites for news, weather, sports, or other information?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

12. **Does your mobile device, have the functionality to ...?**
Watch TV programmes?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

13. **Does your mobile device, have the functionality to ...?**
Play games?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

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14. **Does your mobile device, have the functionality to ...?**
Play music or MP3 files?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

15. **Does your mobile device, have the functionality to ...?**
Play videos; Record videos?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

16. **Does your mobile device, have the functionality to ...?**
Take pictures?
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

17. **How regularly do you use your device for the functionalities already mentioned?**
Check all that apply.

- ☐ Once or more a day
- ☐ Once or more a week
- ☐ Once or more a month
- ☐ Other: _____

18. **Tick all technological devices that you use for Internet / go online with ...(Tick ✓ the appropriate block)**
Check all that apply.

- ☐ Use a cellular phone
- ☐ Tablet
- ☐ Laptop
- ☐ Desktop computer

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19. **If you go online using a desktop computer, where do you do this? Multiple choice. (Tick ✓ the appropriate block)**
Check all that apply.

- [ ] At school
- [ ] At library
- [ ] At an internet café
- [ ] At someone else's house
- [ ] At a phone shop
- [ ] At home
- [ ] Other: _____

20. **Please tell us if you have ever used a mobile device or a computer for teaching purpose?**
Mark only one oval.

- ◯ Yes
- ◯ No

21. **Can you download apps?**
Mark only one oval.

- ◯ Yes
- ◯ No

22. **Which are your favourite ones? List them according to priority and separate your list with a comma.**

_____

_____

_____

_____

_____

23. **Ever experimented with educational apps in class?**
Mark only one oval.

- ◯ Yes
- ◯ No

24. **Please rate your general computer skills.**
Mark only one oval.

	1	2	3	4	5	
Very poor	◯	◯	◯	◯	◯	Advanced

- [ ] Send me a copy of my responses.

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6.4 Annexure D: TAM questionnaire

Perceived usefulness and Ease of use questionnaire.

Adapted from: Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS quarterly, 319-340.
Please rate the usefulness and ease of use of mobile devices.

1. **Email address** *

Perceived usefulness

Please rate the usefulness of mobile devices. Select from the 5-point Likert scale ranging from 1=Strongly disagree, 2=Disagree, 3=Neither disagree no agree, 4=Agree, 5=Strongly agree. Try to respond to all the items.

2. **Mobile devices would enable me to add fun element to class**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

3. **Using mobile devices in my teaching would motivate learners to engage**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

4. **Using mobile devices in my teaching would provide opportunities for learners to connect with one another.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strognly agree

5. **The use of mobile devices would make my teaching effective.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

6. **The use of mobile device would eliminate repetitive and tedious activities, such as marking.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

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7. **The use of mobile devices would enable me to get individualised feedback from all learners in class.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

8. **The use of mobile devices would open up channels of communication with parents.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

9. **I can access the learning activities at times convenient to me.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

10. **The online material and learning activities are accessible at locations suitable and convenient to me.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

11. **Using mobile devices would improve my job performance and enrich the class due to the affordances of mobile devices.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Stronngly agree

Perceived ease of use

Please rate the ease of use of mobile devices. Select from the 5-point Likert scale ranging from 1=Strongly disagree, 2=Disagree, 3=Neither disagree no agree, 4=Agree, 5=Strongly agree. Try to respond to all the items.

12. **Learning to operate a mobile device is easy for me.**
Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly agree

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13. **Its easy to get the mobile device to do what I want it to do.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

14. **I am keen to experiment with mobile devices in my class.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

15. **I think that it would be easy to integrate mobile devices in my class.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

16. **I am a quick learner when it comes to technology.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

17. **I will be able to master the use of mobile devices in class with ease.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

18. **I am already using my phone to (shop, read, search information, email, whatsapp, sms, watch videos, do banking).**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

☐ Send me a copy of my responses.

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6.5 Annexure E: Participants observation checklist

BOJANALA DISTRICT TEACHER PROFESSIONAL DEVELOPMENT
WORKSHOPS OBSERVATION CHECKLIST

ACTION	YES	NO	DESCRIPTION/COMMENT
1. Participant demonstrates continuous use of mobile devices throughout the session.			
2. Participant displays knowledge of the mobile devices used during the workshops.			
3. Participant displays confidence while using the mobile devices.			
4. Participant appears comfortable using the mobile devices.			
5. Participant appears frustrated when using the mobile devices.			
6. If a problem occurs with the mobile device the participant is able to solve it and work through.			

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6.6 Annexure F: UTAUT Participant Questionnaire

UTAUT Participant Questionnaire

You asked to participate in the study conducted to capacitate teachers to use mobile devices and integrate them in teaching and learning. Please complete the following survey to the best of your ability. There are neither »right« nor »wrong« answers, nor does it matter how other people would answer the questions. Please answer all questions and don't skip any. Only your own opinion is important. You do not have to give your name, so no one will find out what your answers were. We cannot and do not want to find out who answered what. Select your response by ticking ✓ the appropriate block. The survey may contain questions of a sensitive nature which will be used to collect demographic information only.

This form should be read in conjunction with the "Information for prospective participants" available at

https://forms.gle/gmh8C1om9KM9tDpr5

Participant consent form

I understand that participation in this research will involve the following:

1. I will be involved in a study on "The professional development of teachers on the use of mobile devices for teaching and learning.
2. Data gathered for this project will not be made available to any third party and will be subject to provisions of the University of Pretoria's ethics requirements.
3. I will not be identified in any way other than a code number or pseudonym in data records, video recordings or reports of the research findings.
4. I may withdraw from parts of this study at any stage, and if I wish I may withdraw from the project completely.
5. If I have my concerns about my participation in this research project I may approach the researcher's supervisor at 012 420 5570.

1. **By indicating the date, I agree and give consent to participate**

   Example: December 15, 2012

Moderators

2. **Are you "Male" or "Female"**
   Mark only one oval.

   - ◯ Female
   - ◯ Male
   - ◯ Prefer not to say
   - ◯ Other:

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3. **Select your age category by ticking ✓ the appropriate block.**
Mark only one oval.

- ◯ 20 - 29
- ◯ 30 - 39
- ◯ 40 - 49
- ◯ 50 - 59
- ◯ 60 - 69

4. **How long have you been in the teaching profession?**
Mark only one oval.

- ◯ 0 - 9 years
- ◯ 10 - 19 years
- ◯ 20 - 29 years
- ◯ 30 - 39 years
- ◯ 40 - 49 years

5. **Do you think teachers in the school have intentions to use mobile devices in the classroom?**
Mark only one oval.

- ◯ Yes
- ◯ No

Technology attributes

Individuals attribute considerable importance to the extent to which the technology in question may be useful and easy to use

Performance expectancy (PE)

The degree to which a teacher believes that using mobile devices will help him or her to attain gains in performance

6. **Would you find it useful to use mobile devices in your classroom?**
Mark only one oval.

- ◯ Yes
- ◯ No

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7. **If yes, would you consider using it for:**
Check all that apply.

- [ ] Assessment,
- [ ] Watching videos
- [ ] Getting students' responses
- [ ] Access to teaching
- [ ] Access to learning tools
- [ ] Discipline
- [ ] Attendance registers
- [ ] Other: _____

8. **How likely is it that using mobile technology makes teaching more meaningful and fun? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very unlikely	◯	◯	◯	◯	◯	Very likely

9. **How likely do you think that using mobile devices would enhance your job performance? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very Unlikely	◯	◯	◯	◯	◯	Very Likely

10. **How likely is it that using mobile devices enables you to complete tasks more efficiently than before? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very unlikely	◯	◯	◯	◯	◯	Very likely

11. **What would constitute success for you if you implemented mobile devices in your classroom? In other words, how would you know if you were successful in implementing mobile devices?**

_____

_____

_____

_____

_____

Effort expectancy (EE)

The degree of ease associated with the use of mobile devices in the classroom

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12. **In your opinion, how would you rate the introduction of mobile devices into your classroom? Indicate by selecting on the scale, with 1 = Very hard; 2 = hard; Not sure; 4 = Easy; 5 = Very Easy**
Mark only one oval.

	1	2	3	4	5	
Very hard	◯	◯	◯	◯	◯	Very Easy

13. **How difficult is it to use mobile devices? Indicate by selecting on the scale, with 1 = Very difficult; 2 = difficult; Not sure; 4 = Easy; 5 = Very Easy**
Mark only one oval.

	1	2	3	4	5	
Very difficult	◯	◯	◯	◯	◯	Very easy

14. **How competent are you in the use of mobile devices? Indicate by selecting your level of competency**
Mark only one oval.

- ◯ Expert
- ◯ Advanced
- ◯ Intermediate
- ◯ Beginner
- ◯ Not yet competent

15. **How easy do you think it would be for learners to use mobile devices in the classroom? Indicate by selecting on the scale, with 1 = Very hard; 2 = hard; Not sure; 4 = Easy; 5 = Very Easy**
Mark only one oval.

	1	2	3	4	5	
Very hard	◯	◯	◯	◯	◯	Very easy

Contextual factors

Individuals may associate importance to the facilitating conditions such as help desks and training programs as well as to the experiences of other individuals in using the technology

Social influence (SI)

The degree to which a teacher is perceived by others whether he or she should use mobile devices in the classroom

16. **Do your colleagues encourage the use of mobile devices for teaching and learning?**
Mark only one oval.

- ◯ Very discouraging
- ◯ Discouraging
- ◯ Encouraging
- ◯ Very encouraging

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17. **How likely are you to be influenced by your peers? In other words, would you like to adopt their practices if it seems like they are successful in implementing mobile devices in their classrooms? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very unlikely	◯	◯	◯	◯	◯	Very likely

18. **Are you influenced by the rest of the staff's levels of motivation if it comes to the use of mobile devices in class**
Mark only one oval.

◯ Yes
◯ No

19. **Is there a culture of innovation at your school?**
Mark only one oval.

◯ Yes
◯ No

20. **How likely is it that mobile devices would promote collaboration among teachers? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very unlikely	◯	◯	◯	◯	◯	Very likely

21. **On a scale of 1 to 5, with 1 being very little and 5 being too much, to what extent does the use of mobile devices in class improve your status or image at school?**
Mark only one oval.

	1	2	3	4	5	
Very little	◯	◯	◯	◯	◯	Too much

Facilitating conditions (FC)

The degree to which a teachers believes that there is an availability of an organizational and technical infrastructure to support use of mobile devices in the classroom

22. **Are there managerial strategies in place at your school to support the use of technological devices in the classroom?**
Mark only one oval.

◯ Yes
◯ No

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23. **Does your school have access to mobile devices?**
Mark only one oval.

- ◯ Yes
- ◯ No

24. **How easy is it for you to get mobile devices in/to your classroom? Indicate by selecting on the scale, with 1 = Very hard; 2 = hard; Not sure; 4 = Easy; 5 = Very Easy**
Mark only one oval.

	1	2	3	4	5	
Very Hard	◯	◯	◯	◯	◯	Very easy

25. **Is there enough mobile devices at the school to enable the use of mobile devices in the classroom whenever needed?**
Mark only one oval.

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Agree
- ◯ Strongly agree

26. **Do you access to WIFI at your school?**
Mark only one oval.

- ◯ Yes
- ◯ No

27. **Do you receive satisfactory technical support when using mobile devices in the classroom?**
Mark only one oval.

- ◯ Yes
- ◯ No

28. **Do you have the knowledge (know how) , resources and technical support to use mobile devices?**
Mark only one oval.

- ◯ Yes
- ◯ No

29. **How likely is it that keeping mobile devices at school makes it convenient to use them? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very unlikely	◯	◯	◯	◯	◯	Very likely

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30. **Having free wi-fi at school makes using mobile devices in the classroom easy.**
Mark only one oval.

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Agree
- ◯ Strongly agree

31. **How likely is it that learners would find the use of mobile devices in the classroom exciting? Indicate by selecting on the scale, with 1 = Very unlikely; 2 = unlikely; Not sure; 4 = Likely; 5 = Very Likely**
Mark only one oval.

	1	2	3	4	5	
Very unlikely	◯	◯	◯	◯	◯	Likely

32. **Do you want to implement mobile devices in your classroom?**
Mark only one oval.

- ◯ Yes
- ◯ No

33. **Are you forced or encouraged by others to implement mobile devices in the classroom? If so, select the party that enforce the use of mobile devices in the classroom from the list provided.**
Mark only one oval.

- ◯ Policy
- ◯ District officials
- ◯ Principal
- ◯ Head of Department
- ◯ Subject Head
- ◯ Voluntary - Self

Thank you for completing our questionnaire!

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6.7 Annexure G: Interview protocol

Interview protocol

Variables			Interview Questions
Technology attributes	Performance expectancy (PE)	Perceived Usefulness (PU)	How useful do you think it is to use mobile devices in your classroom?
		Extrinsic Motivation	How would mobile devices help you to achieve learning outcomes in a fun way?
		Job-Fit	In what way would you say mobile devices will enhance your/learners' performance?
		Relative advantage	How are mobile devices better than board and chalk?
		Outcome Expectations	How would mobile devices lead to effective learning?
	Effort expectancy (EE)	Perceived Ease of Use	In your own opinion, what are the challenges of introducing mobile devices into your classroom?
		Complexity	How does utilising mobile devices affect your daily tasks/ activity?
		Ease of use	In you understanding, does mobile devices have a positive impact on learners or in your school?
Contextual factors	Social influence (SI)	Subjective Norm	How encouraging are your colleagues with regards to the use of mobile devices for teaching and learning?
		Social Factors	In your opinion does mobile devices promote collaboration among learners?
		Image	To what extent does mobile devices promote positive outlook on learning?
	Facilitating conditions (FC)	Perceived Behavioural Control	1. What factors would you regard as barriers to your using mobile devices in your classroom? 2. What do you think should be done to overcome these barriers?
		Facilitating Conditions	What assistance is available for you to implement teaching with technological devices in the classroom? Follow-up: At what level of the school system do you receive support?
		Compatibility	How convenient is it to access the mobile devices in your school?
Moderating variables	age		
	gender		
	experience		
	voluntariness		Do you think teachers in the school have intentions to use mobile devices in the classroom?

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6.8 Annexure H: Lesson Plan

<table>
<tr><td colspan="6">TERM 1 LESSON PLANS – GRADE 4
Educator: Sefora D.M</td></tr>
<tr><td colspan="3">Subject: English First Additional Language</td><td colspan="3">Grade: 4</td></tr>
<tr><td colspan="6">Theme 1: Animal tales</td></tr>
<tr><td colspan="3">Duration: 2 weeks (10 hours)</td><td colspan="3">Term 1 Weeks 1 & 2</td></tr>
<tr><td rowspan="2">CAPS Content and Skills</td><td>Listening and Speaking
(2 hours)</td><td>Reading and Viewing (5 hours)</td><td>Writing and Presenting
(2 hours)</td><td colspan="2">Language Structures and Conventions
(1 hour)</td></tr>
<tr><td>• Does daily listening and speaking practice (YouTube videos)
• Listens to a story about a Hare and Tortoise (You Tube)
• Gives a personal recount about an enjoyable experience</td><td>• Reads a story about a Hare and Tortoise
• Does a comprehension on the story
• Does independent reading</td><td>• Writes sentences about a story and type sentences using laptops
• Writes a personal recount using a frame
• Uses the writing process(Using My Popplet app for mind map)
• Creates a personal dictionary</td><td colspan="2">Spelling and punctuation
• Spelling: writes words correctly in a personal dictionary
• Looks up the meaning of words in an online dictionary
• Punctuation: full stop, capital letters, small letters
Work with words and sentences
• Countable nouns
• Uncountable nouns
• Determiners
• Simple past tense
Vocabulary in context
• Synonyms</td></tr>
<tr><td colspan="2">LEARNING ACTIVITY</td><td colspan="2">TEACHING METHODS / APPROACH
Learners listen to a story three times using Interactive workbooks, they take notes and identify new words. For accuracy they of these words they use Oxford dictionary. They look for meaning of words using Encarta and Online dictionary and answer questions after listening.</td><td colspan="2">RESOURCES
Laptops, Speakers, DBE Workbook, Exercise books,
Pens, Formal Assessment Task, Work sheets</td></tr>
</table>

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Week 1 **LESSON 1:** **Listening and speaking**	**Duration: 60 minutes** **DBE Interactive workbooks** **Listen to a video to introduce the lesson and play a name game.** **Listens to a story about the hare and the tortoise** **Independent Reading - Reader** **Use the exercises in the DBOE Workbook 1 (Terms 1 and 2) pages 36 to 37 for additional support.**	• Laptops, Interactive Workbooks, • NECT English FAL Grade 4 Reader • Dictionary • Personal dictionaries, Online Dictionary • Use the exercises in the DBE Workbooks for additional support. • School Tube http://www.schooltube.com/info/safety/ • YouTube, Google https://www.youtube.com/watch?v=FqeFLMkEng • QR Codes http://www.qr-codegenerator.com/ • School website • Online quiz tools • Games • Google Forms • FlipQuize • Google docs • Relevant ICT applications
LESSON 2: **Listening and speaking**	**Duration: 60 minutes** LB pages and 36 Listens to the story about the hare and the tortoise Discusses questions **Work with words and sentence** LB Page 37 Determiners (one, two etc.) Countable and uncountable nouns(Use You Tube Videos)	
LESSON 3: **Reading and Viewing**	**Duration: 60 minutes** LB pages 36 and 37 Reads a story about the hare and the tortoise from the listening text **Independent reading - Reader** **Use the exercises in the DBOE Workbook 1 (Terms 1 and 2) pages 6 and 7 for additional support.**	
LESSON 4:	**Duration: 60 minutes**	

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Language Structures and Conventions	LB page 37 Simple present tense **Language focus** **Independent reading - Reader**	
LESSON 5: Writing and presenting	**Duration: 60 minutes** **LB page 38** **(Type)Writes a paragraph about the hare and tortoise** Creates a personal dictionary **Formal Task 1 Act 6 (Paragraph writing)** **Use the exercises in the DBOE Workbook 1 (Terms 1 and 2) page 38 for additional support.**	

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